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ENCYCLOPÆDIA BRITANNICA.

PLATOMETER (πλατυς, *broad*, *μέτρον*, *a measure*) is the name of an instrument invented by Mr John Sang, Kirkcaldy, 24th December 1851, the principal feature of which is the employment of a cone acting on an index-wheel, from which is read off the area of any figure whose outline has been followed by the tracer of the instrument. It has the peculiar advantage of giving the areas of the most irregular figures with the same accuracy that it gives the areas of the most regular, and with the same facility. It will be found described and figured in the *Transactions of the Royal Scottish Society of Arts*, vol. iv.

PLATON, a celebrated archbishop of Moscow, whose family name was *Leoshin*, was born 24th June 1737. He was the son of a priest near Moscow, and while yet a student at the university there, he was made teacher of poetry and rhetoric at the convent. He shortly afterwards entered the church; and after various stages of advancement, he was, in 1762, made rector and professor of theology. The visit of Queen Catherine II. to the St Sergius Lavra was made after her coronation in 1762, and Platon preached a discourse before her remarkable for its eloquence. So favourable was the impression, that he was at once appointed court preacher and preceptor in matters of religion to the Grand Duke, for whose instruction he drew up the *Orthodox Faith, or Outlines of Christian Theology*, esteemed the best of his works. He was created archbishop of Tver in 1770; and after a four years' residence at St Petersburg he was removed. During his residency at his new office he established a number of minor schools for religious instruction, and wrote two separate treatises, one for teachers, and the other for pupils. He had also entrusted to him the education of the Princess of Würtemberg-Stuttgart, Maria Pheodorovna, in the tenets of the Græco-Russian church. He was advanced to the see of Moscow in 1775; and in 1785 he erected a convent in Bethania, where he afterwards resided. As metropolitan of the Russian church he enjoyed the privilege of placing the crown on the Emperor Alexander at Moscow 1801. He died at Bethania during the following year, 1802. His works, printed at different times, amount in all to 20 volumes. A selection from them, consisting of the finest passages, was published in 2 volumes in 1805.

PLATTSBURG, a town of the United States of North America, state of New York, on both sides of the Saranac, at its mouth in a wide and beautiful bay on Lake Champlain, 160 miles N. by E. of Albany. It contains many good edifices, among which are the county buildings, several churches, an academy and other schools, two banks, &c. There are also saw-mills, cotton factories, and manufactories of leather, machinery, &c. Plattsburg is a military post, and a large stone barracks was recently erected in the neighbourhood, but it is not at present garrisoned. An extensive and active trade is carried on, the town being connected by railway with Montreal, and by steamers with the various other ports on the lake. The tonnage of the port, enrolled and licensed, June 30, 1852, was 6259; of which, sailing-vessels 4558 tons, steamers 1701 tons. Pop. (1850) 5618.

PLAUEN, a walled town of the kingdom of Saxony, circle of Zwickau, is built on uneven ground in a beautiful valley on the W. bank of the White Elster, 61 miles S.W. of Leipsic. On an elevated spot stands the old castle which was anciently the residence of the stewards of the empire (*Voigte des Reichs*), Plauen having been the capital of the *Voigtland*. Among the buildings of the town are several churches, hospitals, and schools. Plauen is one of the most important manufacturing towns in the kingdom, producing cotton goods, muslins, cambrics, lace, hosiery, leather, watches, philosophical instruments, and other articles. Pop. 13,812.

PLAUTUS, the greatest of the Roman comic dramatists, is almost unknown to us except by his writings. As his personal history was a matter of indifference to his contemporaries, it is not until the writings of a later period that we find even a casual reference to it. Our endeavour to reach the truth is moreover impeded by the many attributes which are generally ascribed to a comic poet, such as humble origin and personal deformity. This may account in some measure for the conflicting statements on almost every point of his life. Until the investigations of Ritschl (*De Plauti poetæ nominibus*) the poet's name was supposed to be *Marcus Accius Plautus;* but on the discovery of the palimpsest manuscript at Milan, his real name was found to be *Titus Maccius Plautus;* the one name *Maccius* having been divided into the two, *M. Accius.* The word Plautus meant in the Umbrian dialect "flat-footed." Hence perhaps the idea of deformity. In some of the manuscripts the cognomen *Asinius* is added to his name. Some have supposed that *Asinus* was the name really given him on account of his having been employed in grinding corn, a work generally performed by asses. Ritschl, however, has proved satisfactorily that Asinius is a corruption of Sarcinas, the ethnic name of the poet. Plautus is generally supposed to have been born at Sarcina, a village in Umbria, on the river Sapis (*Savio*), according to Ritschl (*De ætate Plauti*), in the year 254 B.C. As to his parentage there are two conjectures; either that he was born of slaves, and, going early to Rome, had an opportunity of associating with learned men, or that he was born of free parents who gave him a good education. For the little we know of his life we are indebted to a passage of Varro, preserved by Aulus Gellius (*Noctes Atticæ*, iii. 3.) Plautus while yet young went to Rome, where he was employed working for the actors on the stage ("in operis artificum scenicorum," a passage which does not mean, as supposed by Lessing, that he wrote plays). With the money which he gained by this means he made some commercial speculations. These failed, and Plautus was utterly ruined. He returned to Rome, where his difficulties were probably increased by the great scarcity of corn then prevailing. To support himself, he entered the service of a baker, who employed him in grinding corn with a hand-mill. At this time he composed the *Saturio*, the *Addictus*, and another play whose name is unknown. Ritschl supposes this to have been about the year 224 B.C., Plautus being thirty years of age. By these plays, and by his employment, he gained a sufficient sum to enable him to leave his master, and to continue at Rome writing for the stage. Of the rest of his life nothing is known. It is even doubtful whether he ever obtained the Roman franchise. The date of his death is differently stated by St Jerome and by Cicero. The former (*Chronicles of Eusebius*) names as the time of his death the 145th Olympiad,—that is, between the years 200 and 196 B.C.; while the latter (Brutus, 15), who is more exact, informs us that he died in the consulship of P. Claudius and L. Porcius, while Cato was censor,—that is, 183 B.C. Thus we find that he flourished during the second Punic war, and was contemporary with Cato.

It is difficult, if not impossible, to ascertain how many comedies Plautus actually wrote. Even in the time of Varro, as we see by the chapter in Aulus Gellius already quoted, it was a matter of dispute. Varro, it seems, wrote a book on the subject, entitled *Quæstiones Plautinæ.* At that time no less than 130 plays claimed Plautus as their author. Of these, Varro chose out 21 as being undoubtedly authentic, which, from this circumstance, were called Varronianæ. Among these were the 20 now extant, the *Vidularia*, which is lost, being the 21st. Varro, however, considered others besides these the work of Plautus; and L. Ælius fixes the number at 25. According to Gellius, several plays, which bore the names of other writers, had internal evidence of their having been written by Plautus (*Plautinissimi*). Such were the *Bœotia*, the *Nervolaria*, and the *Fretum*. The remaining plays attributed to Plautus are accounted for in two ways; either there was another comic poet of the name of Plautius, whose works (*Plautianæ*) were confounded with those of Plautus (*Plautinæ*), from the similarity of the two words; or they were the work of contemporaries, which were retouched (*retractatæ et expolitæ*) by Plautus. Probably both conjectures are true.

It is supposed that the extant comedies were arranged in their present order by Priscian the grammarian, who is also thought to have written the acrostic argument prefixed to each. The comedies follow one another, with one exception, in the alphabetical order:—1. The *Amphitryon* is the history of the birth of Hercules, in which his father Jupiter appears in a very questionable light. This play, in its ridicule of the gods, approaches the old Greek comedy more nearly than any of the other productions of Plautus. He himself called it a tragic comedy. So popular was it among the Romans that, as Arnobius tells us, it continued to be acted at Rome in the reign of Diocletian. The *Amphitryon* of Molière, and the *Two Socias* of Dryden, are both imitations of this play. 2. The *Asinaria* is a translation of a comedy written, according to Lessing, by Diphilus, a Greek comic poet. It is the story of a father and son in love with the same mistress. It contains much that is amusing, together with a great deal that is obscene. 3. The *Aulularia* is the story of a miser who discovers in his house a hidden treasure. Unfortunately the end of this play is lost. From the acrostic argument of Priscian, however, Antonius Codrus Urceus, a professor at Bologna, has attempted to supply the deficiency. On it Molière has founded his *Avare;* and Shadwell and Fielding their *Miser.* 4. The *Captivi* is generally acknowledged to be the masterpiece of Plautus. For it Lessing has an unbounded admiration, and even pronounces it "the best piece which has ever come upon the stage." He tells us that, though he had repeatedly read it, with a view to discovering some fault, far from doing so, on each perusal he had found more reason to admire it. It has an excellent plot, abounds with humour, and, far from having any taint of ribaldry, has a decidedly moral tendency. 5. The *Curculio.* 6. The *Casina*, copied from the Greek of Diphilus, is not a play of much merit. The prologue was evidently written long after its first representation, and after the death of Plautus. 7. The *Cistellaria* is a short piece, containing much that is obscene, and little that is interesting. 8. The *Epidicus*, a good play, was a great favourite with Plautus himself. 9. The *Bacchides*, a most ribald farce, is the only case in which the alphabetical arrangement of the plays is not kept. This is accounted for by the fact that, in the 215th line, the *Epidicus* is mentioned, thereby proving that it was written before the *Bacchides.* 10. The *Mostellaria* has been imitated by Reynard in his *Unexpected Return*, and also by Fielding in his *Intriguing Chambermaid.* 11. The *Menœchmi* is very clever and amusing. It has been imitated by Shakspeare in his *Comedy of Errors*, and by Reynard. 12. The *Miles Gloriosus* is one of the best dramas of Plautus. The subject is the outwitting of a braggart. 13. The *Mercator*, a play of small merit, is founded upon the 'Εμπορὸς of Philemon. 14. The *Pseudolus.* This play, and the *Truculentus*, we are told by Cicero (*De Senectute*), were considered by Plautus himself as his two best. The *Pseudolus* certainly is very good; but of the *Truculentus* we cannot say so much. In our opinion, it is the very worst of all the plays, being deficient in plot and filled with obscenity. 15. The *Pœnulus* is remarkable for containing some Carthaginian words, almost the only relics of that language. 16. The *Persa.* 17. The *Rudens*, a pleasing play, but with an unsatisfactory conclusion. 18. The *Stichus.* 19. The *Trinummus* is considered by Lessing to be the best production of its author, next to the *Captivi.* 20. *Truculentus.* 21. *Vidularia.* This play is supposed to have followed the *Truculentus*, and completed the 21 Varronianæ, from the fact, that in an old manuscript (*Codex* of Camerarius), at the end of the *Truculentus*, are the words "Incipit Vidularia," and that at the end of the palimpsest manuscript there are a few sentences of this play.

Horace, in his *Ars Poetica* (270), has the following severe criticism upon Plautus:—

> "At vestri proavi Plautinos et numeros et
> Laudavere sales, nimium patienter utrumque
> Ne dicam stulte, mirati, si modo ego et vos
> Scimus inurbanum lepido seponere dicto,
> Legitimumque sonum digitis callemis et aure."

Lessing has tried to prove that Horace does not mean by these words the unqualified condemnation of Plautus which they seem to imply at first sight, but that he merely condemns his verses. However this may be, we cannot wonder that the polished ear of Horace should have been offended by some of the coarse jokes and irregular lines of Plautus. But, at the same time, Horace ought to have remembered that 150 years had passed since Plautus flourished, and that taste and feeling had much changed in the interval. Such was not, however, the universal opinion of the learned men of the Augustan age. For Cicero (*De Officiis*, 29) says:—"Comedy is of two very different kinds,—the one illiberal, quarrelsome, shameless, and obscene; the other of great elegance, refinement, genius, and wit; to which latter class belong not only our Plautus and the ancient comedy of the Athenians, but also the books of the Socratic philosophers;" thus placing Plautus on a level with the Athenian philosophers and the writers of the Old Comedy. Quintilian (x. 1) also tells us that L. Ælius Stilo used to have so great an admiration for the works of Plautus as to say that, "If the Muses were to speak Latin, they would adopt the language of Plautus."

If the wit of Plautus sometimes seems to us insipid, and his jokes coarse, we must keep in mind how entirely the force of comedy depends upon the circumstances and manners of the age in which it is produced. As Plautus wrote exclusively for the stage, to gain the applause of the lower classes, he was obliged to have recourse to that low buffoonery which was most attractive to them. Sometimes, indeed, Plautus may have intended, by exposing, to check the immoralities of his day. But if such were his object, he ought not throughout to have made the courtezan the only female who had any attractions in the way of wit or conversation, while the lawful wife is generally a mute or else an intolerable scold, who is to be ridiculed and outwitted. Deducting, however, from Plautus all that is low and disgusting, there still remains a fund of real humour for which no one can refuse him admiration. The comedies of Plautus belong to the Comœdia Palliata. His works, and those of Terence, are indeed the only means we have of judging of the New Comedy of the Greeks. For the writings of Menander, Diphilus, Philemon, and the other writers of the New Comedy are, with the exception of a few stray sentences, entirely lost. From this fact, we are unable to ascertain how far they were actually copied by Plautus; but from the Roman tone which pervades his characters, their actions, and their jokes, no one can for a moment suppose that he was a servile copyist. Terence probably imitated his Greek models far more exactly than Plautus; for though Terence is certainly the more elegant and refined writer, Plautus is by far the more original and truly Roman. The comedies of Plautus are not perhaps so interesting to us as those of Aristophanes and the writers of the Old Comedy. For Aristophanes rakes up for us the skeleton closets, and shows us the weak points of those ancients whom we worship almost as demigods; whereas the New Comedy is only a transition between the old and that of modern times, without the piquancy belonging to personality, and with none of the polish and fine discrimination of character which marks the comedy of our days. The text of Plautus is very corrupt. Much of the original has been lost, and the text has been filled with interpolations. This is principally owing to all the manuscripts which we had having been copied from one which was itself corrupt. Some years ago, however, there was discovered in the Ambrosian Library at Milan the palimpsest manuscript, which is as old as the fifth century. This is much purer, though even in it are found some interpolations. Ritschl has already produced six of the plays, with their text, founded on this manuscript.

The oldest edition of the entire works of Plautus which we have is that of Georgius Merula, which was produced at Venice in the year 1472. The best of the earlier editions are those of Taubman, Frankfort, 1605; Wittenburg, 1612 and 1621; Grovonius, Leyden, 1664 and 1669; and at Amsterdam, 1684, the text of which was got by the comparison of six different manuscripts. The best modern editions of the entire works are those of Bothe, Berlin, 1809; and, last, at Leipsic, 1834; and of Weise, Quedlinburg, 1837–38. Ritschl's edition, when completed, will surpass all those previous to it.

The best books we have on Plautus are Lessing's Essay *Von dem Leben und den Werken des Plautus*, to which we are deeply indebted; and Ritschl's *Parergon Plautinorum Terentianorumque.*

Plautus has been translated into almost every European language. The best English translation is that of Bonell Thornton, vols. i. ii. (1767); and Richard Warner, vols. iii. iv. (1773), into familiar blank verse. (C. H. C.)

PLAYFAIR, John, a mathematician and philosopher of great eminence and celebrity, and so peculiarly a benefactor to this publication, as would have made it fit that some memorial of him should be preserved in these pages, even if it could have been surmised that it might not have been found in any other place. There are few names, however, in the recent history of British science that are more extensively or advantageously known, or of which the few particulars that remain to be recorded will be more generally interesting. His life, like most others that have been dedicated to the silent pursuits of learning and science, does not abound in incidents or adventures; but it is full of honour, both for the individual and the studies to which he was devoted, and may be read with more profit than many more ambitious histories.

He was the eldest son of the Reverend James Playfair, minister of Benvie in Forfarshire, in which place he was born on the 10th of March 1748. He resided at home, under the domestic tuition of his father, until the age of fourteen, when he entered at the university of St Andrews; and was almost immediately distinguished not merely for his singular proficiency in mathematical learning, but for the extent of his general knowledge, the clearness of his judgment, and the dignity and propriety of his conduct. A remarkable testimony to this effect has been made public in an early letter of Principal George Hill, who was at this time one of his fellow-students, and was himself so remarkable for early talent that we find it recorded of him that he had privately composed an excellent sermon in the tenth year of his age. A youth of this description cannot be supposed to have been very indulgent in his estimate of the merits of his competitors; and it could therefore have been no ordinary measure of ability that called forth the following ingenuous avowal, in a confidential letter to his mother: "Playfair has very great merit, and more knowledge and a better judgment than any of his class-fellows. I make *no* exceptions; my parts might be more showy, and the kind of reading to which my inclination led me was calculated to enable me to make a better figure at St Andrews; but in judgment and understanding I was greatly inferior to him." (Dr Cook's *Life of Principal Hill.*) It is scarcely a stronger, though undoubtedly a very different proof of his rare attainments, that when the professor of natural philosophy, Wilkie, the once celebrated author of the *Epigoniad*, was prevented by indisposition from delivering the regular lectures, he used generally to delegate the task of instruction to his youthful pupil. Wilkie, besides being a scholar and philosopher of no mean note, was a man of primitive benevolence and integrity, and of great vivacity in conversation; and the friendship which, in spite of the disparity of their years, was speedily formed between him and young Playfair, speaks as much for the social and moral character of the latter, as his substitution of him in the class-room does for his early proficiency in science. On this last subject we shall mention but one fact more. In 1766, when only eighteen years of age, he offered himself, with the approbation of his instructors at St Andrews, as candidate for the professorship of mathematics in Marischal College, Aberdeen, and sustained, with the most distinguished credit, an examination or comparative trial which lasted eleven days, and embraced nearly the whole range of the exact sciences. Out of the six competitors who entered the lists against him, two only were judged to have excelled him, the Reverend Dr Trail, who was appointed to the office, and Dr Hamilton, who afterwards succeeded to and long filled it with much reputation.

In 1769 he removed to Edinburgh, where his merit and modesty very soon introduced him to the friendship of Dr Robertson, Adam Smith, Dr Matthew Stewart, Dr Black, and Dr Hutton; with all of whom he continued on terms of the utmost cordiality during the whole period of their lives. In 1772 he was a candidate for the professorship of natural philosophy at St Andrews, vacant by the death of his friend Dr Wilkie. There was no comparative trial on this occasion; and he was again unsuccessful, under circumstances which have led one of the most dutiful sons of that university (Dr Cook, in his *Life of Principal Hill*) to remark "how much it suffered in thus losing a man by whose talents its reputation would have been so highly promoted." In the course of the same year, the death of his father suddenly devolved upon him the burden of supporting the family, and admonished him no longer to delay the final election of a profession. He had been educated with a view to the church, and was every way qualified to accept a living on the Establishment; but his decided predilection for science had hitherto made him hesitate about engaging in a vocation, the duties of which, he felt, if conscientiously discharged, would necessarily interfere to a great extent with the studies he was loath to abandon. In this emergency, however, he thought himself no longer entitled to indulge in those predilections, and accordingly made application to Lord Gray, the patron, for a presentation to the livings of Liff and Benvie, which had been filled by his father. His lordship was too well aware of his merits to hesitate about conferring so great a benefit on his parishioners; and immediately issued a presentation in his favour, although, from some challenge of his right to the patronage, induction was not obtained until late in the year 1773.

From this period until 1782 Playfair was constantly resident at Liff, and occupied almost exclusively with the pastoral duties of his office. In this retreat his leisure hours were dedicated to the education of his younger brothers, and to a very close and intimate correspondence with Robertson (afterwards Lord Robertson), the son of the illustrious historian, to whom he seems to have confined the remarks that occurred to him upon the different authors he perused, and the subjects of speculation which they suggested. We cannot help hoping that some selection from this correspondence may one day be given to the public. In the year 1779 he contributed to the *Transactions of the Royal Society of London* a paper on the "Arithmetic of Impossible Quantities," which exhibits, within a very small compass, a striking example of the rare and admirable talent of detaching the sound spirit of science from what may be termed its mysticism, and circumscribing, by the most precise and luminous boundaries, the vague and unlimited inquiries into which many mathematicians had been seduced by the nature of the instruments they employed.

In the year 1782 he was induced, by very advantageous offers, to resign his charge, and to superintend the education of Ferguson of Raith, and his brother Sir Ronald; an arrangement which restored him in a great measure to the literary and scientific society of Edinburgh, and enabled him to gratify himself by a personal introduction to several of the most eminent cultivators of science in London. He had repeatedly visited Dr Maskelyne, astronomer-royal, whilst that ingenious mathematician was busied, in 1774, in making a series of observations in Perthshire on the attraction of mountains; and, whilst sharing the shelter of his tent on the side of Schehallien, contracted with him a cordial friendship, which continued unbroken for the remainder of their lives. Under these honourable auspices he made his first appearance in London in 1782, and was speedily introduced to all those in whom he was likely to take most interest. He seems to have kept a pretty full and correct journal of all that he observed during this journey to the metropolis; and a portion of it, which is prefixed to the late collection of his works, is, in our judgment, one of the most interesting parts of that publication. It is not only written with great elegance and accuracy, but affords, in the free, candid, and pointed observations which it contains on the different individuals with whom he comes in contact, a very remarkable proof of his quick and sagacious perception of character, and his power of selecting and turning to account, even in the fever and distraction of a first visit to such a scene, all that was really worthy of careful observation or permanent remembrance.

In 1785 he was received into the university of Edinburgh, in consequence of an arrangement between his two illustrious associates, Dr Adam Ferguson and Mr Dugald Stewart. Mr Stewart exchanged the chair of mathematics, in which he had succeeded to his father, for that of moral philosophy, which had been long filled by Dr Ferguson, who, finding that the delicate state of his health would prevent him from discharging the active duties of the mathematical professor, immediately devolved them upon Playfair, for whom he procured the appointment of joint professor in that department.

In 1788 he published, in the *Transactions of the Royal Society of Edinburgh*, a biographical account of Dr Matthew Stewart, which is remarkable, not only for the ease and purity of the style, but also as containing a singularly clear and interesting account of the labours of Dr Simson in the restoration of the ancient geometry, and of the success both of him and Dr Stewart in adapting the elegant simplicity of the Greek methods of investigation to problems which had previously been regarded as insoluble except by the aid of the modern analysis. He also published, in the same year, a paper "On the Causes which affect the Accuracy of Barometrical Measurements," which is written with all the perspicuity, caution, and sagacity that constitute the great excellence and the great difficulty of such disquisitions, where scientific principles are employed to give precision to physical observations.

In 1790 he published in the same *Transactions* a paper of still greater interest and delicacy, "On the Astronomy of the Brahmins,"—a subject which had been recently recommended to the notice of the European scientific world by the curious and learned observations of M. Bailly, in his *General History of Astronomy*, but had never met with so minute and scrupulous an investigation as it now received at the hands of Mr Playfair. The whole treatise is written with a beautiful perspicuity, in an admirable spirit of candour and ingenuity, and in a style more elegant and spirited than had yet lent its attraction to subjects so recondite and abstruse. The publication accordingly attracted very general notice, both in Europe and in Asia; and gave rise to much discussion and research, the final value and result of which does not seem yet to be ascertained. This was followed in 1794 by a learned and very beautiful treatise on the *Origin and Investigation of Porisms*, in which the obscure nature of the very comprehensive and indefinite theorems to which this name was applied by the ancient geometers, is explained with the most lucid simplicity; and the extraordinary merits of Dr Simson, in deducing their true theory from the very vague and scanty notices of them which had come down to his time, are commemorated with a noble spirit of emulation.

In 1795 he published his *Elements of Geometry*, for the use of the pupils attending his class,—a work which has since been held in such estimation by the public as to have gone through numerous editions of a thousand copies each. In 1797 he composed a sequel to his first paper on the Indian Astronomy, in the shape of *Observations on the Trigonometrical Tables of the Brahmins;* and also a masterly collection of *Theorems on the Figure of the Earth.* It is also understood that he occupied himself a good deal at this time in the preparation of an *Essay on the Accidental Discoveries made by Men of Science while in Pursuit of some other Object*, although we find no portion of this curious discussion in the collection of his works.

His excellent and ingenious friend Dr Hutton died in the year last mentioned; and Playfair, having undertaken to draw up a biographical account of him for the Royal Society, was first led to study his ingenious but somewhat crude speculations on the *Theory of the Earth*, and afterwards to lend them the assistance of his own powerful pen in his *Illustrations of the Huttonian Theory.* This work, upon which he bestowed more time and labour than on any of his other productions, did not appear till 1802; and it was not till 1803 that he presented to their associates his admirable memoir of their departed friend.

Whatever opinion may be formed, now or hereafter, of the truth or soundness of the suppositions by which Dr Hutton endeavoured to explain the actual state and condition of our globe, it is impossible to doubt that Playfair's illustration of that theory must always be ranked amongst the most brilliant aad powerful productions of philosophical genius. The beautiful clearness and captivating eloquence with which the system itself is unfolded and explained, the spirit and force of reasoning with which all the objections to it are combated, the skill with which the infinite variety of facts which it brought into view are combined into one grand and legitimate introduction, and the judgment and extent of learning by which so many large and profound views of nature are brought to bear upon the points in discussion, and blended into one large and discursive argument, uniting the utmost logical precision with the richest variety of topics and the highest graces of composition,—are merits which have been universally acknowledged in this performance, even by those who have not been convinced by its reasonings; and have extorted, even from the fastidious critics of France, the acknowledgment that "Mr Playfair writes as well as Buffon, and reasons incomparably better."

The biographical account of Dr Hutton is by far the best of Playfair's productions in this line, and contains not only an eloquent and luminous account of the speculations in which he was engaged, but, what is too often forgotten in this species of biography, a charming portrait of the individual, drawn, no doubt, by a favourable hand, but gaining far more in grace and effect than it can possibly have lost in correctness, from the softening colours of affection.

In 1805 he quitted the chair of mathematics to succeed Professor Robison in that of natural philosophy. The appointment of Leslie as his successor in the chair of mathematics was opposed at the time by a majority of the Presbytery of Edinburgh, and made the subject of very angry discussion, as well in various publications as in the General Assembly of the Church of Scotland. From both these fields of contention the opponents of Leslie retired discomfited, and, in the opinion, we believe, of many of the lookers on, disgraced. Amongst the heaviest blows they had to sustain were those that parted from the hand of Mr Playfair. He first addressed a Letter to the Lord Provost, in which, after asserting, with infinite spirit and freedom, the dignity of the science in question, he openly imputes the new-sprung zeal for orthodoxy, which had prompted the attack on Leslie, to a wish or design on the part of some of the clergymen of Edinburgh to obtain for themselves a number of the chairs in that university, which had hitherto afforded sufficient occupation to the undistracted industry of laymen. And when this denunciation brought upon him a series of acrimonious and unhandsome attacks, he replied to them all in a pamphlet of greater bulk, written in a style of which the high polish and elegance only serve to give a keener edge to the unsparing severity of the exposures which it conveys.[1] We do not know, indeed, where to find a more perfect model of polemical or controversial writing; and much as it was to be regretted that an occasion should have arisen for employing such a pen and such a mind as Playfair's on any temporary or personal theme, it is impossible not to admire the extraordinary talent and vigour with which, when the occasion did arrive, he could turn talents, exercised in far other studies, to the purposes suggested by the emergency.

In 1807 he was elected a fellow of the Royal Society of London, and soon afterwards presented to that learned body his *Lithological Survey of Schehallien.* In 1809 he contributed to the *Edinburgh Transactions* an excellent paper on "Solids of the greatest Attraction," and in 1812 another on the "Progress of Heat in Spherical Bodies."

In 1814 he published, in 2 vols. 8vo, for the use of his class, an elementary work of great value, under the title of *Outlines of Natural Philosophy.* For some years before this, he had been much occupied in digesting the plan and collecting the materials for a greatly enlarged edition of his *Illustrations of the Huttonian Theory;* with a view to which, he had not only carefully perused and extracted a vast body of voyages and travels, but had made various journeys, and very minutely examined almost all the places in the British dominions the structure of which promised to throw any light on the subject of his researches. No part of the work, however, was actually written, when the preparation for it was suspended by his being induced to draw up for this publication an introductory *Dissertation on the Progress of Mathematical and Physical Science;* a treatise which, though its author had written nothing else, would itself suffice to carry down his name with distinction to the latest posterity. The soundness of judgment, the beauty of the writing, the extent of knowledge, the candour and precision of the estimates of character, and the noble spirit of liberality and generous admiration for genius which breathes throughout the whole performance, give it an attraction which is rarely to be found in works of the same erudition, and render it not only one of the most instructive, but one of the most interesting publications that philosophy has ever bestowed on the world.

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[1] This piece is entitled *Letter to the Author of the Examination of Mr Stewart's Short Statement of Facts relative to the Election of Professor Leslie*, 8vo, Edin. 1806. It has not been reprinted in the collection of his works.

In 1815 he drew up for the Royal Society of Edinburgh a very interesting memoir of his distinguished predecessor Dr John Robison, a philosopher in whose early life there was more adventure, and in his later days more political prejudice, than we usually find to diversify the history of men of science. Nothing can be more spirited and interesting than Playfair's account of the former; nothing more manly and tender than his reluctant but decided protestation against the excesses of the latter.

After the general peace in 1815 had at last opened the Continent to British inquirers, Playfair, at the age of sixty-eight, undertook a long journey through France and Switzerland into Italy, and did not return for a period of nearly eighteen months. His principal attention was directed to the mineralogical and geological phenomena of the different regions which he visited; and he made many notes with a view to the great object which he was not destined to accomplish, namely,—the extension and new-modelling of his *Illustrations of the Huttonian Theory.* Every object of liberal curiosity, however, had for him an attraction as fresh as in his earliest youth; and the social simplicity and benevolence of his character and manners insured him a favourable reception in every new society to which he was introduced.

On his return from this expedition, he employed himself chiefly in preparing the second part of the Dissertation to which we have alluded; and he also drew up a Memoir on the Naval Tactics of Clerk of Eldin, which was published after his death in the *Philosophical Transactions*, though only a fragment of a projected life of Clerk, which he did not live to complete. His health had been occasionally broken for several years by the recurrence of a painful affection of the bladder, which appeared with increased severity in the early part of 1819, but was so far got under as to enable him to complete his course of lectures in the spring. It returned, however, in a still more distressing form in the summer, and at last put a period to his life on the 19th of July. Though suffering great pain during the last part of his confinement, he retained not only his intellectual faculties quite unimpaired, but also the serenity and mildness of his spirit, and occupied himself till within a few days of his death in correcting the proof-sheets of the Dissertation, the printing of the second part of which had commenced some time before his last illness.[1]

Before concluding these notices of Playfair's scientific and literary labours, we have still to mention that, from the year 1804, he was a frequent contributor to the *Edinburgh Review;* and that though most of his articles were of a scientific description, he occasionally diverged into the field of general literature, or indulged in the refinements of metaphysical speculation. Many of his scientific articles attracted great attention on the Continent as well as at home; and several of them are written with a force and beauty that might well entitle them to a higher place than the pages of a periodical publication. There is no general account of the great facts and principles of astronomy so clear, and comprehensive, and exact, nor half so beautiful or majestic in the writing, as his account of Laplace's *Mécanique Céleste*, in the eleventh volume of the publication just mentioned.

In this brief sketch of the events of Playfair's life we have purposely omitted any general account, either of his personal character, or of the distinguishing features of his intellectual powers and habits, thinking it better to give those by themselves, in the words in which they were recorded, to the satisfaction, we believe, of most of those who knew him intimately, in a periodical journal wherein they appeared a short time after his death. The portrait there given has been pronounced by one of the earliest and most illustrious of his surviving friends, "a faithful and perfect resemblance;"[2] and has accordingly been allowed a place in the prefatory memoir which his nephew has prefixed to the collection of his works.

"It has struck many people, we believe, as very extraordinary that so eminent a person as Playfair should have been allowed to sink into his grave in the midst of us, without calling forth almost so much as an attempt to commemorate his merit, even in a common newspaper; and that the death of a man so celebrated and so beloved, and at the same time so closely connected with many who could well appreciate and suitably describe his excellences, should be left to the brief and ordinary notice of the daily obituary. No event of the kind certainly ever excited more general sympathy; and no individual, we are persuaded, will be longer or more affectionately remembered by all the classes of his fellow-citizens; and yet it is to these very circumstances that we must look for an explanation of the apparent neglect by which his memory has been followed. His humbler admirers have been deterred from expressing their sentiments by a natural feeling of unwillingness to encroach on the privilege of those whom a nearer approach to his person and talents rendered it more worthy to speak of them; whilst the learned and eloquent amongst his friends have trusted to each other for the performance of a task which they could not but feel to be painful in itself, and not a little difficult to perform as it ought to be; or perhaps have reserved for some more solemn occasion that tribute for which the public impatience is already at its height.

"We beg leave to assure our readers that it is merely from anxiety to do *something* to gratify this natural impatience that we presume to enter at all upon a subject to which we are perfectly aware that we are incapable of doing justice; for of Mr Playfair's scientific attainments, of his proficiency in those studies to which he was peculiarly devoted, we are but slenderly qualified to judge. But we believe we hazard nothing in saying that he was one of the most learned mathematicians of his age, and among the first, if not the very first, who introduced the beautiful discoveries of the later continental geometers to the knowledge of his countrymen, and gave their just value and true place, in the scheme of European knowledge, to those important improvements by which the whole aspect of the abstract sciences has been renovated since the days of our illustrious Newton. If he did not signalize himself by any brilliant or original invention, he must at least be allowed to have been a most generous and intelligent judge of the achievements of others, as well as the most eloquent expounder of that great and magnificent system of knowledge which has been gradually evolved by the successive labours of so many gifted individuals. He possessed, indeed, in the highest degree, all the characteristics both of a fine and a powerful understanding,—at once penetrating and vigilant, but more distinguished perhaps for the caution and sureness of its march, than for the brilliancy or rapidity of its movements; and guided and adorned through all its progress by the most genuine enthusiasm for all that is grand, and the justest taste for all that is beautiful, in the truth or the intellectual energy with which he was habitually conversant.

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[1] Besides the Dissertation, Mr Playfair contributed the valuable biographical account of ÆPINUS, and the still more valuable articl on PHYSICAL ASTRONOMY.

[2] Letter from Mr Dugald Stewart to Dr Playfair, in the Appendix to the Biographical Account of Professor Playfair, prefixed to the collection of his works, published at Edinburgh in 1822, in 4 vols. 8vo.

"To what account these rare qualities might have been turned, and what more brilliant or lasting fruits they might have produced, if his whole life had been dedicated to the solitary cultivation of science, it is not for us to conjecture; but it cannot be doubted that they added incalculably to his eminence and utility as a teacher, both by enabling him to direct his pupils to the most simple and luminous methods of inquiry, and to imbue their minds, from the very commencement of the study, with that fine relish for the truths it disclosed, and that high sense of the majesty with which they were invested, that predominated in his own bosom. Whilst he left nothing unexplained or unreduced to its proper place in the system, he took care that they should never be perplexed by petty difficulties, or bewildered in useless details, and formed them betimes to that clear, masculine, and direct method of investigation by which, with the least labour, the greatest advances might be accomplished.

"Mr Playfair, however, was not merely a teacher; and has fortunately left behind him a variety of works, from which other generations may be enabled to judge of some of those qualifications which so powerfully recommended and endeared him to his contemporaries. It is perhaps to be regretted that so much of his time, and so large a proportion of his publications, should have been devoted to the subjects of the Indian astronomy, and the Huttonian theory of the earth. For though nothing can be more beautiful or instructive than his speculations on those curious topics, it cannot be dissembled that their results are less conclusive and satisfactory than might have been desired; and that his doctrines, from the very nature of the subjects, are more questionable than we believe they could possibly have been on any other topic in the whole circle of the sciences. To the first, indeed, he came under the great disadvantage of being unacquainted with the eastern tongues, and without the means of judging of the authenticity of the documents which he was obliged to assume as the elements of his reasonings; and as to the other, though he ended, we believe, with being a very able and skilful mineralogist, we think it is now generally admitted that that science does not yet afford sufficient materials for any positive conclusion, and that all attempts to establish a theory of the earth must, for many years to come, be regarded as premature. Though it is impossible, therefore, to think too highly of the ingenuity, the vigour, and the eloquence of those publications, we are of opinion that a juster estimate of Mr Playfair's talent, and a truer picture of his genius and understanding, is to be found in his other writings—in the papers, both biographical and scientific, with which he has enriched the *Transactions* of our Royal Society; his account of Laplace, and other articles, which he is understood to have contributed to the *Edinburgh Review;* the Outlines of his Lectures on Natural Philosophy; and, above all, his Introductory Discourse to the Supplement to the Encyclopædia Britannica, with the final correction of which he was occupied up to the last moments that the progress of his disease allowed him to dedicate to any intellectual exertion.

"With reference to these works, we do not think we are influenced by any national or other partiality when we say that he was certainly one of the best writers of his age; and even that we do not now recollect any one of his contemporaries who was so great a master of composition. There is a certain mellowness and richness about his style which adorns without disguising the weight and nervousness, which is its other great characteristic,—a sedate gracefulness and manly simplicity in the more level passages, and a mild majesty and considerate enthusiasm where he rises above them, of which we scarcely know where to find any other example. There is great equability, too, and sustained force, in every part of his writings. He never exhausts himself in flashes and epigrams, nor languishes into tameness and insipidity; at first sight you would say that plainness and good sense were the predominating qualities, but by and by this simplicity is enriched with the delicate and vivid colours of a fine imagination, the free and forcible touches of a most powerful intellect, and the lights and shades of an unerring and harmonizing taste. In comparing it with the styles of his most celebrated contemporaries, we would say that it was more purely and peculiarly a *written* style, and therefore rejected those ornaments that more properly belong to oratory. It had no impetuosity, hurry, or vehemence,—no bursts or sudden turns or abruptions like that of Burke; and though eminently smooth and melodious, it was not modulated to a uniform system of solemn declamation like that of Johnson; nor spread out in the richer and more voluminous elocution of Stewart; nor still less broken into that patchwork of scholastic pedantry and conversational smartness which has found its admirers in Gibbon. It is a style, in short, of great freedom, force, and beauty; but the deliberate style of a man of thought and of learning, and neither that of a wit throwing out his extempores with an affectation of careless grace, nor of a rhetorician thinking more of his manner than his matter, and determined to be admired for his expression, whatever may be the fate of his sentiments.

"His habits of composition, as we have understood, were not perhaps exactly what might have been expected from their results. He wrote rather slowly, and his first sketches were often very slight and imperfect, like the rude chalking for a masterly picture. His chief effort and greatest pleasure was in their revisal and correction; and there were no limits to the improvement which resulted from this application. It was not the style merely, or indeed chiefly, that gained by it,—the whole reasoning, and sentiment, and illustration were enlarged and new-modelled in the course of it, and a naked outline became gradually informed with life, colour, and expression. It was not at all like the common finishing and polishing to which careful authors generally subject the first draught of their compositions, nor even like the fastidious and tentative alterations with which some more anxious writers assay their choicer passages. It was, in fact, the great filling in of the picture, the working up of the figured *weft* on the naked and meagre *woof* that had been stretched to receive it; and the singular thing in his case was, not only that he left this most material part of his work to be performed after the whole outline had been finished, but that he could proceed with it to an indefinite extent, and enrich and improve as long as he thought fit, without any risk either of destroying the proportions of that outline, or injuring the harmony and unity of the design. He was perfectly aware, too, of the possession of this extraordinary power; and it was partly, we presume, in consequence of this consciousness that he was not only at all times ready to go on with any work in which he was engaged, without waiting for favourable moments or hours of greater alacrity, but that he never felt any of those doubts and misgivings as to his being able to get creditably through with his undertaking to which we believe most authors are occasionally liable. As he never wrote upon any subject of which he was not perfectly master, he was secure against all blunders in the substance of what he had to say; and felt quite assured that, if he was only allowed time enough, he should finally come to say it in the very best way of which he was capable. He had no anxiety, therefore, either in undertaking or proceeding with his task, and intermitted and resumed them at his convenience, with the comfortable certainty that all the time he bestowed on them was turned to good account, and that what was left imperfect at one sitting might be finished with equal ease and advantage at another. Being thus perfectly sure both of his end and his means, he experienced, in the course of his compositions, none of that little fever of the spirits with which that operation is so apt to be accompanied. He had no capricious visitings of fancy, which it was necessary to fix upon the spot or to lose for ever; no casual inspiration to invoke and to wait for; no transitory and evanescent lights to catch before they faded. All that was in his mind was subject to his control, and amenable to his call, though it might not obey at the moment; and whilst his taste was so sure that he was in no danger of overworking anything that he had designed, all his thoughts and sentiments had that unity and congruity that they fell almost spontaneously into harmony and order; and the last added, incorporated, and assimilated with the first, as if they had sprung simultaneously from the same happy conception.

"But we need dwell no longer on qualities that may be gathered hereafter from the works he has left behind him. They who lived with him mourn the most for those which will be traced in no such memorial; and prize far above those talents which gained him his high name in philosophy, that personal character which endeared him to his friends, and shed a grace and a dignity over all the society in which he moved. The same admirable taste which is conspicuous in his writings, or rather the higher principles from which that taste was but an emanation, spread a similar charm over his whole life and conversation, and gave to the most learned philosopher of his day the manners and deportment of the most perfect gentleman. Nor was this in him the result merely of good sense and good temper, assisted by an early familiarity with good company, and a consequent knowledge of his own place and that of all around him. His good breeding was of a higher descent; and his powers of pleasing rested on something better than mere companionable qualities. With the greatest kindness and generosity of nature he united the most manly firmness and the highest principles of honour, and the most cheerful and social dispositions with the gentlest and steadiest affections. Towards women he had always the most chivalrous feelings of regard and attention, and was, beyond almost all men, acceptable and agreeable in their society, though without the least levity or pretension unbecoming his age or condition; and such, indeed, was the fascination of the perfect simplicity and mildness of his manners, that the same tone and deportment seemed equally appropriate in all societies, and enabled him to delight the young and the gay with the same sort of conversation which instructed the learned and the grave. There never, indeed, was a man of learning and talent who appeared in society so perfectly free from all sorts of pretension or notion of his own importance, or so little solicitous to distinguish himself, or so sincerely willing to give place to every one else. Even upon subjects which he had thoroughly studied he was never in the least impatient to speak, and spoke at all times without any tone of authority; whilst, so far from wishing to set off what he had to say by any brilliancy or emphasis of expression, it seemed generally as if he had studied to disguise the weight and originality of his thoughts under the plainest form of speech and the most quiet and indifferent manner; so that the profoundest remarks and subtlest observations were often dropped, not only without any solicitude that their value should be observed, but without any apparent consciousness that they possessed any. Though the most social of human beings, and the most disposed to encourage and sympathise with the gaiety and joviality of others, his own spirits were in general rather cheerful than gay, or at least never rose to any turbulence or tumult of merriment; and whilst he would listen with the kindest indulgence to the more extravagant sallies of his younger friends, and prompt them by the heartiest approbation, his own satisfaction might generally be traced in a slow and temperate smile, gradually mantling over his benevolent and intelligent features, and lighting up the countenance of the sage with the expression of the mildest and most genuine philanthropy. It was wonderful, indeed, considering the measure of his own intellect, and the rigid and undeviating propriety of his own conduct, how tolerant he was of the defects and errors of other men. He was too indulgent, in truth, and favourable to his friends, and made a kind and liberal allowance for the faults of all mankind; except only faults of baseness or of cruelty, against which he never failed to manifest the most open scorn and detestation. Independently, in short, of his high attainments, Mr Playfair was one of the most amiable and estimable of men: delightful in his manners, inflexible in his principles, and generous in his affections, he had all that could charm in society or attach in private; and whilst his friends enjoyed the free and unstudied conversation of an easy and intelligent associate, they had at all times the proud and inward assurance that he was a being upon whose perfect honour and generosity they might rely with the most implicit confidence, in life and in death,—and of whom it was equally impossible that, under any circumstances, he should ever perform a mean, a selfish, or a *questionable* action, as that his body should cease to gravitate or his soul to live.

"If we do not greatly deceive ourselves, there is nothing here of exaggeration or partial feeling, and nothing with which an indifferent and honest chronicler would not concur. Nor is it altogether idle to have dwelt so long on the personal character of this distinguished individual. For we are ourselves persuaded that this personal character has done almost as much for the cause of science and philosophy amongst us as the great talents and attainments with which it was combined; and has contributed in a very eminent degree to give to the better society of Edinburgh that tone of intelligence and liberality by which it is so honourably distinguished. It is not a little advantageous to philosophy that it is in fashion; and it is still more advantageous, perhaps, to the society which is led to confer on it this apparently trivial distinction. It is a great thing for the country at large,—for its happiness, its prosperity, and its renown,—that the upper and influencing part of its population should be made familiar, even in its untasked and social hours, with sound and liberal information, and be taught to know and respect those who have distinguished themselves for great intellectual attainments. Nor is it, after all, a slight or despicable reward for a man of genius to be received with honour in the highest and most elegant society around him, and to receive in his living person that homage and applause which is too often reserved for his memory. Now, those desirable ends can never be effectually accomplished unless the manners of our leading philosophers are agreeable, and their personal habits and dispositions engaging and amiable. From the time of Hume and Robertson, we have been fortunate in Edinburgh in possessing a succession of distinguished men, who have kept up this salutary connection between the learned and the fashionable world; but there never perhaps was any one who contributed so powerfully to confirm and extend it, and that in times when it was peculiarly difficult, as the lamented individual of whom we are now speaking; and they who have had the best opportunity to observe how superior the society of Edinburgh is to that of most other places of the same size, and how much of that superiority is owing to the cordial combination of the two aristocracies of rank and of letters (of both of which it happens to be the chief provincial seat), will be best able to judge of the importance of the service he has thus rendered to its inhabitants, and, through them, and by their example, to all the rest of the country." (F. J.)

PLAYHOUSE. See THEATRE.

PLEBEIAN, or PLEBS, connected etymologically with the root PLEO, and with πλῆθος, a term applied by the more correct among the Greek writers on Roman history to the commonalty of Rome. It thus stands contrasted with *patrician;* and the two great divisions of the Roman people thus indicated give to the earliest periods of Roman history its peculiar character and interest. The ancients themselves do not agree about the time at which the distinction arose between the plebeians and the patricians. They are generally believed to have formed two distinct classes so early as the time of Romulus; while a recent writer (Dr W. Ihne's *Forschungen auf dem Gebiete der Röm. Verfassüngsgeschichte*, Frankfort, 1847) endeavours to prove that the plebeians were originally identical with the clients. The time when they first appear as a distinct class in contrast to the patricians is in the reign of Tullus Hostilius. The plebeian order, recently increased by the Alban conquest, was, in the days of Ancus Martius, far superior in point of numbers to the *populus Romanus.* They were excluded, however, from the senate, the comitia, and from all civil and priestly offices of state. In all matters connected with the army the plebeians had to shed their blood, if need were, in defence of their fellow-citizens. In judicial affairs they had to succumb to the patricians. They continued to have their own sacra; and they were free landowners, and had their own gentes.

The population of Rome thus consisted of two opposing elements. The plebeian order stood in no definite relation to the patricians; and it had no means of protecting itself against any arbitrary proceeding of the ruling class. Such a state of things could not last. Tarquinius Priscus was the first to conceive the idea of ameliorating the condition of the plebeians; but he only effected the admission of the noblest among the old plebeian families into the three old tribes. It remained for others to effect their enlargement. This was reserved for Servius Tullius. He divided the city into four parts; the plebeians into twenty-six tribes; and each plebeian received, according to Niebuhr, seven jugera of land. Each tribe had its own sacra, festivals, and meetings, which were convoked by their tribunes.

The next king that ruled over Rome the plebeians lost all they had gained. A third of the plebeians lost their estates in the war with Porsenna, became impoverished, and were perhaps for a time subject to the Etruscans. After the first secession, however, B.C. 494, the plebeians gained several great advantages. These advantages continued to progress until, in B.C. 286, Hortensius succeeded in successfully and permanently reconciling the two orders, and procuring for the *plebescita* of the plebeians the full power of *leges* binding upon the whole nation. Thus, after many generations, the government of Rome had passed from an oppressive oligarchy to a moderate democracy, in which each party had its proper influence, and the power of checking the other if it should venture to assume more than it could legally claim.

PLECTRUM (πλῆκτρον, *an instrument to strike with*), was a little stick made of various materials, such as wood, horn, ivory, and metal, with which the player struck the chords of a stringed instrument.

PLEDGE (*plegius*), in common law, a surety or gage, either real or personal, which the plaintiff or demandant is to find for his prosecuting the suit.

PLEIADES, in fabulous history, the seven daughters of Atlas, King of Mauritania, and of Pleïone, who were changed into the constellation which bears their name. They were Maia, Electra, Taygete, Sterope, Merope, Halcyone, and Celæno, who were also called *Atlantides*, from their father Atlas.

PLEIADES, an assemblage of seven stars, in the neck of the constellation Taurus. These stars are so called from the Greek πλέω, *to sail*, as being terrible to mariners, by reason of the rains and storms which frequently rise with them. The Latins called them *vergiliæ*, from *ver*, spring; because of their rising about the time of the vernal equinox.

PLEONASM (πλεονασμός, *excess*), a figure by which we may use words seemingly superfluous to express a thought with the greater energy; such as, "I saw it with my own eyes," "I heard it with my own ears," and the like.

PLESCHEN, or PLESZEW, a town of Prussia, in the province and government of Posen, and 54 miles S.E. of that town. It is not far from the Polish frontier; and has a considerable trade in horses and cattle which come from Poland. There are manufactured here shoes, cloth, tobacco, and potash. Pop. 4955.

PLETHORA (πληθώρη, *fulness*), in *Medicine*, is when the vessels are too much loaded with fluids. A plethoric state is marked by plumpness, fulness of countenance, a high colour, frequent dimness of sight, and ringing of the ears. It is often accompanied by corpulency, and a great accumulation of fat about the belly. It is generally the consequence of high living, of indolence, with much indulgence in sleep and luxury. Plethoric people are liable to a long train of dangers and inconveniences. They are apt to lose breath, to perspire on the slightest exertion, to headache, to vertigo, to palsy, to apoplexy, to bluntness of faculties, to stomach complaints, to low spirits, and a variety of other uncomfortable sensations. Bleeding is not considered good for plethora. In addition to regimen and the care of the general health, frequent purgatives are proper; and a course of mineral waters is frequently very salutary.

PLICA POLONICA, or PLAITED HAIR, is a disease in which the hairs are thicker than usual, and so entangled that it is impossible to separate them. It is peculiar to Poland, Lithuania, Hungary, and some neighbouring countries. Baron Larrey carefully investigated the nature of this disease when at Warsaw with the French army, and was perfectly satisfied that it is a local and factitious complaint, produced by dirt and neglect, and that it may be cured with safety. The head is to be shaved, and an ointment applied made of equal parts of sulphur ointment and pitch ointment, and the head is to be frequently washed with soap and water. Mercury, rubbed in with hair powder, is good for destroying the vermin. Internal remedies, such as Plummer's pill, or slight doses of calomel, may in some cases be necessary.

PLINIUS SECUNDUS, CAIUS, a Roman writer on natural history and other subjects, was born A.D. 23, in the tenth year of Tiberius, and died August 25, A.D. 79, in the first year of Titus. His birth-place has been the subject of considerable discussion; but the weight of testimony is thought to incline in favour of *Novum Comum*, now Como, in Cisalpine Gaul, in preference to Verona or (as suggested by Hardouin) Rome. His earlier years were passed probably at his native place; but while a youth he was enabled, by the affluence of his family, to remove to Rome, and attend the lectures of the grammarian Apion and other teachers of eminence. It was in his early life, probably, that he visited the provinces of Africa, Egypt, and Greece. In about his twenty-third year he served in Germany, under the *legatus* Pomponius Secundus, in command of a troop of cavalry. At this period he travelled over a great part of that country, visiting the sources of the Danube, the country of the Chauci (modern Oldenburg and Hanover), Belgic Gaul, and the shores of the German Ocean. It was in Germany, too, that he wrote his first work, a treatise, now lost, *On the Use of the Javelin by Cavalry*. In A.D. 52 he returned to Rome, and for a short time turned his attention to forensic pursuits,—a vocation in which he probably gained little or no distinction. On the death of Pomponius, who was equally celebrated as a general and as a poet, Pliny wrote his *Life*, in two books. During the earlier years of Nero's reign, he lived in retirement, and devoted the whole of his time probably to literary pursuits.

It was at this period, or somewhat earlier, that he completed a *History of the Wars in Germany*, in twenty books, which he had commenced while in that country (in obedience, the younger Pliny says, to the injunctions of a vision), and which, like his *Life of Pomponius Secundus*, is no longer extant. His next composition was a voluminous work, entitled *The Student*, in three books, and which, like most of his other works, has perished. It purported to be a manual for the training of an orator from infancy to his entrance upon public life. In the latter part of Nero's reign he wrote a treatise, in eight books, of which some fragments still survive, *On Ambiguities of Language*,—a work which, he informs us (*Hist. Nat.*, b. i.), made a great sensation among certain Stoics, logicians, and grammarians, but the doctrines of which they had not hitherto attempted to refute. Towards the close of the same reign, Pliny was appointed imperial *Procurator* in Nearer Spain, and, not improbably, at the same period was raised to equestrian rank. About A.D. 70 or 71 he returned to Rome, and, having been previously acquainted with the Emperor Vespasianus, was soon admitted into the number of his most intimate friends, and honoured with an appointment near his person, the nature of which is now unknown. During this reign, he completed his *Continuation of the Roman History of Aufidius Bassus*, in thirty-one books,—a work which he had previously commenced, but the publication of which, he says (*Hist. Nat.*, b. i.), he had determined to postpone until after his decease. No portion of it, unfortunately, has survived. It was in A.D. 77, probably, that he published his most important work, and the only one that has come down to us, his *Historia Naturalis*. From a remark in b. xix., c. 19, it would appear that he contemplated writing another work,—an intention probably which he did not live to realize.

In A.D. 73 or 74 Pliny had been appointed *Præfectus* of the Roman fleet stationed at Misenum, on the western coast of Italy; and to this he owed, remotely, his singular death, the details of which we learn from a letter of his nephew, the younger Pliny, to Tacitus the historian (b. vi., Ep. 16). Being at Misenum, and having his attention drawn to a cloud of unusual appearance arising from Mount Vesuvius, Pliny ordered a light vessel to be got ready, and, taking his tablets with him, embarked. Amid showers of ashes and pumice, he made his way into the midst of the danger, observing and noting down every change in the appearance of the phenomenon. It being found impossible to land at Retina, a village near Herculaneum, and the pilot advising him to return to Misenum, "Fortune favours the bold" was his answer; and he gave orders to steer for Stabiæ, in order to join Pomponianus there. On his arrival at Stabiæ, where for the moment the danger was not so imminent, he found his friend on the point of setting sail. Pliny prevailed upon him, however, to forego his intention, and requested the servants to conduct him to the bath. He then took his place at table, and dined, to all appearance without the least apprehension of danger. After again encouraging his friends and soothing their fears, he retired to rest, and soon fell asleep. Pomponianus, however, and the others, who in the meantime had sat up, finding the peril becoming more and more imminent, ordered him to be aroused; which done, they betook themselves to the open fields, tying pillows upon their heads to protect themselves from the falling stones. The sea being too tempestuous to allow of their embarking, Pliny now lay down upon a sail. Alarmed afresh, however, by the nearer approach of the flames, and making an effort to rise, he fell to the ground and expired, suffocated by the vapours no doubt, his chest being naturally contracted and his lungs weak. It was this eruption also which overwhelmed Herculaneum and Pompeii.

Of Pliny's habits, an interesting account has been preserved by his nephew in a letter addressed to Macer (b. iii., Ep. 5); from which we learn that but few moments of his life were left unemployed in literary pursuits. In summer he was in the habit of sitting up to a late hour at his studies; while in winter he would set to work at one or two in the morning, and sometimes at midnight even. After waiting upon the Emperor before daybreak, and executing his commissions, it was his practice to return home and resume his studies. Taking an early meal, he would, in summer, recline for a few moments in the sun, some book being read to him, and he making extracts in the meanwhile. Indeed this was his constant practice, for it was a favourite maxim with him, that "There was no book so bad but that some good might be got out of it." He would then take a cold bath, and, after a slight refreshment of food and rest, continue his literary pursuits till the evening meal. During this repast as well, some book was usually read to him, he making comments from time to time. Such was his mode of life when at Rome; and in the country there was no relaxation from his application to study. When on a journey his secretary was always by his side, ready to take down what he might dictate. By this economy of his time he amassed 160 volumes of notes, closely written on both sides; and for a portion only of which, when in Spain, one Largius Licinius offered him 400,000 sesterces. Pliny died unmarried.

For an insight into Pliny's sentiments upon religion and philosophy, virtue and vice, men and manners, we must have recourse to his *Natural History*, as our only source of information; and here even, not unfrequently, we are precluded from coming to any satisfactory conclusion, owing to the contradictions and obscurities that, equally from the compilatory nature of the work, the curtness of his style, the corruptness of the text, and the unsettled state of his opinions, so frequently present themselves. We have every reason to believe, however, that he was a man of high moral principles, and a lover, so far as his light extended, of virtue for its own sake. Impressed with great and noble sentiments, expressing his horror of bloodshed, debauchery, and drunkenness, and detesting that falsehood, meanness, and profligacy which so fearfully characterized imperial Rome, he loses no opportunity—to the extent of prejudice even—of proclaiming himself a *laudator temporis acti*, of extolling the simplicity of the olden times, and of leading us to suppose that he looked upon the elder Cato as his ideal of perfection, and considered his precepts to be little short of oracular. His religious and philosophical opinions were evidently of an unsettled character. In common with Lucretius and the Epicureans, he denies the existence of a Providence and the immortality of the soul; while, on the other hand, he adopts the Pythagorean notion of the harmony of the spheres, and agrees with the Stoics in considering the universe, or Nature, to be identical with the Deity, and in the belief that the world will ultimately be destroyed by fire. Pliny, it is evident, was not a rigid adherent of any sect of philosophy; but we may feel assured that he was a decided pantheist, and least unfavourable perhaps, as a whole, to the tenets of Epicurus. He appears, however, to have taken but a gloomy view of human existence and the dealings of God with man; so much so, that did we not learn from other sources that he had experienced no want of success in life, was in affluent circumstances, and enjoyed ample means for gratifying his literary tastes and caprices, we should have concluded that he was an eminently disappointed man, and that hence arose the dissatisfaction, which he omits no opportunity of expressing, with the terms upon which life has been granted to us. At the very earliest moment that the plan of his work will admit of his expressing the opinion (b. vii., c. 1), "It is far from easy to determine," says he, "whether Nature has proved to man a kind parent or a merciless stepmother,"—a complaint which is immediately followed up by repinings at the sad lot of man,—"The only tearful animal," he says.

Then, again (b. vii., c. 51), man's liability to disease is a blemish in the economy of Nature; and life is too short, and its tenure too uncertain. So sensitive is he upon the injustice of man being born to sorrow, that he expresses it as his conviction (b. vii., c. 41) that "no pleasure whatever can possibly compensate for the slightest grief." As life has not been granted on his own terms, he thinks it unworthy of his acceptance, and the sooner it is got rid of the better. Nature, in his opinion, has bestowed no greater blessing on man than a short life; sudden death he regards as a singular phænomenon, and as the supreme happiness of the human race; and the highest privilege that has been conferred upon us is the power that has been given to every one of putting an end to his own existence (b. xxviii., c. 2). "After burial," says he (b. vii., c. 56), "come the quiddities about the Manes (*Manium ambages*). All men, after their last day, return to what they were before the first; and after death there is no more sensation left in the body or in the soul than there was before birth." The doctrines of the immortality of the soul, of transmigration, and of a place for departed spirits, find equally little favour with him.

The faults presented by his work, valuable as it is, are of two kinds,—the one, the natural result of his own unsettled opinions on most matters of a speculative nature; the other, the consequence of his determination to embrace every subject included in the "*encyclopædia*" of the Greeks (b. i.), his want of discrimination, his ignorance of many of the subjects upon which he treats, his imperfect acquaintance probably with the language of his originals, and his unconscious prepossession for all that is strange, startling, and marvellous. Prone to censure credulity in others; equally averse, as he professes to be, to superstition and to scepticism; and a disbeliever, as he says, in omens, astrology, and magic,—there is nothing, it would appear, in some instances, that he is not ready, with a most astounding credulity, to believe; while, again, on other occasions, with an equally singular waywardness, he refuses to give credit where there is nothing in reality that ought in any way to stagger belief. Induced probably by the example of the elder Cato, his great prototype, he loses no opportunity of manifesting the strongest aversion to the Greeks, and brings repeated charges against them of viciousness, vanity, and lying; and yet to these same Greeks is he avowedly indebted for the larger and by far the more valuable part of his information upon most of the subjects of which he treats! A hater, too, of servility in others, he makes no scruple of falling in with the adulation of the day, whenever his subject leads him to mention his friend and patron the Emperor Vespasianus, and his sons Titus and Domitianus. Compiled, as his work is, from upwards of 2000 volumes, some errors might naturally be expected, and would be as readily forgiven; but so anxious is he for a large accumulation of facts, and those of as singular a nature as possible, that he inserts statements which a moment's consideration would have convinced the most credulous even must be destitute of all reasonable foundation. The result, too, of his own ignorance of many of his subjects is, that he is incapable of correcting the errors of those from whom he has borrowed, or of determining the relative value of the facts which he selects and of those which he omits. Much must have been left to his amanuenses, no doubt; and it is either to their carelessness and ignorance, or, what is equally probable, to his own imperfect knowledge of the language, that we must attribute his numerous incorrect translations from the Greek,—the works of Theophrastus in particular.

Pliny, in short, appears to have been actuated by a thirst for acquiring knowledge, from books, from oral information, and from personal observation, as ardent perhaps as that which influenced either Aristotle or our Lord Bacon, but without a particle of their genius, their powers of discernment, or their capacity for turning their acquisitions to practical account. The result is, that his *Historia Naturalis* cannot be viewed as a "Natural History" in our sense of the term, but as a vast compilation merely of asserted facts in meteorology, geography, zoology, botany, mineralogy, and therapeutics, and in the various arts more or less remotely connected with them. His work, however, is of inestimable value in many respects, and Cuvier, a man better qualified perhaps than any one else to give an opinion on the subject, while fully sensible of its imperfections, has awarded it a high rank among the most valuable productions of antiquity (*Biogr. Univers.*, vol. xxxv.) "This great work," he says, "is one of the most precious monuments left to us by antiquity, and a proof of the astonishing learning of a warrior and a statesman. To appreciate with justice this vast and celebrated composition, we must consider the plan, the facts, and the style. The plan is immense: it is his object to write, not merely a Natural History in our present restricted sense of the term—not a treatise, more or less detailed, on animals, plants, and minerals; but a work which embraces astronomy, physics, geography, agriculture, commerce, medicine, and the fine arts, in addition to natural history properly so called; while at the same time he continually interweaves with his narrative information relative to man considered metaphysically, and the history of nations,—so much so, indeed, that in many respects this work may be called the Encyclopædia of its age. It was impossible that, in treating, however cursorily, of such a prodigious number of subjects, the writer should not have recorded a multitude of remarkable facts; which to us are the more valuable as he is the only author extant who mentions them. Unhappily, the manner in which he has collected and arranged them causes them to lose much of their value; from his mixture of truth and fable, and more especially from the difficulty, and in some cases the impossibility, of discovering exactly of what objects he is speaking. Pliny was not an observer, like Aristotle; still less was he a man of genius, capable, like that philosopher, of seizing the laws and relations according to which Nature has regulated her productions. In general, he is only a compiler, and, indeed, mostly a compiler who, having no idea himself of the subjects on which he collects the testimonies of others, cannot appreciate the truth of those testimonies, nor even always understand what they mean. A comparison of his extracts with the original authors still extant, and especially with Aristotle, shows us that he was far from selecting either what was most important or most exact. In general, he prefers whatever is singular and marvellous, or what may help him in establishing the contrasts in which he so much delights, or the reproaches he is so fond of uttering against Providence. It is true that he does not give the same degree of faith to everything that he mentions, but it is quite by chance that he believes or doubts; and it is by no means the most childish stories that always provoke his incredulity. But if Pliny possesses little merit as a critic and a naturalist, it is far otherwise with his talent as a writer, and the immense treasury which he opens to us of Latin terms and forms of expression: these, from the very abundance of the subjects upon which he treats, render his work one of the richest repositories of the Roman language. Wherever he finds it possible to give expression to general ideas or to philosophical views, his language assumes considerable energy and vivacity, and his thoughts present a certain novelty and boldness which greatly tend to relieve the dryness of his enumerations, and, with the majority of his readers, excuse the deficiencies of his scientific information. He is always grave and noble, and everywhere shows a love of justice and virtue, a horror of that cruelty and baseness of which he had such frightful examples before his eyes, and a contempt for that unbridled luxury which in his time had so deeply corrupted the Roman people. For these great merits Pliny cannot be too highly praised; and, in spite of the faults which we cannot but recognise in him when viewed as a naturalist, we must nevertheless allow that he is one of the most meritorious of the Roman writers, and among the most worthy to be ranked in the number of the classics after the reign of Augustus."

The style of Pliny is often harsh, and always elliptical; so much so, that the brevity and conciseness which he seems more particularly to aim at not unfrequently degenerate into obscurity; relieved, however, by his general elevation of tone, his fondness for point and contrast, and touches of keen irony every now and then. With wit or genuine humour he seems to have had but little acquaintance, and we have but two or three faint traces of them throughout the work. Occasionally the context has the appearance of being little more than rough notes, hastily put together by himself, or left to the mercy of his scribes, and subjected to no revision before publication. This, combined with the corruptness of the text, renders it next to impossible, in some instances, to divine his meaning.

The following is a brief outline of the thirty-seven books into which the *Historia Naturalis* is divided:—The first contains the dedication to Titus, with a sketch of the plan proposed, and concludes with a summary of the contents of the other thirty-six, and a list of the authorities consulted in each. The second treats of the Deity, the universe, the earth, sun, moon, stars, and elements. In the next four books we have a geographical description (in most instances a bare recital of names) of the earth as known to the ancients; the sixth book, more particularly, being valuable for a detailed account of India, including *Taprobane*, the modern Ceylon. The seventh treats of man,—his organization, generation, and destiny; his virtues and vices, and his progress in the various arts and inventions. An account of beasts, fishes, birds, reptiles, and insects, with a sketch of human and comparative anatomy, forms the subject of the next four books. Botany is the main subject of the next sixteen books, which, though inartistically put together, are made to include a large amount of interesting information upon numerous subjects,—among them, perfumes, wines, oils, resins, fruits, trees, cabinet-woods, grafting, the culture of the vine and of the cereals, prognostics derived from various sources, flax, tissues, vegetables, garden-plants, chaplets, and chaplet-flowers; with an elaborate account, in books xxii.–xxvii., of the remedies derived from every portion of the vegetable world, and a description of the various diseases then known. In b. xxviii. he treats—and with much revolting detail—of the medicaments derived from the human body. In the next two books he describes the remedies derived from other living creatures, branching off into an account of the history of medicine and magic (which last he looks upon as an offshoot of the medical art), with some notices of the more current superstitions of the day. B. xxxi. and b. xxxii. are devoted to an account of medicinal waters, and the remedies derived from fish and other aquatic animals and productions. In b. xxxiii. and b. xxxiv. he gives a description of the various metals, with a large amount of miscellaneous information more or less remotely connected with them; his digressions embracing money, jewels, plate, bronzes, statues, and statuaries of all nations, with a correct table of their dates. B. xxxv. contains an account of mineral pigments and the art of painting, with copious notices of the more eminent painters, and of the various eras of the art. In b. xxxvi. he passes on to a description of stone and the other materials employed in building, the use of marble for the purposes of sculpture, the history of that art and of the more eminent sculptors and their works, the most remarkable buildings and works of art at Rome and elsewhere, concluding with a history of the invention and manufacture of glass. In b. xxxvii. he gives an account of gems, murrhine, amber, and precious stones; and concludes the work with a patriotic eulogium upon Italy, her productions, her fertility, her beauties, and her elevated rank among nations.

The earliest edition of the *Historia Naturalis* was published by J. De Spira, at Venice, 1469. The first edition of critical merit is that by Hardouin (Paris, 1685 and 1723). The most valuable critical edition is that by Sillig (Hamburg and Gotha, 1851–55, 6 vols. 8vo), the last six books being rendered additionally valuable by the new readings of a manuscript of the tenth or eleventh century, discovered at Bamberg, which has been admirably collated by M. Jan. In many passages previously looked upon as hopelessly corrupt, or else not at all suspected of being so, this manuscript supplies words and sentences which greatly tend to alter or elucidate the meaning; and by the aid of them Sillig has been enabled to *re-write* these books in a great degree. Twenty-two lines have also been added, from this manuscript, at the end of the work; before the discovery of which, both Jan and Sillig had expressed it as their opinion that the proper termination was wanting; and even now, notwithstanding the comparative completeness of the restored text, Bernhardy (*Grundriss d. Röm. Lit.*, p. 644, 2d ed.) is of opinion that there is still something wanting. From a perusal of these new readings, we may feel assured that the text of the earlier books is defective in the extreme; and much, no doubt, of the alleged obscurity of Pliny's style may be attributed to this cause. The best illustrated editions of the text are those published by Lemaire (Paris, 1827–33, 10 vols. 8vo), under various editors; and by Panckoucke (Paris, 1829–33, 20 vols. 8vo), with a French translation by Ajasson de Grandsagne, and notes by Cuvier, Fée, Parisot, and other learned men.

There are English translations of this work, by Philemon Holland (London, 1601, 2 vols. folio); and by Dr Bostock and H. T. Riley (London, 1855–57, 6 vols. 8vo), with copious illustrations of the text. (H. T. R.)

Plinius Cæcilius Secundus, *Caius*, commonly known as the "Younger Pliny," was the son of Caius Cæcilius, a person of equestrian rank, and of Plinia, the sister of the elder Pliny. His native place was probably *Novum Comum*, now Como; though Verona has been suggested. He was born A.D. 61 or 62; for we learn, from a letter of his to Cornelius Tacitus (b. vi., Ep. 20), that he was in his eighteenth year at the decease of his uncle, in A.D. 79. The time of his death is not known, but it is thought to have been towards the close of the reign of Trajanus, who died A.D. 117. Losing his father in early life, he was adopted by his uncle, then in Spain; upon whose return to Rome, A.D. 70 or 71, he was, with his mother, received under his roof. His education was conducted under the supervision of his uncle and his guardian Verginius Rufus, a person of consular rank, and of whom (b. ii., Ep. 1) he speaks in terms of grateful remembrance. In his fourteenth year he wrote a Greek tragedy, of which he does not speak in very flattering terms in after life (b. vii., Ep. 4). At Rome, he studied eloquence under Quintilianus and Nicetes Sacerdos. With his mother, he was residing with the elder Pliny at Misenum at the period of the great eruption of Vesuvius, and his death. At the age of nineteen he appeared as an advocate in the Forum, and was frequently employed in a similar capacity in the court of the *Centumviri*; as also in prosecutions before the Roman senate. While young he served as military tribune in Syria, where he met with Euphrates, the Stoic philosopher, and Artemidorus. After his return to Rome, he was appointed *Quæstor Cæsaris*, and was *Prætor* about A.D. 93. Towards the end of the reign of Domitianus, he drew upon himself the resentment of that emperor for his support of the cause of Helvidius, who was put to death. In A.D. 100 he was appointed Consul, upon which occasion he composed his Panegyric upon the Emperor Trajanus. In A.D. 103 he became *Pro-prætor* of the province of Pontica. He filled other offices also; and it is inferred from his letters (b. iii., Ep. 20; b. iv., Ep. 25) that he attained senatorial rank. His latter years were probably spent in retirement in Italy, his constitution being weak and his health delicate. He was twice married; his first wife dying about A.D. 96, the following year he married Calpurnia, who was considerably younger than himself,—a highly accomplished woman, and a member of an illustrious family. He had no children by either wife, born alive.

His character may be inferred from his letters. Somewhat credulous and superstitious, he was evidently an amiable man,—frugal, temperate, and in general humane; a promoter of learning, and on terms of intimacy with most of the literary men of his day. Possessing several villas on the banks of the Lake of Como, he was in the enjoyment of affluence; and he spent his money liberally, for the benefit of others as well as the improvement of his estates. He has been accused, however, of being jealous of the reputation of some of his friends; and that he was somewhat vain of his own acquirements, there is reason to believe.

The only extant works of Pliny are his *Panegyric upon Trajanus*, and his *Epistles*, in ten books. Very different estimates have been put upon the former. By some scholars it has been styled a work of surpassing excellence, and a model of eloquence; while by others it is stigmatized as a fulsome composition, and of little merit. Indeed, we are bound to admit that, in point of flattery, it oversteps modern notions of propriety, and that its style is too studied and formal: its chief value probably consists in what little information it gives us about the author and his times. The first nine books of the *Epistles* are addressed to various persons, and furnish the chief materials for Pliny's Life, with much interesting information about his contemporaries. The tenth book contains his letters to Trajanus during his government in Asia Minor, together with the Emperor's answers; an interesting series, which, it has been suggested, though on insufficient grounds, was not the genuine production of Pliny. Be this as it may, the collection forms a valuable accession to ancient literature, the merits of which are well described by Erasmus.—"The letters of Pliny," he says, "are redolent of wit, elegant, and appropriate: in them we read nothing but what pertains to everyday life, and everything is purely Latin, chaste, and ably described."

The two letters descriptive of the death and literary habits of the elder Pliny, and those addressed to Trajanus, with the answers, form the most interesting portions of the work. From the time of Tertullian, peculiar interest has been attached by the Christian world to Pliny's name, from the testimony which he bears (b. x., Ep. 97) relative to the character and tenets of the early Christians of his day,—the followers, as he calls them, of "a perverse and extravagant superstition." The conduct of Pliny, who was otherwise a humane man, towards the Christians of Bithynia, seems to have been cruel and intolerant; and his object is to ask the Emperor's advice as to his future proceedings, more particularly with the view of putting down their secret meetings. The Emperor's answer (b. x., Ep. 98), advising him to be lenient, and not too searching in his inquiries, is tempered with a spirit of mercy and justice, which unfortunately has not at all times characterized professing Christians themselves in their differences upon religion.

The first edition of the *Epistolæ* is that of Naples, 1476, folio; and of the *Panegyricus* and *Epistolæ*, that of Venice, 1485, 4to. The best edition of the entire works is that of Gierig (Leipsic, 1806, 2 vols. 8vo). The edition of the *Epistolæ* by Cortius and Longolius (Amst., 1734, 4to) is highly commended. There is also a very elaborate Life of Pliny by Masson (Amst., 1709, 8vo). There are two English translations of the *Epistolæ*,—one by Lord Orrery, the other by W. Melmoth; the latter probably the more meritorious of the two. (H. T. R.)

PLINTH. See Glossary to ARCHITECTURE.

PLOCK (Russian *Plozk*), a government of the Russian empire, in the kingdom of Poland, lying between N. Lat. 52. 15. and 53. 30., E. Long. 18. 45. and 22. 35.; and bounded on the E. by the government of Augustovo, S. by those of Lublin and Warsaw, W. and N. by Prussia; area, 6742 square miles. The Bug and the Vistula bound it on the S. and W., and the Narew, an affluent of the former river, flows through it from N. to S. A large part of the country is occupied with woods and marshes; but some parts of it consist of fine meadows and rich arable land. The government is divided into six circles. Pop. (1851) 548,406, including 30,803 Germans.

PLOCK, the chief town of the above government, on the right bank of the Vistula, 50 miles N.W. of Warsaw. It is well built on a hill in a fertile region; and contains an ancient cathedral with many interesting monuments, other Roman Catholic churches, and a Reformed church, several convents, an episcopal palace, schools of various kinds, an orphan hospital, lunatic asylum, and a theatre. A trade in corn, hides, &c., is actively carried on with Dantzic and other places. Pop. (1854) 12,728.

PLOËRMEL, a town of France, capital of an arrondissement, in the department of Morbihan, on the lake and river Duc, 25 miles N.E. of Vannes. The town is well built, and has wide, clean streets, two squares, and a public green. The parish church is a low, heavy building, containing interesting monuments of two of the dukes of Brittany. There are also here a college, hospital, and court-house. The inhabitants trade in hempen yarn, iron, cattle, woollen and linen stuffs, &c. The climate is very healthy. Pop. (1856) 4868.

PLÖN, a town of Denmark, in the duchy of Holstein, on a narrow neck of land separating the two lakes of Great and Little Plön, 17 miles S.E. of Kiel. The situation is very pleasant and picturesque. On a hill, rising steeply out of the lake, stands the castle, occasionally the residence of the Danish monarchs. It commands an extensive view over one of the most fertile regions of Holstein, consisting of hill and dale, wood and water, meadows and corn-fields. The town itself is very ancient, having been a celebrated place as early as the time when the Vandals held this country; but except the usual public buildings it has no structures of any importance. Pop. 3000. The great lake, irregular in form, 7 miles long and 4 broad, the largest in Holstein, is fringed with wood and studded with several islets.

PLOT, ROBERT, a learned antiquary and philosopher, was born at Sutton-Barne, in the parish of Borden, Kent, in the year 1641. He studied in Magdalen Hall, and afterwards in University College, Oxford. In 1682 he was elected secretary of the Royal Society, and published the *Philosophical Transactions* from No. 143 to No. 166 inclusive. The next year Elias Ashmole appointed him first keeper of his museum; and about the same time the vice-chancellor nominated him primarius professor of chemistry in the university of Oxford. In 1687 he was made secretary to the earl marshal; and the following year received the title of historiographer to James II. In 1690 he resigned his professorship of chemistry, and likewise his place of keeper of the museum, to which he presented a very large collection of natural curiosities, which he had described in his Histories of Oxfordshire and Staffordshire; the former published at Oxford in 1677, folio, and reprinted, with additions and corrections, in 1705, and the latter printed of the same size in 1686. In January 1694–5

Henry Howard, earl marshal, nominated him Mobray-herald extraordinary; two days after which he was constituted register of the Court of Honour; and, on the 30th of April 1696, he died of the stone, at his house at Borden.

As Dr Plot delighted in natural history, the above works were designed as essays towards a Natural History of England; and he had actually formed a design of travelling through England and Wales for that purpose. He accordingly drew up a plan of his scheme, in a letter addressed to Bishop Fell, which is inserted at the end of the second volume of Leland's *Itinerary*, in the edition of 1744. Amongst several manuscripts which he left behind him were large materials for the Natural History of Kent, Middlesex, and the city of London. Besides the above works, he published *De Origine Fontium Tentamen Philosophicum*, 8vo, and nine papers in the *Philosophical Transactions*.

PLOTINUS, the most celebrated writer and teacher of the Neo-Platonic school. He was born at Lycopolis, a city of Egypt, in A.D. 204, and began very early to show a great singularity both in his taste and in his manners. At the age of twenty-eight he had a strong desire to study philosophy, on which occasion he was recommended to the most famous professors of Alexandria. He was not satisfied with their lectures; but upon hearing those of Ammonius, he confessed that this was the man he wanted. He studied for eleven years under that excellent master, and then went to hear the Persian and Indian philosophers. In A.D. 243, when the Emperor Gordianus intended to wage war against the Persians, he followed the Roman army, but probably repented of it; for it was with difficulty he could save his life by flight after the emperor had been slain. He was then thirty-nine. The year following he went to Rome, and read philosophical lectures in that city; but avoided following the example of Erennius and Origen, his fellow-pupils, who having, like him, promised not to reveal some hidden and excellent doctrines which they had received from Ammonius, had nevertheless broken their pledge. Plotinus continued ten years in Rome without writing anything; but in his fiftieth year he obtained as his scholar Porphyry, who being of an exquisitely fine genius, was not satisfied with superficial answers, but required to have all difficulties thoroughly explained; and therefore Plotinus, to treat things with greater accuracy, was obliged to write more books. He had previously written twenty-one books, and during the six years of Porphyry's sojourn with him he wrote twenty-four, and nine after Porphyry left Rome, making in all fifty-four. The Romans had a high veneration for him; and he passed for a man of such judgment and virtue that many persons of both sexes, when they found themselves dying, entrusted him, as a kind of guardian angel, with the care of their estates and children. He was the arbiter of numberless lawsuits; and constantly behaved with such humanity and rectitude that he did not create a single enemy during the twenty-six years he resided in Rome. He did not meet with the same justice, however, from all of his own profession; for Olympias, a philosopher of Alexandria, being envious of his glory, used his utmost endeavours, though in vain, to ruin him. The Emperor Gallienus and the Empress Salonina had a very high regard for him; and if it had not been for the opposition of some jealous courtiers, they would have caused the city of Campania to be rebuilt, and given it to him, with the territory belonging to it, to establish a colony of philosophers, and to govern it according to the ideal laws of Plato's commonwealth. He laboured under various disorders during the last year of his life, which obliged him to leave Rome, when he was carried to Campania, to the heirs of one of his friends, who furnished him with everything necessary: and he died there, A.D. 270, at the age of sixty-six, in the noblest manner that a heathen philosopher could expire. "I am labouring with all my might," said he, "to return the divine part of me to the Divine Whole which fills the universe."

We have already remarked that the ideas of Plotinus were singular and extraordinary; and we shall now show that they were so. He was ashamed of being lodged in a body, for which reason he did not care to tell the place of his birth or family. The contempt he had for all earthly things was the reason why he would not permit his picture to be drawn; and when his disciple Amelius urged him to do so, "Is it not enough," said he, "to drag after us, whithersoever we go, that image in which nature has shut us up? Do you think that we should likewise transmit to future ages an image of that image, as a sight worthy of their attention?" On the same principle, he refused to attend to his health; for he never made use of preservatives or baths, and did not even eat the flesh of tame animals. He ate but little, and often abstained from bread; which, joined to his intense meditation, prevented him from sleeping. In short, he thought the body altogether below his notice, and had so little respect for it that he considered it as a prison, from which it would be his supreme happiness to be freed. When Amelius, after his death, inquired of the oracle of Apollo about the state of his soul, he was told that it was gone to the assembly of the blessed, where charity, joy, and a love of the union with God prevail. And the reason given for this, as related by Porphyry, is, "that Plotinus had been peaceable, gracious, and vigilant; that he had perpetually elevated his spotless soul to God; that he had loved God with his whole heart; that he had disengaged himself, to the utmost of his abilities, from this wretched life; that, elevating himself with all the powers of his soul, and by the several gradations taught by Plato, towards that Supreme Being which fills the universe, he had been enlightened by him, had enjoyed the vision of him without the help or interposition of ideas, and, in short, had often been united to him." This is the account of Porphyry, who also tells us that he himself had once been favoured with the vision. Plotinus had his familiar spirit as well as Socrates; but, according to Porphyry, it was not one of those called *demons*, but of the order of those who are called *gods;* so that he was under the protection of a spirit superior to that of other men. When Amelius desired him to share in the sacrifices which he used to offer up on solemn festivals, "It is their business," replied Plotinus, "to come to me; not mine to go to them."

Porphyry put the fifty-four books of Plotinus in order, and divided them into six *Enneades*. The greater part of them turn on the most high-flown ideas in metaphysics; and this philosopher seems, in certain points, to differ but little from Spinoza. He wrote two books to prove that all being is one and the same; which is, in fact, the very doctrine of Baruc Spinoza. He inquires, in another book, whether there are many souls, or only one. His manner of composing partook of the singularity of his nature. He never read over his compositions after he had written them; he wrote a bad hand, and was not exact in his orthography; he stood in need, therefore, of a faithful friend to revise and correct his writings; and he chose Porphyry for this purpose in preference to Amelius, who had been his disciple twenty-four years, and was very much esteemed by him. Marsilius Ficinus, at the request of Cosmo de' Medici, executed a Latin version of the works of Plotinus, with a summary and analysis of each book, which was printed at Basil, first by itself in 1559, and afterwards with the Greek in 1580, folio. His Life was written by Porphyry, the most illustrious of his disciples. A beautiful edition of the works of Plotinus, in 3 vols. 4to, has been published at the Oxford university press, with this title, *Plotini Opera Omnia Edidit Fredericus Creuser, Oxon. e typographeo*

Academico, 1835. There is also an English translation of *Select Works of Plotinus*, by Taylor.

PLOUGH. See Agriculture.

PLOWDEN, Edmund, sergeant at law, descended from an ancient family in Shropshire, was born in 1517, and was first a student of the university of Cambridge, where he spent three years in the study of philosophy and medicine. He then removed to Oxford, where having continüed his former studies about four years more, he was in 1552 admitted to the practice of physic and surgery; but probably finding the practice of the healing art less agreeable than the study of physic, he entered himself of the Middle Temple, and began to read law. Wood says that in 1557 he was summer reader to that society, and Lent reader three years afterwards, being then sergeant and oracle of the law. He died in the year 1584, aged sixty-seven; and was buried in the Temple church. He wrote *Commentaries or Reports of divers Cases in the reigns of Edward VI., Mary, and Elizabeth*, London, 1571, 1578, 1599, and 1613, written in the old Norman language; and *Queries, or a Moot-Book of Cases, translated, methodized, and enlarged*, by H. B. of Lincoln's Inn, London, 1662, in 8vo.

PLUCHE, Noel Antoine, a celebrated French writer, was born at Rheims in 1688; and having distinguished himself by his engaging manners and proficiency in the belles lettres, was appointed professor of humanity in the university of that city. Two years afterwards he obtained the chair of rhetoric, and was admitted into holy orders. The Bishop of Leon, informed of his talents, conferred upon him the direction of the college of his episcopal city. By his industry and superior knowledge, a proper order and subordination were soon established in it; but some peculiar opinions respecting the affairs of the time disturbed his tranquillity, and obliged him to resign his office. The intendant of Rouen, at the request of the celebrated Rollin, intrusted him with the education of his son. He published *Le Spectacle de la Nature*, in 9 vols. 12mo; *Histoire du Ciel*, or History of the Heavens, in 2 vols. 12mo (Voltaire called this work *Fable du Ciel*); *De Linguarum Artificio*, a work which he translated under the title of *Le Mécanique des Langues*, in 12mo; *Harmony of the Psalms and the Gospel*, or a translation of the Psalms and Hymns of the Church, with notes relative to the Vulgate, the Septuagint, and Hebrew Text, printed at Paris in 1764, in 12mo. In 1749 Abbé Pluche retired to Varenne St Maure, where he gave himself up entirely to devotion and study. He died of apoplexy, on the 20th of November 1761, at the age of seventy-three years.

PLUMB-LINE, or Plummet, an instrument used by carpenters, masons, and others, in order to judge whether walls or beams be upright planes, horizontal, or the like. It is so called from a piece of lead fastened to the end of a cord, which usually constitutes this instrument. Sometimes the string descends along a wooden ruler, raised perpendicularly on another, in which case it becomes a level.

PLUNKET, William Conyngham, *Baron*, Lord Chancellor of Ireland. This eminent lawyer, orator, and statesman, was the second son of the Rev. Thomas Plunket, a minister of the Church of Scotland in Ireland, and was born in the county of Fermanagh in July 1765. He was educated in boyhood by his father, who was a man of considerable abilities and reputation; and in 1779 he became a student of Trinity College, Dublin, having failed at his entrance in obtaining the humble honour of a sizarship. Though well versed in regular academic studies, as his writings and speeches abundantly prove, he was most conspicuous in his university career as the acknowledged leader of the Historical Society, the debating club of Trinity College, at this time full of young men of remarkable promise. In this arena, according to the tradition of his contemporaries, he showed from the first the powers of a great speaker; and he held an admitted superiority in an assembly among whose members were several orators of great future eminence.

Having entered Lincoln's Inn in 1784, Plunket was called to the Irish bar in 1787. His talents, acquirements, character, and station in life were calculated to insure him success in the profession of the law. If somewhat deficient in ready dexterity, his intellect was exactly that of a jurist or a great master of equity—not too refining or overprone to speculation, and yet capable of the highest legal generalizations, and of applying them to masses of fact, however tedious and complicated. His power of close and rapid argument was very remarkable, his memory equally capacious and exact, and he had enriched an ample store of professional learning with the fruits of assiduous general study. In addition, he was sedate and persevering in his disposition, his promise of eloquence was already acknowleged, and his fortune was sufficiently scanty to coerce him to submit to drudgery. Accordingly, although at first his progress at the bar was not rapid, he gradually obtained a considerable practice in equity; became known as a logical pleader and powerful advocate; and after an apprenticeship of eleven years as a junior, was raised to the rank of king's counsel in 1798.

In 1798 he entered the Irish Parliament as member for Charlemont. His political faith was already settled, and was only slightly modified in after life, at least as regards its cardinal tenets. He was an anti-Jacobin Whig of the school of Burke, not ungracefully filled with a fervent Irish patriotism. Having but little turn for speculation, he disliked the principles of the French Revolution, and its ferocious excesses made such an impression upon him that he always showed the greatest antipathy to merely democratic movements. But he was a sincere admirer of the constitutional government of England as established in 1688; he reverenced the predominance it secures to law and to the play of social forces; and he naturally loved its parliamentary and municipal institutions. He even justified the ascendancy it had given to the established church, although he thought that the time had at length arrived for extending toleration to Roman Catholics and Dissenters. To transfer it to Ireland as thus modified, and under an independent legislature, was, even in his youth, the only reform he sought for his country; and although he opposed the Union with all his power, this was only because he thought it incompatible with this object.

When Plunket became a member of Parliament, the Irish Whig party was almost extinct, and Mr Pitt was feeling his way to accomplish the Union. In this he was seconded ably by Lord Castlereagh, by the panic caused by a wild insurrection, and by the secession of Mr Grattan from politics. When, however, the measure was actually brought forward, it encountered a vehement opposition; and among the ablest and fiercest of its adversaries was Plunket, whose powers as a great orator were now universally recognised. His speeches in these debates show all the force of reasoning, the admirable arrangement, and the grasp of facts which characterize his later efforts; but they are somewhat disfigured by personal invective, and here and there betray an indecent acrimony. They raised him, however, immediately to the front rank of his party; and when Mr Grattan re-entered the moribund senate in which even his genius had been displayed in vain, he took his seat next to Plunket, thus significantly recognising the place he had attained.

After the union of Great Britain and Ireland Plunket returned to the practice of his profession, and became at once a leader of the equity bar. In 1803, after the outbreak of Emmet's rebellion, he was selected as one of the crown lawyers to prosecute the unfortunate enthusiast, and at the trial, in summing up the evidence, delivered a speech of remarkable power, which shows his characteristic dislike of revolutionary outbursts. For this speech he was exposed to much unmerited obloquy, and more especially to the libellous abuse of Cobbett, who could not endure his antipathy to democratic violence, and against whom he brought a successful action for damages. In 1804, in Mr Pitt's second administration, he became solicitor, and then attorney-general for Ireland; and he continued in office when Lord Grenville came into power at the head of the ministry of all the talents. Plunket held a seat in Parliament during this period; and when there, made several able speeches in favour of Catholic emancipation, and of continuing the war with France; but when the Grenville cabinet was dissolved, he returned once more to professional life, and for some years devoted himself exclusively to it.

In 1812, having amassed a considerable fortune, he re-entered Parliament as member for Trinity College, and identified himself thoroughly with the Grenville or anti-Gallican Whigs. He was now in the full maturity of his powers, and very soon was acknowledged one of the first, if not the first, orator of the House of Commons. His political tenets and his great abilities combined to secure him respect and admiration. His peculiar reverence for the English constitution in church and state, his strong dislike of French principles, his steady advocacy of the war with Napoleon, and his antipathy to anything like democracy, made him popular with the Tory party. On the other hand, he was the zealous and most able supporter of Catholic emancipation; he was not averse to some measure of parliamentary reform; and, as generally he was on the side of constitutional progress, he was reckoned a principal ornament of one of the sections of the Whigs. During the period between 1812 and 1822 his speeches on the Catholic question, on the renewal of the war in 1815, and on the "Peterloo massacre," as it was called, will alike indicate his position as a statesman, and give an idea of his oratorical abilities.

In 1822 Plunket was once more attorney-general for Ireland, with Lord Wellesley as lord-lieutenant. One of his first official acts was to prosecute for the "bottle riot;" an attempt on his part to put down the Orange faction in Ireland. But, though always the advocate of the Catholic claims, he strenuously opposed the Catholic Association, which about this time, under the guidance of Mr O'Connell, began its extraordinary and successful agitation. He struggled vehemently to extinguish it, and in 1825 made a powerful speech against it; and thus the curious spectacle was seen of the ablest champion of an oppressed sect doing all in his power to check its efforts to emancipate itself. And yet in this conduct it cannot be denied that Plunket was quite consistent with his principles of politics.

In 1827 Plunket was made master of the rolls in England; but, owing to the professional jealousy of the bar, who not unnaturally thought him an intruder, he was obliged to abandon this office. Soon afterwards he became chief justice of the common pleas in Ireland, and was then created an English peer. He was thus no longer a member of the House of Commons when the great measure of 1829 at length threw it open to the misgoverned sect of whom he had for many years been the chief advocate. In 1830 he was appointed lord chancellor of Ireland, and held the office, with an interval of a few months only, until 1841, when he finally retired from public life. During this period he made some able speeches in favour of parliamentary reform; but they were scarcely equal to his earlier efforts; and his reputation as a judge, though far from low, was not so eminent as might have been expected. He died in 1854, in his ninetieth year; and at his death the bar of Ireland held a general meeting to acknowledge their sense of his great qualities, and to devise a monument to his memory.

The eloquence of Lord Plunket is his best title to fame. It was remarkable for a felicitous exposition of principles not too recondite for the general hearer, and yet broad, deep, and comprehensive; for close, rapid, and vigorous reasoning; for perspicuous and well-arranged narrative; and for a diction, chaste, severe, and idiomatic—very rarely adorned with metaphor or antithesis, yet occasionally enriched with the most admirable illustrations, and frequently enlivened with a caustic and powerful satire. If it was wanting in anything, it was in passion; unlike that of Mr Fox, it never *subdued* the hearer; but it convinced him by a mingled display of argument, exposition, and irony, scarcely equalled even in the age of Brougham, Canning, and Lyndhurst. (W. O'C. M.)

PLURAL. See GRAMMAR.

PLUTARCH, one of the most celebrated writers of antiquity, was a native of Chæroneia in Bœotia. The exact date of his birth and death is unknown; but as he tells us that he studied philosophy under Ammonius at Delphi, when Nero made a tour through Greece, and as we know this circumstance to have taken place A.D. 66, we may place the birth of Plutarch towards the latter years of the reign of Claudius (A.D. 48–53). He was sprung from an honourable family, which had often been invested with the highest offices of the magistracy. He speaks of having seen his great-grandfather Nicarchus, from whom he learned, as from an eye-witness, the miseries which his country had suffered from the oppressions of Antony. His grandfather Lamprias was distinguished for his eloquence and imagination; and his father is praised for his modesty, his acquaintance with the theology of his time, and his knowledge of the works of the poets. Plutarch had two brothers, Timon and Lamprias; of the former of whom he says that he has no obligations to fortune so great as the enjoyment of his brother Timon's invariable friendship and kindness. Under Ammonius, of whom we know little more than what his pupil has told us, he acquired the doctrines of that humane and rational philosophy for which he was afterwards so distinguished. Upon what occasion he visited Italy is uncertain, but it is supposed to have been on some public business of the Chæroneians. Whilst he remained at Rome, he found his house resorted to by all the principal citizens, and his lectures on philosophy attended by the most illustrious of the Romans. Sossius Senecio, who was four times consul, once under Nerva and thrice under Trajan, was his most intimate friend. To him he addresses his *Lives*, except that of Aratus, which is inscribed to Polycrates of Sicyon, the grandson of Aratus. Whether he remained in Italy till all philosophers were banished from that country by a decree of Domitian, is a point of which we have no means of determining; but we know that he spent the greater part of his time in his native city. Here he devoted himself to the discharge of such humble duties as the magistrates of Chæroneia were required to perform; and we find that he also joined to his magisterial character the office of priest of Apollo. Suidas states that he was preceptor to Trajan; but he was so nearly contemporary with that emperor that little credit is due to this assertion. Plutarch was married to a lady of his native city, called Timoxena, and in his matrimonial connection he seems to have been particularly fortunate. By her he had five children, four sons and a daughter, who died young; and on this occasion he addressed a beautiful letter of consolation to his wife, which is highly honourable to both parties. Two only of his sons survived, Plutarch and Lamprias, the latter of whom appears to have been a philosopher; and it is to him that we are indebted for a catalogue of his father's writings. His nephew Sextus was of considerable eminence, and taught the Greek language to Marcus Antoninus. We have no particular account either as to the manner or the time of his death, only it is evident that he lived to a good old age. The most probable conjecture is that of Fabricius, who says he died in the fifth year of Hadrian, at the age of seventy.

His works have been divided, and they admit of a pretty equal division, into Lives and Morals,—the former of which, in his own estimation, were to be preferred, as more noble than the latter. His style has been excepted to with some reason. He has also been criticised for some mistakes in Roman antiquities, and for a partiality to the Greeks. On the other hand, he has been justly praised for the copiousness of his fine sense and learning, for his integrity, and for a certain air of goodness which appears in all he wrote. His business was not to please the ear, but to instruct and charm the mind; and in this none ever excelled him. The work which has immortalized Plutarch is his *Lives* of forty-six Greeks and Romans. The latest and best edition of the Greek text is that of C. Sintenis, Leipsic, 1839–46, 4 vols. 8vo. The translations are numerous. They have been done into French by Amyot, 1559, of which there is an English translation by Sir Thomas North, London, 1612, but unfortunately it does not always follow the French. Dryden's was by numerous hands, he having written only the dedication, and the Life of Plutarch attached. The English version of John and William Langhorne has frequently been printed. There is a good German translation by Kaltwasser, Magdeburg, 10 vols. 8vo, 1799–1806. The other writings of Plutarch, above sixty in number, are classed under the general name *Moralia*, or ethical works. The best edition of the Greek text is that of Wyttenbach, Oxford, 8 vols., 1795–1821. It has been done into French by Amyot, into German by Kaltwasser, and into English by various hands, 5 vols. 1684–94; but a good English translation of the *Morals* is still wanted.

PLUTO. See HADES.

PLUTUS, in Pagan worship, the god of riches, is frequently confounded with Pluto. He was represented as appearing lame when he approached, but provided with wings at his departure, to show the difficulty of amassing wealth and the uncertainty of its enjoyment. He was also represented blind, to show that he often bestowed his favours on the most unworthy, and left in necessity those who had the greatest merit.

PLYMOUTH, a town at the western extremity of the county of Devon, on the southern shore of England, 216 miles by road, and 247 by railway (*via* Bristol and Exeter) from the metropolis. It is situated at the head of the sound of the same name, and on the small river Plym, from which circumstance the prefix of its name is undoubtedly derived. It is a place which has grown to its present importance from the natural advantages of maritime access, and the capability of defence arising from local circumstances, which have been extended by liberal expenditure under the direction of men of the most scientific attainments.

The entrance to the harbour, or more properly harbours, of Plymouth, is not without its dangers, consisting of rocks and shoals. Of the former are the *Mewstone*, the *Shagstone*, and the *Renny;* and of the latter the *Tinker*, the *Shovel*, the *Knap*, and the *Panther;* but their position is so well known, and so accurately pointed out by buoys, that in all but the most tempestuous and foggy weather they are easily avoided. The first object deserving notice in the water-access to Plymouth is that part called the *Sound*, a most capacious anchoring place, capable of affording shelter and protection to 100 sail of the line. The Sound has been rendered secure by that prodigious display of human labour known by the name of the *Breakwater*. As a full and scientific description of that work has been given in a former volume (see vol. v., p. 306), we refer to it; only adding, that since the trial of the storms of 1816 and 1817, the strength as well as the utility of the work has been proved by a storm which took place on the 23d of November 1824, when the whole southern coast of England was bestrewed with wreck and desolation. The tide then rose to the frightful height of 26 feet 2 inches, whilst the mean rise of the water at spring-tides is usually only 18 feet. The greater part of the surface of the Breakwater was on that occasion completely overturned, and huge stones of from two to five tons each were carried from the outer and deposited on the inner slope. It need scarcely be remarked, that those liabilities to injury to which such a work as the breakwater is subject whilst in progress, will not exist in an equal degree when the work is completed. Thus, in a hurricane of January 1828 not a single stone of the finished part of the work was removed from its position. (See BREAKWATER.)

Within the breakwater there are many indentations, the mouths of which terminate in the *Sound*, and form excellent harbours, some of them adapted for the largest class of ships. The easternmost of these inlets is at first called Catwater, and extends to the Lake of Saltram, being crossed by the Lary Bridge, an elegant work, erected between the years 1824 and 1827, about 500 feet in length. The small river Plym rises in the Dartmoor Mountains, and empties itself into the Lake of Saltram. The next to Catwater is a capacious harbour, called Sutton Pool, which is capable of receiving a thousand sail. It is used chiefly by the largest class of merchant ships, and by the steam-packets; and it has several yards for repairing or building merchant vessels. The next harbour is called Mill Bay; it is chiefly used for commercial purposes, and has some good quays, some ship-building yards, and good moorings for steamboats. Beyond that, at the extreme west, which separates it from Cornwall, is that indentation which is of the most importance to the British navy. It is the harbour of Hamoaze, one of the finest in the world. It is open to the full force of the tide, but receives the stores of fresh water which fall into it from the rivers Tavy, Tamar, Lynher, and St Germains. It is the place where the men-of-war in ordinary are moored; and on its border are the extensive dock-yard, the gun-wharf, and the powder-magazine, which, with other objects, will hereafter be noticed. In Hamoaze, the admiral commanding the port has his flag displayed on his ship; and when surrounded, as he commonly is, by a hundred sail of vessels, a most impressive spectacle is presented to view afloat, whilst the picturesque objects on the shore tend to increase the effect.

Within the breakwater is Drake's or St Nicholas' Island. It is surrounded with rocks, has a strong castle and other fortifications, and is provided with furnaces for heating balls, and with other means of defence. It is of great importance, as commanding the entrance into Hamoaze, Catwater, and the other harbours.

Little is known of Plymouth prior to the time of the Norman conquest, when it was called *South Town* or *Sutton*, although under the Saxon dynasty it was called *Tamerweorth*. In the reign of Edward I. it was called *Sutton Prior* and *Sutton Valletort*, the northern parts being built on the lands of the prior of Plympton, and the southern parts on the estates of the Valletorts. At that period it was chiefly inhabited by fishermen. Under the fostering care of the priors the place made considerable advances, and the more appropriate name of *Plym-mouth* was given to it. The growing prosperity of the town excited the jealousy of France; and in 1339 a force from thence landed, and attempted to burn it. They succeeded in burning a portion, but were ultimately repulsed, with the loss of 500 men, by Hugh Courtenay, Earl of Devon, aided by a number of "knights and men of the countrie." A similar attempt was made in 1377, but with no great result; and after each, the fortifications were extended and strengthened. In 1335 the Black Prince embarked from Plymouth for France, and on his return to England he landed here with his prisoner, King John of France, who had been captured at the famous battle of Cressy. At the threatened invasion of England by the Spanish Armada, Plymouth was not behind the neighbouring maritime towns in providing for the defence of the kingdom, as we learn it contributed to the fleet "seven ships and one fly-boat." During the civil war between Charles I. and the Parliament, Plymouth was held by the troops of the latter party, who, though besieged, and almost reduced by famine, resisted for three years every effort of the royalists. After the restoration the citadel was erected; and in the reign of William III. the dockyard and the naval arsenal were established towards the west, upon the eastern shore of Hamoaze. Since that time it has gone on increasing; but the greatest progress has been made during the present century, in which it has assumed a new character, in the intelligence and wealth of the inhabitants, as well as in the architectural style of its buildings both public and private. The buildings collectively called Plymouth are comprehended in three divisions, now known, the first by that name, the second by that of Stonehouse, and the third by that of Devonport. The name of the last was, till August 1824, Plymouth Dock, when, on an application from the inhabitants, the present name was given by royal authority.

The population of the three ports, at the respective decennial enumerations, has been as follows:—

Ports.	1801.	1811.	1821.	1831.	1841.	1851.
Plymouth...	16,040	20,803	21,591	31,080	36,527	52,221
Stonehouse..	3,407	5,174	6,043	9,571	9,711	11,979
Devonport...	23,747	30,083	33,578	34,883	33,820	38,180
Total......	43,194	56,060	61,212	75,534	80,058	102,380

Plymouth was incorporated a borough by Henry VI. in the year 1439, and by that charter, and subsequent alterations of a trifling nature, was governed till 1835, when, by the law made to reform municipal corporations, it was divided into six wards, each choosing six councillors, who elect twelve aldermen, one of whom is appointed mayor. The borough returns two members to the House of Commons. The town is in the hundred of Roborough, and consists of two parishes, which are within the deanery of Plympton and the archdeaconry of Totness, in the diocese of Exeter. The church of the parish of St Andrews is interesting to the admirers of ancient architecture. It formerly belonged to a monastery; and many alterations having been made since its erection in 1440, various styles are exhibited in the building, which thus as a whole appears incongruous; and though handsome in parts, it wants, as regards the body of the church, that altitude which is the most essential ingredient of Gothic architecture. It consists of a nave of considerable dimensions, with aisles, and a chancel of great extent. The windows are mostly of the pointed style, and the tower, containing a fine peal of eight bells, must be admitted to be of good general proportions, and it is crowned by a pinnacled compartment of remarkable beauty.

The church of the other parish is known by the name of Charles church, probably in remembrance of the second king of that name, who divided the borough of Plymouth into two parishes, and erected this edifice. The tower and spire have an agreeable outline, but otherwise the exterior of the building can only be described as in the debased Gothic style of a degenerate period. Each of these churches has a chapel attached to it under the respective clergymen, which together contain sittings for 2700 persons. The populousness of the town has rendered the erection of several other churches imperative. The principal of the new buildings is dedicated to St James, and was erected in 1854-5, from a design by Mr St Aubyn. The several sects of Methodists, Baptists, Independents, Quakers, Roman Catholics, Unitarians, and Jews have their respective places of religious worship; but the first mentioned have by far the most numerous body of adherents. The Hoe or Howe at Plymouth is an eminence on the south side of the town. It is a healthy and pleasing promenade, stretching from Catwater to Mill Bay, on the eastern extremity of which is built the principal defence of this most important place, called the Citadel. The entrance to this work, on the side of the town, is through two gateways of a bad specimen of architecture. The buildings consist of houses for the governor and other officers, of barracks, an hospital, a magazine, an armoury, and a chapel. The fortification consists of three regular and two irregular bastions, the curtains of the regular bastions being strengthened by two ravelins and horn-works; on the east, north, and west sides are a deep ditch, counterscarp, and covered way, palisadoed, and the parapets are pierced for 120 cannon. The lower fort is connected with the citadel, and is chiefly intended to defend the Sound.

Amongst the public buildings of Plymouth, the most imposing is a noble pile, which comprehends the Royal Hotel, the assembly-rooms, and the theatre. The foundation was laid in September 1811, and the building was completed in 1818. The front is in the Ionic style, and nearly 100 yards in length. The expense of the erection, amounting to L.60,000, was defrayed partly by the corporation and partly by the institution of a tontine. The theatre is large, and is constructed with not less regard to the safety than to the accommodation of the audience.

The Athenæum is a fine building, erected by the Philosophical Institution, and completed in the year 1819. The portico exhibits four columns appropriate to the character of a building devoted to literature and art. The general style of the architecture is Doric, blended with the Grecian. In connection with the institution is a public library, which now contains a vast and well-selected collection of books.

The custom-house, erected at the commencement of the present century, is worthy of the town, and convenient for its commerce. It exhibits a front of granite, suitable, solid, and well proportioned. The interior is well arranged for business. On the ground floor are the offices of the principal surveyor, the tide-surveyor, the landing-waiter, the searchers, and others. A granite staircase leads to the long room, which is 54 feet in length, 26 in width, and 22 in height. This building was completed in 1820, at an expense of L.8000.

The Royal Baths is an elegant pile of building between Plymouth and Stonehouse. It is furnished with hot and cold baths of fresh or of sea water, of hot air, of sulphur, and of vapour. Within it has a pump-room, where a medicinal water is supplied from a spring, which is chiefly composed of muriates of soda, of magnesia, and of lime, combined with small proportions of sulphate and carbonate of lime, and a very minute portion of carbonate of iron. It is one of the best arranged institutions of its kind in England; and belongs to a joint-stock company, incorporated by charter in 1828.

An edifice was commenced in 1835 for an hospital and dispensary for South Devon and East Cornwall. At present the central part only is erected; but in the original plan it was contemplated to erect two wings, as soon as sufficient funds could be obtained for the purpose. These would double the capacity of the building as to beds, and supply other conveniences. There are in the centre part a theatre for operations and lectures, and wards for forty beds, with appropriate rooms for nurses and other attendants. Few towns have advanced so much within the last fifty years, in respect to its public buildings, as Plymouth. That advance is still progressive; and amongst the new erections may be noticed the town-hall, the gaol, the Botanical

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Society's hall, the mechanics' institute, and the free public library. In the first-named building is a fine portrait of the Prince Regent by Hoppner; and the latter has lately been augmented by the erection of a museum in the Ionic style, and which is well stored with curiosities. It bears the name of the Cottonian Museum, from the founder —— Cotton, Esq., F.R.S., of Plymouth. With all the improvements here noticed, it must be observed that the principal thoroughfares are irregular in their disposition, and that the most bustling street is the narrowest of the town; and though there are excellent shops of every description, some of them exhibiting fronts of chaste architectural character, yet they are incongruously to be seen among houses of very antique date and style. The northern part of the town consists of small but neat houses; but the best masses of buildings are at the west end, and they are chiefly occupied by persons in the legal, medical, or other professions.

The sanitary state of Plymouth has lately been much discussed. In 1853, in a report published by the General Board of Health, it was stated to be one of the most unhealthy towns in the kingdom; and the want of proper sewerage and drainage, combined with the impure and defective water supply, and the uncleanly state of many of the dwellings, especially those of the lower classes, have rendered the place pestilential; but lately some measures have been taken in order to stay these evils, and there is reason to hope that in the course of a few years the town will be restored to its former position as one of the most healthy in the southern part of the kingdom. The market for fish is very remarkable, both for the variety, the excellence, and the cheapness of that description of food. The market-days are Mondays, Thursdays, and Saturdays; and the market-place is spacious, comprising nearly 3 acres.

The maritime commerce of Plymouth is extensive. A great trade in timber is carried on with the Baltic, with America, and the Mediterranean; and there is a direct intercourse with the East and West Indies and Mauritius, which secures a good supply of tropical commodities. It is a bonding port for many articles, and especially for tobacco. There are also large importations of timber, hemp, tallow, and other articles, for the use of the dock-yard. The coasting trade is carried on principally with London, Newcastle, Newport in Monmouthshire, and Bristol. Great quantities of manganese are shipped to Scotland, lead to Bristol, and some wool to Hull. The docks have lately been extended at an immense cost. A great curiosity is the iron floating pier, 300 feet long and 40 feet wide. The amount of duty received at the custom-house during the past year (1857) considerably exceeded L.100,000. The number of sailing-vessels registered at Plymouth, December 31, 1857, was 425, tonnage 47,441; of steam-vessels 9, tonnage 332. In 1857 there entered 3333 sailing-vessels, tonnage 268,311; and 527 steam-vessels, tonnage 178,695: and there cleared 1771 sailing-vessels, tonnage 135,279; and 567 steam-vessels, tonnage 159,373. Besides these, there are more than fifty decked boats, called *trawlers*, employed in the extensive sea fishery, the produce of which is sent to Exeter, Bath, and even to London. The building and repairing of ships give occupation to some hundreds of persons.

Plymouth was in 1834 constituted a stannary town. The neighbouring tin and other mines are numerous and productive. The vicinity also abounds in quarries of granite, slate, and marble; the latter being highly esteemed for its veining and susceptibility of polish. The export of granite and the other stone is much facilitated by the tram-railway, 24 miles in length, which extends from the interior of Dartmoor to the quays of Catwater and Sutton Pool harbours. By the same means coal, lime, and manure are conveyed from the port to the interior. This railroad was executed by a joint-stock company formed in the year 1818, and was completed in 1820. The exchange for the merchants, erected in 1813, is near the custom-house; and amongst other institutions, it has a chamber of commerce, a marine insurance office, a steam-packet office, the oil-gas company's office, and an appropriate reading-room.

Plymouth.

Plymouth abounds with benevolent institutions, both of ancient and modern foundation. The workhouse, which is a corporate establishment, founded by several acts of Parliament, provides for a great number of paupers of both sexes and of all ages. Charles's alms-houses, founded by Charles II., Joy's alms-houses, the Household of Faith, the new alms-houses, the Mendicity Society, the Female Benevolent Society, and some others, are supported either by bequests, or by voluntary contributions, or by annual subscriptions. Most of the places of worship have schools attached to them; and there are a few endowed schools, and one grammar-school, from whose funds exhibitions are given to students at Oxford. Besides the hospital already noticed, there is a large public dispensary, and an infirmary for diseases of the eye. There is a medical society, with a professional library for the members of the healing art, embracing the entire field of medical literature. In 1815 a law library was established, the members of which consist exclusively of barristers and attorneys. The books are open for reference to any subscriber to the general library, to whose collection they have been recently united. The amusements of Plymouth are the stage, music, balls, annual races, and, what is more appropriate to the situation, regatta or marine races, in which the assistance of the Naval Yacht Club is afforded.

Stonehouse, the centre town of the group, received the name from Joel de Stonehouse, the lord of this domain in the reign of Henry III., before which it was called *Hippeston.* It has now descended to the Earl of Mount Edgecumbe, who, by granting leases on liberal terms, has assisted in that great increase of the town which the state of the population at the present time shows. These leases are granted on lives, renewable for ever at a fixed fine, and subject to an annual conventional rent. The town is joined with Plymouth by a thoroughfare street, and it occupies nearly the same level. The southern part is most on the increase, and is almost entirely occupied by genteel families, chiefly those of naval and military officers, and other persons holding situations under the government; but some other parts consist of small ill-built houses, which are occupied for the most part by the dock-yard artizans.

Stonehouse was constituted a township by the Reform Act, and exercises the elective franchise in connection with the borough of Devonport. It is divided into two wards, the east and the west, by the line of Brownlow Street. It is under the jurisdiction of a bench of magistrates. The poor are under the management of a governor, visitors, and guardians, in a workhouse, attached to which is a prison for vagrants and petty offenders, who are detained till they can be removed by the orders of the magistrates. The chief trade by water is in coals and timber; and the vessels discharge their cargoes on quays in the Pool, in which are accommodations for building ships.

The buildings devoted to public worship in connection with the Established Church are two ancient chapels dedicated to St George and St Paul, and two modern edifices, besides a chapel in connection with the Royal Naval Hospital, and which is open to the public. The Roman Catholics, Independents, both kinds of Methodists, the Baptists, Wesleyans, and others, have also places of worship; and most of them have schools for the instruction of those attending their respective public services.

An object that strikes every one in passing from Plymouth into Stonehouse is the establishment of the United Gas Company, at Mill Bay, by which the three towns in a direct line of nearly 4 miles are supplied with light.

The edifices belonging to the government are the most prominent objects in Stonehouse. One of these, the Marine Barracks, is on the western shore of Mill Bay, where there is a convenient landing-place. The buildings form an oblong square, in front of which are the apartments for the privates, whilst those of the officers are on the two sides. On the west side are the entrance-gate and a newly-erected guard-house. These barracks are handsomely and regularly built, have an hospital, and accommodate about 1000 men. The mess apartments are spacious and well furnished; and the officers have a very good library.

The Royal Naval Hospital is situated in the north-east part of Stonehouse. This important institution for the reception of sick and wounded marines and seamen was founded in 1762. It occupies a rising ground, and the area of the whole is about 24 acres, of which 13 are formed into a delightful place of exercise-ground for the convalescent patients. It consists of ten buildings, surrounding an extensive quadrangle, each containing six wards calculated to receive sixteen patients; but in cases of emergency the number can be extended to twenty. Thus as many as 1200 patients can be accommodated at one time. The superior officer is of the rank of post-captain in the navy, and has under him two lieutenants. The other officers are a physician, a surgeon, a steward, a dispenser, four hospital mates, several extra mates, and a chaplain.

The most remarkable object at Stonehouse is one only finished during the last reign, and hence bearing the name of the Royal William Victualling-Yard. It is situated close to the shore, upon which a most extensive marine terrace has been constructed, 50 feet broad, and nearly 1500 feet in length. It is entered from the land side by a magnificent gateway, under an arch surmounted by a statue of William IV., and two lateral ways. The whole of the building is of beautiful granite; and the shafts of the columns forming the internal avenue are each of one stone 36 feet high. After passing the gateway on the left are the neat granite-fronted residences of the two principal resident officers. On the right is the baking establishment, comprising a quadrangular range of buildings 250 by 200 feet, inclosing an architectural chimney-shaft of granite 150 feet in height. Further on is the Melville quadrangle, 240 feet square, with its rusticated granite archway (28 feet high), and the clock-chamber, of the same material, making together an elevation of 95 feet, and forming a magnificent centre-piece 61 feet in width. Opposite to this is the basin, 250 by 200 feet in extent, surrounded by quays of granite, save where an iron swing-bridge vaults over an opening of 45 feet into Stonehouse Pool. Answering the great bake-house, on the opposite of the basin, is the brew-house, similar in dimensions and in external character to the former, and having a corresponding chimney-shaft. Passing onwards in a direct line from the entrance, the irregular quadrangle of the cooperage is on the left, and beyond that the Clarence stores, which run along the quay of that name, 340 feet. There is also a reservoir for fresh water, elevated above most of the buildings, being 50 feet in height, neatly finished with granite and an iron railing, which contains 7000 tons. The Melville quadrangle includes the offices of the establishment, and, with the Clarence stores, are used as depôts for wet and dry provisions, and for slops for the seamen. In the brew-house a steam-engine is used in the operation of grinding malt, in mashing, and pumping. Two similar engines are employed in the bake-house, where there are twenty-five pair of millstones, affording the means of grinding a thousand bushels of meal in ten hours. In the same period flour is converted in the bake-house into ship biscuit, to the extent of 2450 lb. weight. The entire premises of this establishment occupy an extent of about 13 acres, of which one-half has been recovered from the sea, and the remainder excavated from the rock, the stone taken from which has been made use of to build a strong wall to defend the whole against the sea. The cost of this enormous establishment was above L.1,500,000.

Devonport, the third town of the group, is divided from Stonehouse by an arm of the sea, or inlet, over which there is now a bridge. It is in the parish of Stoke Damerel; and the ground on which it stands is for the most part the property of the St Aubyn family, whose steward holds a court-leet and a court-baron annually at Michaelmas, when a jury is sworn in, to prevent nuisances, and to appoint and swear in constables. Having been constituted a borough by the Reform Act, it now returns two members to Parliament; but the right of voting for them is also extended to the householders of Stonehouse. The town is locally governed by a mayor, twelve aldermen, and thirty-six councillors. It has also a bench of justices independent of the magistracy of Plymouth and Stonehouse.

The town of Devonport is supplied with water by a company established by act of Parliament 33 George III., which, by means of pipes, have brought from the Dartmoor Hills a stream of water which winds amongst the hills for thirty-seven miles, when it reaches a reservoir on the higher part of the town, whence it is distributed to the several streets and houses. The streets of the town are clean, and the whole has an appearance of great neatness; and two or three of these streets are of very handsome architecture. Several of the public buildings, though upon a small scale, are distinguished for the classical elegance of their architectural designs. The town-hall is distinguished by a Doric portico, in which the depth of the pronaos, and the elevation of the entrance-door upon a second internal landing, are features exciting great admiration. The columns are 27 feet 6 inches in height, and the lower diameters 5 feet 6 inches. The hall is 75 feet in length, 40 feet in width, and 31 feet in height. On the walls are portraits of Georges I., II., III., also of William IV., and of Queens Charlotte and Caroline. Within the building are cells for prisoners, offices for parochial purposes, and apartments occupied by the mechanics' institute. The library is an elegant erection, executed in 1823. The celebrated Denon, on seeing the design for this *façade*, pronounced it the best attempt to appropriate Egyptian architecture to domestic purposes that had ever come under his notice. The institution is designated the Civil and Military Library. It has a news-room, committee-room, and spacious library, already containing between 6000 and 7000 volumes, constantly augmenting; and besides, it possesses a comprehensive and valuable collection of minerals, presented by Sir John St Aubyn.

When the name of Devonport was given to this town, a column was erected to commemorate the grant, which now forms one of its chief architectural ornaments. This noble monument is of Devonshire granite, fluted, and of Doric proportions; measuring 65 feet 4 inches from the bottom of the shaft to the top of the capital, and making, with its inferior and crowning pedestals, a total altitude of 101 feet. Its height above the street, including the rock on which it stands, is 124 feet. A staircase of 140 steps leads to the gallery, the prospect from which will well repay the labour of ascending to it. Its cost of erection was L.2750.

The church of Stoke Damerel, the mother church of this very populous parish, being small, several chapels of ease have been erected. The principal of these is St Mary's, a neat structure of brick and stone, in the middle-pointed style of architecture, erected in 1851, from a design by St Aubyn: it presents a picturesque appearance; and consists of nave and chancel, with aisles, porch, and tower; above the tower rises a handsome spire to the height of 122 feet. The interior length of the edifice is about 110 feet. Mount Zion chapel, belonging to the Calvinists, exhibits an ingenious adaptation of Mohammedan architecture to Christian purposes. Though it has a strange, it has also a picturesque appearance; and the interior is capacious and commodious. St Aubyn's chapel is distinguished by its stone spire. It was built by subscription, under an act of Parliament, in 1771. St John's chapel was built in the same way, eight years later, at a cost of L.7700. The arrangement of the interior is curiously amphitheatrical. The roof embraces a clear span of 70 feet, the length of the chapel being 90 feet. Besides these episcopal chapels, a large one was built in the dock-yard by government in 1821. It was chiefly intended for the accommodation of the officers, civil, naval, and military, together with the operatives and soldiers belonging to the yard; but it is also open to the public. Besides the established churches, the Calvinist and Arminian Methodists, and the Independents and Baptists, have their places of worship, as well as the smaller sects of the Moravians and the Unitarians.

The government-house, on Mount Wise, near the grand parade, commands a southern view of much beauty. It contains every accommodation for carrying on the military government, and for the family of the governor. The front extends 200 feet. A large brass cannon, at the principal entrance, was taken from the Turks in the engagement of the Dardanelles. The port-admiral's house is near to it, on the north-west side, and comprises all the offices for the transaction of naval business, except that of courts-martial, which are always held on board the flag-ship in Hamoaze. At a short distance from it, on the top of the hill, is the *semaphore*, by which a constant communication is maintained between the office and the flag-ship, and which forms the first of a chain of telegraphs communicating with the Admiralty in London. The parade with its martial pomp and music, and Mount Wise with its charming walks and prospects, form a great source of pleasure to the inhabitants. To these may be added Richmond Walk, at the foot of Mount Wise, which leads to the public baths constructed at the joint expense of the navy and ordnance departments, and to the king's stairs, erected for access to the shore in 1820.

The most important object in Plymouth and its vicinity is the dock-yard. In the eighth volume of this work, under the article Dock-Yards, is a general description of this establishment, to which the reader is referred. To what is there stated we may add, that the whole dock-yard extends over 75 acres of land, of which about one-sixth is the property of the crown, and the remainder of Sir John St Aubyn, under a lease for twenty-one years, renewable every seven years with a fine of L.534, 4s. 6d., and an annual ground-rent of thirty shillings per acre.

The operations carried on within the yard give employment to upwards of 2000 men in time of peace, and the number of individuals depending on it for subsistence exceeds 7000. The chapel of the dock-yard is a fine building, the foundation of which was laid in 1814. The interior is elegantly fitted up. It is 100 feet in length and 75 in breadth, and has a tower with a set of bells. The erection is said to have cost L.24,000. In the year 1834 a police force was established as a civil guard to the dock-yard, consisting of a director, three inspectors, three sergeants, and forty constables.

The gun-wharf is an important part of this naval arsenal, on the north side of the dock-yard. It covers five acres of land. It contains storehouses filled with the various instruments of destruction; vast quantities of muskets, pistols, and cutlasses are deposited in chests or arranged in racks, or on the walls in the form of stars, circles, and crescents. Near these storehouses is the blacksmith's shop, and other buildings used as depositories for gun-carriages and the implements of the field-train. The intervals between the different edifices are occupied by piles of ordnance belonging to the ships in the harbour, with their respective names painted on the cannon. There are also large quantities of shot arrayed in pyramidical heaps, marked with the number contained in each pile. The vast portion of stores seen here, together with the armoury, form a sight worthy of attention.

Visitors, who are not foreigners, are permitted to inspect the whole of the dock-yard premises; they are, however, always accompanied by a constable. Foreigners must obtain an order for admission from the Admiralty.

Plymouth, a seaport of the United States of North America, state of Massachusetts, on Plymouth Bay, 35 miles S.E. of Boston. It is built chiefly of wood, and entirely in modern style, there being not a single antique building to remind the visitor that this is the oldest town of New England. The Pilgrim's Hall is a plain massive granite building, erected in 1824 by the Pilgrim Society, who meet annually here to commemorate the arrival here of the 101 pilgrim fathers, as they are called, in the Mayflower, December 22, 1620. In the hall there are several historical paintings and a cabinet of curiosities; and in front of the building is placed a part of the rock on which the emigrants first set foot. Some of the churches are handsome; and one occupies the site of that originally built by the pilgrims. Plymouth contains county buildings, banks, newspaper offices, cotton factories, &c. The inhabitants are largely engaged in the fisheries. The total tonnage of the port, June 30, 1852, was 3368 registered, and 9365 enrolled and licensed; the latter including 2538 tons employed in the coasting trade, 5169 in cod-fishing, and 1495 in mackerel-fishing. Pop. (1850) 6024.

PLYMPTON, two adjoining towns of England, county of Devon, on the left bank of the Plym, 4 miles N.E. of Plymouth, and 213 W.S.W. of London. Plympton St Mary, which lies to the N.W. of the other, contains no notable building, except the old lichen-tinted church, standing with its demons' heads and other grotesque ornaments in a lawn-like churchyard. Pop. of the parish (1851) 2815. Plympton Earle, or Plympton St Maurice, contains the ruins of a castle famous in the wars of King John and of the Commonwealth, crowning a knoll, near which stand the old granite church and the quaint grammar school with its high roof and piazza. The town contains many old houses, some of them raised on arches; and a venerable guildhall, bearing the date 1671. Plympton Earle was the birthplace of Sir Joshua Reynolds. Pop. (1851) 833.

PLYNTERIA (πλυντήρια, from πλύνειν, *to wash*), a Grecian festival in honour of Athena, who received from the daughter of Cecrops the name of Aglauros. During the solemnity they undressed the statue of the goddess and washed it. The day on which it was observed the people regarded as unfortunate and inauspicious; and therefore no person was permitted to appear in the temples, which were purposely surrounded with ropes. It was customary at this festival to bear in procession a cluster of figs, thus intimating the progress of civilization amongst the primitive inhabitants of the earth.

PNEUMATICS.

Air.

ACCORDING to the present usage of our language, this term is restricted to that part of natural philosophy which treats of mechanical properties of elastic fluids. The word, in its original meaning, expresses a quality of air, or more properly of breath.

Extent of the science.

We have extended the term PNEUMATICS to the study of the mechanical properties of all elastic or sensibly compressible fluids,—that is, of fluids whose elasticity and compressibility become an interesting object of our attention; as the term HYDROSTATICS is applied to the study of the mechanical properties of such bodies as interest us by their fluidity or liquidity only, or whose elasticity and compressibility are not familiar or interesting, though not less real or general than in the case of air and all vapours.

No precise limit to the different classes of bodies.

There is no precise limit to the different classes of natural bodies with respect to their mechanical properties. There is no such thing as a body perfectly hard, perfectly soft, perfectly elastic, or perfectly incompressible. All bodies have some degree of elasticity intermixed with some degree of ductility. Water, mercury, oil, are compressible; but their compressibility need not be attended to in order perfectly to understand the phenomena consequent on their materiality, fluidity, and gravity. But if we neglect the compressibility of air, we remain ignorant of the cause and nature of its most interesting phenomena, and are but imperfectly informed with respect to those in which its elasticity has no share; and it is convenient to attend to this distinction in our researches, in order to understand those phenomena which depend solely or chiefly on compressibility and elasticity. This observation is important; for here elasticity appears in its most simple form, unaccompanied with any other mechanical affection of matter (if we except gravity), and lies most open to our observation, whether employed for investigating the nature of this very property of bodies, or for explaining its mode of action. We shall even find that the constitution of an avowedly elastic fluid, whose compressibility is so very sensible, will give us the distinctest notions of fluidity in general, and enable us to understand its *characteristic appearances*, by which it is distinguished from solidity,—namely, the *equable* distribution of pressure through all its parts in every direction, and the horizontality which its surface assumes by the action of gravity; phenomena which have been assumed as equivalent to the definition of a perfect fluid, and from which all the laws of hydrostatics and hydraulics have been derived. And these laws have been applied to the explanation of the phenomena around us; and water, mercury, oil, &c., have been denominated fluid only because their appearances have been found to tally exactly with these consequences of this definition, while the definition itself remains in the form of an assumption, unsupported by any other proof of its obtaining in nature.

Air the most familiar compressible fluid.

Of all the sensible compressible fluids, air is the most familiar, was the first studied, and has been the most minutely examined. It has therefore been generally taken as the example of their mechanical properties, whilst those mechanical properties which are peculiar to any of them, and therefore characteristic, have usually been treated as an appendix to the general science of pneumatics.

Different properties of air.

But although the mechanical properties are the proper subjects of our consideration, it will be impossible to avoid considering occasionally properties which are more of a chemical nature; because they occasion such modifications of the mechanical properties as would frequently be unintelligible without considering them in conjunction with the other; and, on the other hand, the mechanical properties produce such modifications of the properties merely chemical, and of very interesting phenomena consequent on them, that these would often pass unexplained unless we give an account of them in this place.

Air.

Mechanical properties.

By mechanical properties we mean such as produce, or are connected with, sensible changes of motion, and which indicate the presence and agency of moving or mechanical powers. They are therefore the subject of mathematical discussion; admitting of measure, number, and direction. We shall therefore begin with the consideration of air.

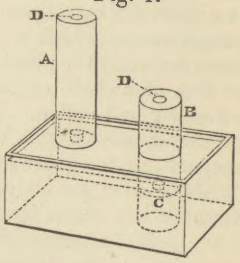
What is air?

It is by no means an idle question to put, What is this air of which so much is said and written? We see nothing, we feel nothing of it. We find ourselves at liberty to move about in any direction without any obstacle or hinderance. Whence, then, the assertion, that we are surrounded with a matter called air? A few very simple observations and experiments will show us that this assertion is well founded.

Proofs that it is matter

We are accustomed to say, that a vessel is empty when we have poured out of it the water which it contained. Take a cylindrical glass jar, having a small hole in its bottom; and having stopped this hole, fill the jar with water, and then pour out the water, leaving the glass empty, in the common acceptation of the word. Now, throw a bit of cork, or any light body, on the surface of water in a cistern; cover this with the glass jar A held in the hand with its bottom upwards, and move it downwards, as at B, keeping it all the while in an upright position. The cork will continue to float on the surface of the water in the inside of the glass, and will most distinctly show whereabouts that surface is. It will thus be seen, that the water within the glass has its surface considerably lower at C than that of the surrounding water; and however deep we immerge the glass, we shall find that the water will never rise in the inside of it so as to fill it. If plunged to the depth of 32 feet, the water will only half fill it; and yet the acknowledged laws of hydrostatics tell us, that the water would fill the glass if there were nothing to hinder it. There is therefore something already within the glass which prevents the water from getting into it; manifesting in this manner the most distinctive property of matter, viz. the hindering other matter from occupying the same place at the same time.

Fig. 1.



Possessed of impulsive force

While things are in this condition, pull the stopper D out of the hole in the bottom of the jar, and the water will instantly rise in the inside of the jar, and stand at an equal height within and without. This is justly ascribed to the escape through the hole of the matter which formerly obstructed the entry of the water; for if the hand be held before the hole, a puff will be distinctly felt, or a feather held there will be blown aside; indicating in this manner that what prevented the entry of the water, and now escapes, possesses another characteristic property of matter, *impulsive force*. The materiality is concluded from this appearance, in the same manner that the materiality of water is concluded from the impulse of a jet from a pipe. We also see the mobility of the formerly pent up, and now liberated substance, in consequence of external pressure, viz. the pressure of the surrounding water.

Impenetrability,

Also, if we take a smooth cylindrical tube, shut at one end, and fit a plug or cork to its open end, so as to slide along it, but so tightly as to prevent all passage by its sides; and if the plug be well soaked in grease, we shall find that no force whatever can push it to the bottom of the tube. There is therefore something within the tube preventing by its impenetrability the entry of the plug, and therefore possessing this characteristic of matter.

Elasticity,

In like manner, if, after having opened a pair of common bellows, we shut up the nozzle and valve hole, and try to bring the boards together, we find it impossible. There is something included which prevents this, in the same manner as if the bellows were filled with wool; but on opening the nozzle we can easily shut them, viz. by expelling this something; and if the compression be forcible, the something will issue with considerable force, and very sensibly impel any thing in its way.

Inertia, and mobility.

It is not accurate to say, that we move about without *any* obstruction: for we find, that if we endeavour to move a large fan with rapidity, a very sensible hinderance is perceived, and a sensible wind is produced, which will agitate the neighbouring bodies. It is therefore justly concluded that the motion is possible only in consequence of having driven this obstructing substance out of the way; and that this impenetrable, resisting, moveable, impelling substance, is matter. We perceive the perseverance of this matter in its state of rest when we wave a fan, in the same manner that we perceive the inertia of water when we move a paddle through it. The effects of wind in impelling our ships and mills, in tearing up trees, and overturning buildings, are equal indications of its perseverance in a state of motion. To this matter, when at rest, we give the name air; and when it is in motion we call it wind.

Air a material fluid.

Air, therefore, is a material fluid; a fluid, because its parts are easily moved, and yield to the smallest inequality of pressure. Air possesses some others of the very general, though not essential, properties of matter. It is heavy. This appears from the following facts.

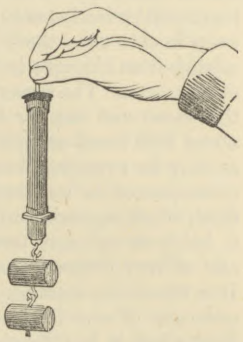
1. It always accompanies this globe in its orbit round the sun, surrounding it to a certain distance, under the name of atmosphere, which indicates the being connected with the earth by its general force of gravity. It is chiefly in consequence of this that it is continually moving round the earth from east to west; forming what is called the trade-wind, to be more particularly considered afterwards. All that is to be observed on this subject at present is, that, in consequence of the disturbing force of the sun and moon, there is an accumulation of the air of the atmosphere, in the same manner as of the waters of the ocean, in those parts of the globe which have the moon near their zenith or nadir: and as this happens successively, going from the east to the west, by the rotation of the earth round its axis in the opposite direction, the accumulated air must gradually flow along to form the elevation. This is chiefly to be observed in the torrid zone; and the generality and regularity of this motion are greatly disturbed by the changes which are continually taking place in different parts of the atmosphere from causes which are not mechanical.

2. It is in like manner owing to the gravity of the air that it supports the clouds and vapours which we see constantly floating in it. We have even seen bodies of no inconsiderable weight float, and even rise, in the air. Soap bubbles, and balloons filled with inflammable gas, (hydrogen or gas obtained from oil or coal,) rise and float in the same manner as a cork rises in water. This phenomenon proves the weight of the air, in the same manner that the swimming of a piece of wood indicates the weight of the water which supports it.

Familiar proofs of its weight.

3. But we are not left to these refined observations for the proof of the air's gravity. We observe many familiar phenomena, which must be immediate consequences of the supposition that air is a heavy fluid, and, like other heavy fluids, presses on the outsides of all bodies immersed in or surrounded by it. Thus, for instance, if we shut the nozzle and valve hole of a pair of bellows after having squeezed the air out of them, we shall find that even some hundred pounds, are necessary for separating the boards. They are kept together by the pressure of the heavy air which surrounds them in the same manner as if they were immersed in water. In like manner, if we stop the end of a syringe after its piston has been pressed down to the bottom, and then attempt to draw up the piston, we shall find a considerable force necessary, viz. about fifteen or sixteen pounds for every square inch of the section of the syringe. Exerting this force, we can draw up the piston to the top, and we can hold it there; but the moment we cease acting, the piston rushes down and strikes the bottom. It is called a suction, as we feel something as it were drawing in the piston; but it is really the weight of the incumbent air pressing it in. And this obtains in every position of the syringe; because the air is a fluid, and presses in every direction. Nay, it presses on the syringe as well as on the piston; and if the piston be hung by its ring on a nail, the syringe requires force to draw it down, just as much as to draw the piston up; and if it be let go, it will spring up unless loaded with at least fifteen pounds for every square inch of its transverse section. See fig. 2.

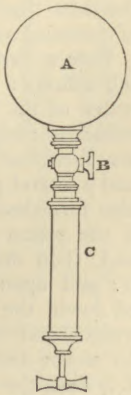
Fig. 2.



It may even be weighed.

4. But the most direct proof of the weight of the air is had by weighing a vessel empty of air, and then weighing it again when the air has been admitted; and this, as it is the most obvious consequence of its weight, has been asserted as long ago as the days of Aristotle. If we take a very large and limber bladder, and squeeze out the air very carefully, and weigh it, and then fill it till the wrinkles just begin to disappear, and weigh it again, we shall find no difference in the weight. But this is not Aristotle's meaning: because the bladder, considered as a vessel, is equally full in both cases, its dimensions being changed. We cannot take the air out of a bladder without its immediately collapsing. But what would be true of a bladder would be equally true of any vessel. Therefore, take a round vessel A, (fig. 3,) fitted with a stopcock B, and syringe C. Fill the whole with water, and press the piston to the bottom of the syringe. Then keeping the cock open, and holding the vessel upright, with the syringe undermost, draw down the piston. The water will follow it by its weight, and leave part of the vessel empty. Now shut the cock, and again push up the piston to the bottom of the syringe, the water escapes through the piston valve, as will be explained afterwards; then opening the cock, and again drawing down the piston, more water will come out of the vessel. Repeat this operation till all the water have come out. Shut the cock, unscrew the syringe, and weigh the vessel very accurately. Now open the cock, and admit the air, and weigh the vessel again, it will be found heavier than before, and this additional weight is the weight of the air which fills it; and it will be found to be 523 grains, about an ounce and a fifth avoirdupois, for every cubic foot that the vessel contains. Now since a cubic foot of water would weigh 1000 ounces, this experiment would show that water is about 840 times heavier than

Fig. 3.



air. The most accurate judgment of this kind of which we have met with an account, is that recorded by Sir George Shuckburgh, in the sixty-seventh volume of the Philosophical Transactions, (p. 560.) From this it follows, that when the air is of the temperature 53, and the barometer stands at 29¼ inches, the air is 836 times lighter than water. But the experiment is not susceptible of sufficient accuracy for determining the exact weight of a cubic foot of air. Its weight is very small; and the vessel must be strong and heavy, so as to overload any balance that is sufficiently nice for the experiment.[1]

The most convenient method of doing this.

To avoid this inconvenience, the whole may be weighed in water, first loading the vessel so as to make it preponderate an ounce or two in the water. By this means the balance will be loaded only with this small preponderancy. But even in this case there are considerable sources of error, arising from changes in the specific gravity of the water and other causes. The experiment has often been repeated with this view, and the air has been found at a medium to be about 840 times as light as water, but with great variations, as may be expected from its very heterogeneous nature, in consequence of its being the menstruum of almost every fluid, of all vapours, and even of most solid bodies; all which it holds in solution, forming a fluid perfectly transparent, and of very different density according to its composition. It is found, for instance, that perfectly pure air of the temperature of our ordinary summer is considerably denser than when it has dissolved about half as much water as it can hold in that temperature; and that with this quantity of water the difference of density increases in proportion as the mass grows warmer, for damp air is more expansible by heat than dry air. We have had occasion to consider this subject when treating of the connection of the mechanical properties of air with the state of the weather.

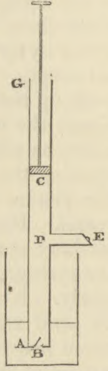
This property of air denied by the Peripatetics.

Such is the result of the experiment suggested by Aristotle, evidently proving the weight of the air; and yet the Peripatetics uniformly refused it this property. It was a matter long debated among the philosophers of the last century. The reason was, that Aristotle assigns a different cause to many phenomena which any man led by common observation would ascribe to the weight of the air. Of this kind is the rise of water in pumps and syphons. Aristotle had asserted that all nature was full of being, and that nature abhorred a void. He adduces many facts, in which it appears, that if not absolutely impossible, it is very difficult, and requires great force, to produce a space void of matter. When the operation of pumps and syphons came to be known, the philosophers of Europe, found in this fancied horror a ready solution of the phenomena. We shall state the facts that every reader may see what kind of reasoning was received not two centuries ago.

Construction of pumps in the last century.

Pumps were then constructed in the following manner: A long pipe GB was set in the water of the well A. This was fitted with a sucker or piston C, having a long rod CF, and was furnished with a valve B at the bottom, and a lateral pipe DE at the place of delivery, also furnished with a valve. The fact is, that if the piston be thrust down to the bottom, and then drawn up, the water will follow it; and upon the piston being again pushed down, the water shuts the valve B by its weight, and escapes or is expelled at the valve E; and on drawing up the piston again the valve E is shut, the water again rises after the piston, and is again expelled at its next descent.

Fig. 4.



The Peripatetics explain all this by saying, that if the water did not follow the piston there would be a void between them. But nature abhors a void; therefore the water follows the piston; this reasoning is overturned by one observation. Suppose the pipe shut at the bottom, the piston can be drawn up, and thus a void produced.

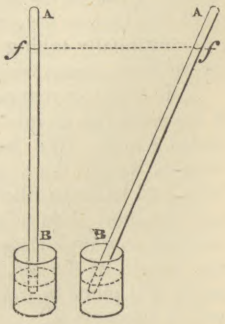
Galileo first predicted the height to which water would rise.

Galileo seems to have been the first who seriously ascribed this to the weight of the air. Many had supposed air heavy; and thus explained the difficulty of raising the board of bellows, or the piston of a syringe, &c. But he distinctly applies to this allowed weight of the air all the consequences of hydrostatical laws; and he reasons as follows. The heavy air rests on the water in the cistern, and presses it with its weight. It does the same with the water in the pipe, and therefore both are on a level: but if the piston, after being in contact with the surface of the water, be drawn up, there is no longer any pressure on the surface of the water within the pipe; for the air now rests on the piston only, and thus occasions a difficulty in drawing it up. The water in the pipe, therefore, is in the same situation as if more water were poured into the cistern, that is, as much as would exert the same pressure on its surface as the air does. In this case we are certain that the water will be pressed into the pipe, and will raise up the water in it, and follow it till it is equally high within and without. The same pressure of the air shuts the valve E during the descent of the piston. He did not wait for the very obvious objection, that if the rise of the water was the effect of the air's pressure, it would also be its measure, and would be raised and supported only to a certain height. He directly said so, and adduced this as a decisive experiment. If the horror of a void be the cause, says he, the water must rise to any extent however great; but if it be owing to the pressure of the air, it will only rise till the weight of the water in the pipe is in equilibrio with the pressure of the air, according to the common laws of hydrostatics. And he adds, that this is well known; for it is a fact, that pumps will not *draw* water much above forty palms, although they may be made to *propel* it, or to *lift it* to any height. He then makes an assertion, which, he says, if true, will be decisive. Let a very long pipe, shut at one end, be filled with water, and let it be erected perpendicularly with the close end uppermost, and a stopper in the other end, and then its lower orifice immersed into a vessel of water; the water will subside in the pipe upon removing the stopper, till the remaining column is in equilibrio with the pressure of the external air. This experiment he proposes to the curious; saying, however, that he thought it unnecessary, there being already such abundant proofs of the air's pressure.

His prediction verified.

It is probable that the cumbersomeness of the necessary apparatus protracted the making of this experiment. Another equally conclusive, and much easier, was made in 1642 after Galileo's death, by his zealous and learned disciple Toricelli. He filled a glass tube, close at one end, with mercury; judging, that if the support of the water was owing to the pressure of the air, and was the measure of this pressure, mercury would in like manner be supported by it, and this at a height which was also the measure of the air's pressure, and therefore thirteen times less than water. He had the pleasure of seeing his expectation verified in the completest manner; the mercury descending in the tube AB, and finally settling at the height

Fig. 5.



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[1] This method as here stated requires a strong vessel, and consequently overloads a delicate balance; but the objection does not apply when water is not used, and the flask weighed, first when full of air, and again when the air has been exhausted by the air-pump to a known amount; in this way the specific gravity of any gas may be determined.

*f*B of $29\frac{3}{4}$ Roman inches: and he found, that when the tube was inclined, the point *f* was in the same horizontal plane with *f* in the upright tube, according to the received laws of hydrostatical pressure. The experiment was often repeated, and soon became famous. About three years afterwards the same experiment was published, at Warsaw in Poland, by Valerianus Magnus, as his own discovery: but it appears from the letters of Roberval, not only that Toricelli was prior, and that his experiment was the general topic of discussion among the curious; but also highly probable that Valerianus Magnus was informed of it when at Rome, and daily conversant with those who had seen it. He denies, however, even having heard of the name of Toricelli.

Origin of the Royal Society.

This was the era of philosophical ardour; and we think that it was Galileo's invention and immediate application of the telescope which gave it vigour. Discoveries of the most wonderful kind in the heavens, and which required no extent of previous knowledge to understand them, were thus put into the hands of every person who could purchase a spy-glass; whilst the high degree of credibility which some of the discoveries, such as the phases of Venus and the rotation and satellites of Jupiter, gave to the Copernican system, immediately set the whole body of the learned in motion. About the years 1642 and 1644 we find clubs of gentlemen associated in Oxford and London for the cultivation of knowledge by experiment; and before 1655 all the doctrines of hydrostatics and pneumatics were familiar there, and established by experiment. Mr. Boyle procured a coalition of these clubs under the name of the Invisible and Philosophical Society. In May 1658 Mr. Hooke finished for Mr. Boyle an air-pump, which had employed him a long time, and occasioned him several journeys to London for things which the workmen of Oxford could not execute. He speaks of this as a great improvement on Mr. Boyle's own pump, which he had been using some time before. Boyle therefore must have invented his air-pump, and was not indebted for it to Schottus's account of Otto Guerické's, published in the *Mechanica Hydraulo-pneumatica* of Schottus in 1657, as he asserts *Technica Curiosa.* The Royal Society of London arose in 1656 from the coalition of these clubs, after fifteen years' co-operation and correspondence. The Montmorine Society at Paris had subsisted nearly about the same time; for we find Pascal in 1648 speaking of the meetings in the Sorbonne College, from which we know that society originated. Nuremberg, in Germany, was also a distinguished seminary of experimental philosophy. The magistrates, sensible of its valuable influence in many manufactures, the source of the opulence and prosperity of their city, and many of them philosophers, gave philosophy a professed and munificent patronage, furnishing the philosophers with a copious apparatus, a place of assembly, and a fund for the expence of their experiments; so that this was the first academy of sciences out of Italy under the patronage of government. In Italy, indeed, there had long existed institutions of this kind. Rome was the centre of church-government, and the resort of all expectants for preferment. The clergy was the majority of the learned in all Christian nations, and particularly of the systematic philosophers. Each, eager to recommend himself to notice, brought forward every thing that was curious; and they were the willing vehicles of philosophical communication. Thus the experiments of Galileo and Toricelli were rapidly diffused by persons of rank, the dignitaries of the church, or by the monks their obsequious servants.

Toricellian experiment, repeated in various forms.

All now agree in giving Toricelli the honour of the first invention; and it universally passes by the name of the Toricellian Experiment. The tube is called the Toricellian tube; and the space left by the mercury is called the Toricellian Vacuum, to distinguish it from the Boylean Vacuum, which is only an extreme rarefaction. The experiment was repeated in various forms, and with apparatus which enabled philosophers to examine several effects which the vacuum produced on bodies exposed to it. This was done by making the upper part of the tube terminate in a vessel of some capacity, or communicate with such a vessel, in which were included along with the mercury bodies on which the experiments were to be made. When the mercury had run out, the phenomena of these bodies were carefully observed.

An objection to the conclusion drawn from it obviated.

An objection was made to the conclusion drawn from Toricelli's experiment, which appears formidable. If the Toricellian tube be suspended on the arm of a balance, it is found that the counterpoise must be equal to the weight both of the tube and of the mercury it contains. This could not be, say the objectors, if the mercury were supported by the air. It is evidently supported by the balance; and this gave rise to another notion of the cause different from the Peripatetic *fuga vacui.* A suspensive force, or rather attraction, was assigned to the upper part of the tube.

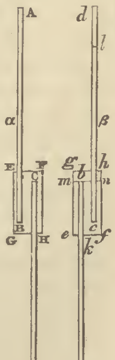
But the true explanation of the phenomena is most easy and satisfactory. Suppose the mercury in the cistern and tube to freeze, but without adhering to the tube, so that the tube could be freely drawn up and down. In this case the mercury is supported by the base, without any dependence on the pressure of the air; and the tube is in the same condition as before, and the solid mercury performs the office of a piston to this kind of syringe. Suppose the tube thrust down till the top of it touches the top of the mercury. It is evident that it must be drawn up in opposition to the pressure of the external air, and it is precisely similar to the syringe in fig. 2. The weight sustained therefore by this arm of the balance is the weight of the tube and the downward pressure of the atmosphere on its top.

Galileo's original experiment performed.

The curiosity of philosophers being thus excited by this very manageable experiment, it was natural now to try the original experiment proposed by Galileo. Accordingly Berti in Italy, Pascal in France, and many others in different places, made the experiment with a tube filled with water, wine, oil, &c., and all with the success which might be expected in so simple a matter: and hence the doctrine of the weight and pressure of the air was established beyond contradiction or doubt. All this was done before the year 1648. A very beautiful experiment was exhibited by Auzout, which completely satisfied all who had any remaining doubts.

A decisive experiment by Auzout.

Fig. 6.



A small box or vial EFGH, had two glass tubes, AB, CD, three feet long, inserted into it in such a manner as to be firmly fixed in one end, and to reach nearly to the other end. AB was open at both ends, and CD was close at D. This apparatus was completely filled with mercury, by unscrewing the tube AB, filling the box and the tube CD; then screwing in the tube AB, and filling it; then holding a finger on the orifice A, the whole was inverted and set upright in the position represented in the figure β, immersing the orifice A (now *a* of fig. β,) in a small vessel of quicksilver. The result was, that the mercury ran out at the orifice *a*, till its surface *m n* within the phial descended to the top of the tube *b a*. The mercury also began to descend in the tube *d c* (formerly DC,) and run over into the tube *b a*, and run out at *a*, till the mercury in *d c* was very near equal in a level with *m n*. The mercury descending in *b a* till it stood at *k*, $29\frac{1}{2}$ inches above the surface *o p* of the mercury in the cistern, just as in the Toricellian tube.

The rationale of this experiment is very easy. The whole apparatus may first be considered as a Toricellian tube of an uncommon shape, and the mercury would flow out at *a*. But as soon as a drop of mercury comes out, leaving a space above *m n*, there is nothing to keep up the mercury in the tube $d\,c$. Its mercury, therefore, descends also; and running over into $b\,a$, continues to supply its expence till the tube $d\,c$ is almost empty, or can no longer supply the waste of $b\,a$. The inner surface therefore falls as low as it can, till it is level with b. No more mercury can enter $b\,a$, yet its column is too heavy to be supported by the pressure of the air on the cistern below; it therefore descends in $b\,a$, and finally settles at the height $k\,o$, equal to that of the mercury in the Toricellian tube.

The prettiest circumstance of the experiment remains. Make a small hole g in the upper cap of the box. The external air immediately rushes in by its weight, and now presses on the mercury in the box. This immediately raises the mercury in the tube $d\,c$ to l, $29\frac{1}{2}$ inches above $m\,n$. It presses on the mercury at k in the tube $b\,a$, balancing the pressure of the air in the cistern. The mercury in this tube therefore is left to the influence of its own weight, and it descends to the bottom. Nothing can be more apposite or decisive.

The gravity of the air a statical principle.

And thus the doctrine of the gravity and pressure of the air is established by the most unexceptionable evidence; and we are entitled to assume it as a statical principle, and to affirm *a priori* all its legitimate consequences.

And in the first place, we obtain an exact measure of the pressure of the atmosphere. It is precisely equal to the weight of the column of mercury, of water, of oil, &c. which it can support; and the Toricellian tube, or others fitted up upon the same principle, are justly termed *baroscopes* and *barometers* with respect to the air. Now it is observed that water is supported at the height of 32 feet nearly: the weight of the column is exactly 2000 avoirdupois pounds on every square foot of base, or $13\frac{9}{10}$ on every square inch. The same conclusion very nearly may be drawn from the column of mercury, which is nearly $29\frac{1}{2}$ inches high when in equilibrium with the pressure of the air. We may here observe, that the measure taken from the height of a column of water, wine, spirits, and the other fluids of considerable volatility, as chemists term it, is not so exact as that taken from mercury, oil, and the like. For it is observed, that the volatile fluids are converted by the ordinary heat of our climates into vapour when the confining pressure of the air is removed; and this vapour, by its elasticity, exerts a small pressure on the surface of the water, &c. in the pipe, and thus counteracts a small part of the external pressure; and therefore the column supported by the remaining pressure must be lighter, that is, shorter. Thus it is found, that rectified spirits will not stand much higher than is competent to a weight of 13 pounds on an inch, the elasticity of its vapour balancing about $\frac{1}{13}$ of the pressure of the air. We shall afterwards have occasion to consider this matter more particularly.

A difficulty solved.

As the medium height of the mercury in the barometer is $29\frac{1}{2}$ inches, we see that the whole globe sustains a pressure equal to the whole weight of a body of mercury of this height; and that all bodies on its surface sustain a part of this in proportion to their surfaces. An ordinary sized man sustains a pressure of several thousand pounds. How comes it then that we are not sensible of a pressure which one should think enough to crush us together? This has been considered as a strong objection to the pressure of the air; for when a man is plunged a few feet under water, he is very sensible of the pressure. The answer is by no means so easy as is commonly imagined. We feel very distinctly the effects of removing this pressure from any part of the body. If any one will apply the open end of a syringe to his hand, and then draw up the piston, he will find his hand sucked into the syringe with great force, and it will give pain; and the soft part of the hand will swell into it, being pressed in by the neighbouring parts, which are subject to the action of the external air. If one lays his hand on the top of a long perpendicular pipe, such as a pump filled to the brim with water, which is at first prevented from running out by the valve below; and if the valve be then opened, so that the water descends, he will then find his hand so hard pressed to the top of the pipe, that he cannot draw it away. But why do we only feel the *inequality* of pressure? There is a similar instance wherein we do not feel it, although we cannot doubt of its existence. When a man goes slowly to a great depth under water in a diving-bell, we know unquestionably that he is exposed to a new and very great pressure, yet he does not feel it. But those facts are not sufficiently familiar for general argument. The human body is a bundle of solids, hard or soft, filled or mixed with fluids, and there are few or no parts of it which are empty. All communicate either by vessels or pores; and the whole surface is a sieve through which the insensible perspiration is performed. The whole extended surface of the lungs is open to the pressure of the atmosphere; every thing is therefore in equilibrio; and if free or speedy access be given to every part, the body will not be damaged by the pressure, however great, any more than a wet sponge would be deranged by plunging it any depth in water. The pressure is instantaneously diffused by means of the incompressible fluids with which the parts are filled; and if any parts are filled with air or other compressible fluids, these are compressed till their elasticity again balances the pressure. Besides, all our fluids are acquired slowly, and gradually mixed with that proportion of air which they can dissolve or contain. The whole animal has grown up in this manner from the first vital atom of the embryo. For such reasons the pressure can occasion no change of shape by squeezing together the flexible parts; nor any obstruction by compressing the vessels or pores. We cannot say what would be felt by a man, were it possible that he could have been produced and grown up *in vacuo*, and then subjected to the compression. We even know that any sudden and considerable change of general pressure is very severely felt. Persons in a diving-bell have been almost killed by letting them down or drawing them up too suddenly. In drawing up, the elastic matters within have suddenly swelled, and not finding an immediate escape, have burst the vessels. Dr. Halley experienced this, the blood gushing out from his ears by the expansion of air contained in the internal cavities of this organ, from which there are but very slender passages.

The weather-glass.

A very important observation recurs here. The pressure of the atmosphere is variable. This was observed almost as soon as philosophers began to attend to the barometer. Pascal observed it in France, and Descartes observed it in Sweden in 1650. Mr. Boyle and others observed it in England in 1656. And before this, observers, who took notice of the concomitancy of these changes of aerial pressure with the state of the atmosphere, remarked, that it was generally greatest in winter and in the night; and certainly most variable during winter and in the northern regions. Familiar now with the weight of the air, and considering it as the vehicle of the clouds and vapours, they noted with care the connection between the weather and the pressure of the air, and found that a great pressure of the air was generally accompanied with fair weather, and a diminution of it with rain and mists. Hence the barometer came to be considered as an index not only of the present state of the air's weight, but also as indicating by its variations changes of weather.

The pressure of the air in proportion to the elevation.

In the next place, we may conclude that the pressure of the air will be different in different places, according to their elevation above the surface of the ocean; for if air be a heavy fluid, it must press in some proportion according to its perpendicular height. If it be a homogeneous fluid of equal density and weight in all its parts, the mercury in the cistern of a barometer must be pressed precisely in proportion to the depth to which that cistern is immersed in it; and as this pressure is exactly measured by the height of the mercury in the tube, the height of the mercury in the Toricellian tube must be exactly proportional to the depth of the place of observation under the surface of the atmosphere.

This proved by experiments.

The celebrated Descartes first entertained this thought, (Epist. 67. of Pr. III.) and soon after him Pascal. His occupation in Paris not permitting him to try the justness of his conjecture, he requested Mr. Perrier, a gentleman of Clermont in Auvergne, to make the experiment, by observing the height of the mercury at one and the same time at Clermont and on the top of a very high mountain in the neighbourhood. His letters to Mr. Perrier in 1647 are still extant. Accordingly, Mr. Perrier, in September 1648, filled two equal tubes with mercury, and observed the heights of both to be the same, viz. 26$\frac{7}{24}$ inches, in the garden of the convent of the Friars Minims, situated in the lowest part of Clermont. Leaving one of them there, and one of the fathers to observe it, he took the other to the top of Puy de Dome, which was elevated nearly 500 French fathoms above the garden. He found its height to be 23$\frac{2}{24}$ inches. On his return to the town, in a place called *Font de l'Arbre*, 150 fathoms above the garden, he found it 25 inches; when he returned to the garden it was again 26$\frac{7}{24}$, and the person set to watch the tube which had been left, said that it had not varied the whole day. Thus a difference of elevation of 3000 French feet had occasioned a depression of 3$\frac{1}{8}$ inches; from which it may be concluded, that 3$\frac{1}{8}$ inches of mercury weighs as much as 3000 feet of air, and one-tenth of an inch of mercury as much as 96 feet of air. The next day he found, that taking the tube to the top of a steeple 120 feet high, made a fall of one-sixth of an inch. This gives 72 feet of air for one-tenth of an inch of mercury; but ill agreeing with the former experiment. But it is to be observed, that a very small error of observation of the barometer would correspond to a great difference of elevation, and also that the height of the mountain had not been measured with any precision. This has been since done (Mem. Acad. par. 1703,) and found to be 529 French toises.

Pascal published an account of this great experiment,[1] and it was quickly repeated in many places of the world. In 1653, it was repeated in England by Dr. Power (Power's Exper. Phil.) and in Scotland in 1661, by Mr. Sinclair, professor of philosophy in the university of Glasgow, who observed the barometer at Lanark, on the top of mount Tinto in Clydesdale, and on the top of Arthur's seat at Edinburgh. He found a depression of two inches between Glasgow and the top of Tinto, three quarters of an inch between the bottom and top of Arthur's seat, and $\frac{5}{32}$ of an inch at the cathedral of Glasgow on a height of 126 feet.[2]

Hence a method of measuring heights.

Hence we may derive a method of measuring the heights of mountains. Having ascertained with great precision the elevation corresponding to a fall of one-tenth of an inch of mercury, which is nearly 90 feet, we have only to observe the length of the mercurial column at the top and bottom of the mountain, and to allow 90 feet for every tenth of an inch. Accordingly this method has been practised with great success; but it requires an attention to many things not yet considered; such as the change of density of the mercury by heat and cold; the changes of density of air from its compressibility; a change immediately connected with or dependent on the very elevation we wish to measure.

Also a measure of the density of the air.

These observations give us the most accurate measure of the density of air and its specific gravity. This is but vaguely though directly measured by weighing air in a bladder or vessel. The weight of a manageable quantity is so small, that a balance sufficiently ticklish to indicate even very sensible fractions of it is overloaded by the weight of the vessel which contains it, and ceases to be exact; and when we take Bernouilli's ingenious method of suspending it in water, we expose ourselves to great risk of error by the variation of the water's density. Also it must necessarily be humid air which we can examine in this way: but the proportion of an elevation in the atmosphere to the depression of the column of mercury or other fluid, by which we measure its pressure, gives us at once the proportion of this weight or their specific gravity. Thus since it is found that in such a state of pressure the barometer stands at 30 inches, and the thermometer at 32°, 87 feet of rise produces one-tenth of an inch of fall in the barometer, the air and the mercury being both of the freezing temperature, we must conclude that mercury is 10,440 times heavier or denser than air. Then, by comparing mercury and water, we get $\frac{1}{800}$ nearly for the density of air relative to water; but this varies so much by heat and moisture, that it is useless to retain any thing more than a general notion of it; nor is it easy to determine whether this method or that by actual weighing be preferable. It is extremely difficult to observe the height of the mercury in the barometer nearer than $\frac{1}{200}$ of an inch; and this will produce a difference of even five feet, or $\frac{1}{20}$ of the whole. Perhaps this is a greater proportion than the error in weighing.[3]

Height of the atmosphere.

From the same experiments we also derive some knowledge of the height of the aerial covering which surrounds our globe. When we raise our barometer 87 feet above the surface of the sea, the mercury falls about one-tenth of an inch in the barometer; therefore if the barometer shows 30 inches at the sea-shore, we may expect that, by raising it 300 times 87 feet or five miles, the mercury in the tube will descend to the level of the cistern, and that this is the height of our atmosphere. But other appearances lead us to suppose a much greater height. Meteors are seen with us much higher than this, and which yet give undoubted indication of being supported by our air. There can be little doubt, too, that the visibility of the expanse above us is owing to the reflection of the sun's light by our air. Were the heavenly spaces perfectly transparent, we should no more see them than the purest water through which we see other objects; and we see them as we see water tinged with milk or other fæculæ. Now it is easy to show, that the light which gives us what is called twilight must be reflected from the height of at least 50 miles; for we have it when the sun is depressed 18 degrees below our horizon.

Why this knowledge is not accurate.

A little attention to the constitution of our air will convince us, that the atmosphere must extend to a much greater height than 300 times 87 feet. We see from the most familiar facts that it is compressible; we can squeeze it in an ox-bladder. It is also heavy; pressing on the air in this bladder with a very great force, not less than 1500 pounds. We must therefore consider it as in a state of compression, existing in smaller room than it would assume if it were not compressed by the incumbent air. It must therefore be in a condition something resembling that of a quantity of fine carded wool thrown loosely into a deep pit; the lower strata carrying the weight of the upper strata, and being compressed by them; and so much the more compressed as they are further down, and only the upper stratum in its unconstrained and most expanded state. If we shall suppose this wool thrown in by a hundred weight at a time, it will be divided into strata of equal weights, but of unequal thickness; the lowest being the thinnest, and the superior strata gradually increasing in thickness. Now, suppose the pit filled with air, and reaching to the top of the atmosphere, the weights of all the strata above any horizontal plane in it is measured by the height of the mercury in the Toricellian tube placed in that plane; and one-tenth of an inch of mercury is just equal to the weight of the lowest stratum 87 feet thick; for on raising the tube 87 feet from the sea, the surface of the mercury will descend one-tenth of an inch. Raise the tube till the mercury fall another tenth. This stratum must be more than 87 feet thick: how much more we cannot tell, being ignorant of the law of the air's expansion. In order to make it fall a third tenth, we must raise it through a stratum still thicker; and so on continually.

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[1] *Grande Expérience sur la Pésanteur de l'Air.*

[2] See Sinclair's *Ars Nova et Magna Gravitatis et Levitatis*; Sturmii *Collegium Experimentale, and* Schott. *Technica Curiosa.*

[3] Barometers are now made by which accurate observations may be made to the $\frac{1}{1000}$th part of an inch.

All this is abundantly confirmed by the very first experiment made by the order and directions of Pascal. For by carrying the tube from the garden of the convent to a place 150 fathoms higher, the mercury fell $\frac{7}{24}$ inches, or 1.2916; which gives about 69 feet eight inches of aerial stratum for $\frac{1}{10}$ of an inch of mercury; and by carrying it from thence to a place 350 fathoms higher, the mercury fell $1\frac{22}{24}$, or 1.9167 inches, which gives 109 feet seven inches for $\frac{1}{10}$ of an inch of mercury. These experiments were not accurately made. It is evident, however, from the whole tenor of them, that the strata of air decrease in density as we ascend through the atmosphere; but it remained to be discovered what is the force of this decrease, that is, the law of the air's expansion. Till this be done we can say nothing about the constitution of our atmosphere; we cannot tell in what manner it is fittest for raising and supporting the exhalations and vapours which are continually arising from the inhabited regions; not as an excrementitious waste, but to be supported, perhaps manufactured, in that vast laboratory of nature, and to be returned to us in beneficent showers. We cannot use our knowledge for the curious, and frequently useful, purpose of measuring the heights of mountains and taking the levels of extensive regions; in short, without an accurate knowledge of this, we can hardly acquire any acquaintance with those mechanical properties which distinguish air from those liquids which circulate here below.

Compressibility of the air.

Having therefore considered at some length the leading consequences of the air's fluidity and gravity, let us consider its compressibility with the same care; and then, combining the agency of both, we shall answer all the purposes of philosophy, discover the laws, explain the phenomena of nature, and improve art. We proceed therefore to consider a little the phenomena which indicate and characterise this other property of the air. All fluids are elastic and compressible as well as air; but in them the compressibility makes no figure, or does not interest us while we are considering their pressures, motions, and impulsions. But in air the compressibility and expansion draw our chief attention, and make it a proper representative of this class of fluids.

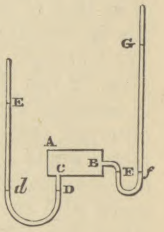
A familiar phenomenon.

Nothing is more familiar than the compressibility of air. It is seen in a bladder filled with it, which we can forcibly squeeze into less room; it is seen in a syringe, of which we can push the plug farther and farther as we increase the pressure. But these appearances bring into view another, and the most interesting, property of air, viz. its *elasticity*. When we have squeezed the air in the bladder or syringe into less room, we find that the force with which we *compressed* it is necessary to *keep it in this bulk;* and that if we cease to press it together, it will swell out and regain its natural dimensions. This distinguishes it essentially from such a body as a mass of flour, salt, or such like, which remain in the compressed state to which we reduce them. There is something therefore which opposes the compression different from the simple impenetrability of the air: there is something that opposes mechanical force: there is something too which produces motion, not only resisting compression, but pushing back the compressing body, and communicating motion to it. As an arrow is gradually accelerated by the bow-string pressing it forward, and at the moment of its discharge is brought to a state of rapid motion; so the ball from a pop-gun or wind-gun is gradually accelerated along the barrel by the pressure of the air during its expansion from its compressed state, and finally quits it with an accumulated velocity. These two motions are indications perfectly similar of the elasticity of the bow and of the air.

Fluidity of the air experimentally proved

Thus it appears that air is heavy and elastic. It needs little consideration to convince us in a vague manner that it is fluid. The ease with which it is penetrated, and driven about in every direction, and the motion of its pipes and channels, however crooked and intricate, entitle it to this character. But before we can proceed to deduce consequences from its fluidity, and to offer them as a true account of what will happen in these circumstances, it is necessary to exhibit some distinct and simple case, in which the characteristic mechanical property of a fluid is clearly and unequivocally observed in it. That property of fluids is, that any pressure applied to any part of them is propagated through the whole mass in every direction; and that in consequence of this diffusion of pressure, any two external forces can be put in equilibrio by the interposition of a fluid, in the same way as they can be put in equilibrio by the intervention of any mechanical engine.

Fig. 7.



Let a close vessel ABC (fig. 7.), of any form, have two upright pipes EDC, GFB, inserted into any parts of its top, sides, or bottom, and let water be poured into them, so as to stand in equilibrio with the horizontal surfaces at E, D, G, F, and let D *d*, F *f*, be horizontal lines, *it will be found* that the height of the column E *d* is sensibly equal to that of the column G *f*. This is a fact universally observed in whatever way the pipes are inserted. Now the surface of the water at D is undoubtedly pressed upwards with a force equal to a column of water, having its surface for its base, and E *d* for its height; it is therefore prevented from rising by some opposite force. This can be nothing but the elasticity of the confined air pressing it down. The very same thing must be said of the surface at F; and thus there are two external pressures at D and F set in equilibrio by the interposition of air. The force exerted on the surface D, by the pressure of the column E *d*, is therefore propagated to the surface at F; and thus air has this characteristic mark of fluidity.

In this experiment the weight of the air is insensible when the vessel is of small size, and has no sensible share in the pressure reaching at D and F. But if the elevation of the point F above D is very great, the column E *d will be observed* sensibly to exceed the column G *f*. Thus if F be 70 feet higher than D, E *d* will be an inch longer than the column G *f*: for in this case there is reacting at D, not only the pressure propagated from F, but also the weight of a column of air, having the surface at D for its base and 70 feet high. This is equal to the weight of a column of water one inch high.

It is by this propagation of pressure, this *fluidity*, that the pellet is discharged from a child's pop-gun. It sticks fast in the muzzle; and he forces in another pellet at the other end, which he presses forward with the rammer, condensing the air between them, and thus propagating to the other pellet the pressure which he exerts, till the friction is overcome, and the pellet is discharged by the air expanding and following it.

Hero's fountain.

There is a philosophical toy which illustrates this property of air, and which we shall have occasion to consider as converted into a useful hydraulic machine. This is what is usually called *Hero's fountain*. It consists of two vessels KLMN (fig. 8.), OPQR, which are close on all sides. The tube AB, having a funnel a-top, passes through the uppermost vessel without communicating with it, being soldered into its top and bottom. It also passes through the top of the under-vessel, where it is also soldered, and reaches almost to its bottom. This tube is open at both ends. There is another open tube ST, which is soldered into the top of the under vessel and the bottom of the upper vessel, and reaches almost to its top. These two tubes serve also to support the upper vessel. A third tube GF is soldered into the top of the upper vessel, and reaches almost to its bottom. This tube is open at both ends, but the orifice G is very small. Now suppose the uppermost vessel filled with water to the height EN, E *e* being its surface a little below T. Stop the orifice G with the finger, and pour in water at A. This will descend through AB, and compress the air in OPQR into less room. Suppose the water in the under vessel to have acquired the surface C *c*, the air which formerly occupied the whole of the spaces OPQR, and KL*e*E will now be contained in the spaces *o* P *c* C and KL *e* E; and its elasticity will be in equilibrio with the weight of the column of water, whose base is the surface E *e*, and whose height is A *c*. As this pressure is exerted in every part of the air, it will be exerted on the surface E *e* of the water of the upper vessel; and if the pipe FG were continued upwards, the water would be supported in it to an height *e* H above E *e*, equal to A *c*. Therefore if the finger be now taken from off the orifice G, the water will spout up to the same height as if it had been immediately forced out by a column of water A *c* without the intervention of the air, that is, nearly to H. If instead of the funnel at A, the vessel have a brim VW which will cause the water discharged at G to run down the pipe AB, this fountain will play till all the water in the upper vessel is expended. The operation of this second fountain will be better understood from fig. 9, which an intelligent reader will see is perfectly equivalent to fig. 8. A very powerful engine for raising water upon this principle has long been employed in the Hungarian mines; where the pipe AB is about 200 feet high, and the pipe FG about 120; and the condensation is made in the upper vessel, and communicated to the lower at the bottom of the mine, by a long pipe.

Fig. 8.

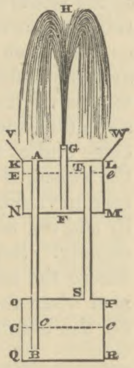
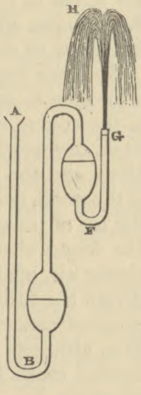


Fig. 9.



Laws of hydrostatics applicable to air.

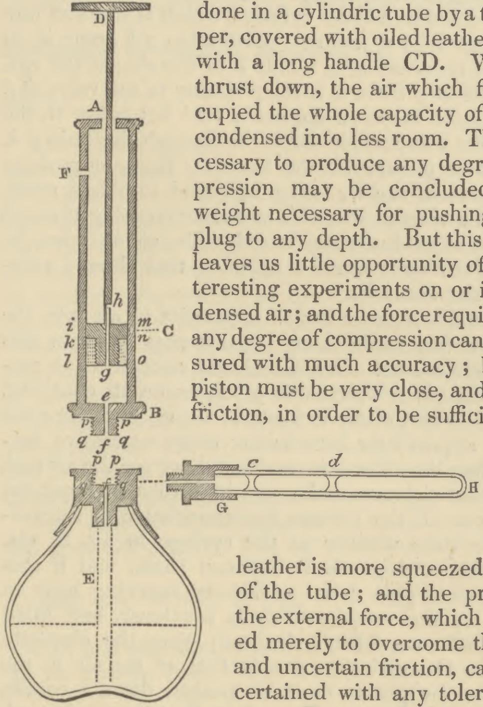
We may now then apply to air the laws of hydrostatics and hydraulics, in perfect confidence that their legitimate consequences will be observed in all its situations. We shall in future substitute, in place of any force acting on a surface of air, a column of water, mercury, or any other fluid whose weight is equal to this force; and as we know distinctly from theory what will be the consequences of this hydrostatic pressure, we shall determine *a priori* the phenomena in air; and in cases where theory does not enable us to say with precision what is the effect of this pressure, experience informs us in the case of water, and analogy enables us to transfer this to air.

More refined experiments.

From such familiar and simple observations and experiments, the fluidity, the heaviness, and elasticity, are discovered of the substance with which we are surrounded, and which we call *air*. But to understand these properties, and completely to explain their numerous and important consequences, we must call in the aid of more refined observations and experiments, which even this scanty knowledge of them enables us to make; we must contrive some methods of producing with precision, any degree of condensation or rarefaction, of employing or excluding the gravitating pressure of air, and of modifying at pleasure the action of all its mechanical properties.

Nothing can be more obvious than a method of compressing a quantity of air to any degree. Take a cylinder or prismatic tube AB (fig. 10.) shut at one end, and fit it with a piston or plug C, so nicely that no air can pass by its sides. This will be best done in a cylindric tube by a turned stopper, covered with oiled leather, and fitted with a long handle CD. When this is thrust down, the air which formerly occupied the whole capacity of the tube is condensed into less room. The force necessary to produce any degree of compression may be concluded from the weight necessary for pushing down the plug to any depth. But this instrument leaves us little opportunity of making interesting experiments on or in this condensed air; and the force required to make any degree of compression cannot be measured with much accuracy; because the piston must be very close, and have great friction, in order to be sufficiently tight. And as the compression is increased, the leather is more squeezed to the side of the tube; and the proportion of the external force, which is employed merely to overcome this variable and uncertain friction, cannot be ascertained with any tolerable precision. To get rid of these imperfections, the following addition may be made to the instrument, which then becomes what is called the condensing syringe.

Fig. 10.



The end of the syringe is perforated with a very small hole *e f*, and being externally turned to a small cylinder, a narrow slip of bladder, or of waxed silk, must be tied over the hole at *f*. Now let us suppose the piston pushed down to the bottom of the barrel, to which it applies close; when it is drawn up to the top, it leaves a void behind, and the weight of the external air presses on the slip of bladder, which therefore clasps close to the brass, and thus performs the part of a valve, and keeps it close, so that no air can enter. But the piston having reached the top of the barrel, a hole F in the side of it is just below the piston, and the air rushes through this hole, and fills the barrel. Now push the piston down again, it immediately passes the hole F, and no air escapes through it; it therefore forces open the valve at *f*, and escapes while the piston moves to the bottom.

Now let E be any vessel, such as a glass bottle, having its mouth furnished with a brass cap firmly cemented to it, having a hollow screw which fits a solid screw *p p*, turned to the cylindric nozzle of the syringe. Screw the syringe into this cap, and it is evident that the air forced out of the syringe will be accumulated in this vessel; for upon drawing up the piston, the valve *f* always shuts by the elasticity or expanding force of the air in E; and on pushing it down again, the valve will open as soon as the piston has got so far down that the air in the lower part of the barrel is more powerful than the air already in the vessel. Thus at every stroke an additional barrelful of air will be forced into the vessel E; and it will be found, that after every stroke the piston must be farther pushed down before the valve will open. It cannot open till the pressure arising from the elasticity of the air condensed in the barrel, is superior to the elasticity of the air condensed in the vessel; that is, till the condensation of the first, or its density, is *somewhat* greater than that of the last, in order to overcome the straining of the valve on the hole, and the sticking occasioned by the clammy matter employed to make it air-tight.

Sometimes the syringe is constructed with a valve in the piston. This piston, instead of being of one piece, and solid, consists of two pieces perforated. The upper part *i k n m*, is connected with the rod or handle, and has its lower part turned down to a small cylinder, which is screwed into the lower part *k l o n*, and as a perforation *g h* going up in the axis, and terminating in a hole *h* in one side of the rod, over this hole at *g* there is a valve similar to the valve at *f*. When the piston is drawn up, and a void left below it, the weight of the external air forces it through the hole *g h*, opens the valve *g*, and fills the barrel. Then, on pushing down the piston, the air being squeezed into less room, presses on the valve *g*, shuts it; and none escaping through the piston, it is gradually condensed as the piston descends, till it opens the valve *f*, and is added to that already accumulated in the vessel E.

Elasticity of the air increased by condensation.

Having in this manner forced a quantity of air into the vessel E, we can make many experiments in it in this state of condensation. We are chiefly concerned at present, with the effect which this produces on its elasticity. We see this to be greatly increased; for we find more and more force required for introducing every successive barrelful. When the syringe is unscrewed, we see the air rush out with great violence, and every indication of great expanding force. If the syringe be connected with the vessel E, in the same manner as the syringe in fig. 3, viz. by interposing a stopcock B between them, and if this stopcock have a pipe at its extremity, reaching near to the bottom of the vessel, which is previously half filled with water, we can observe distinctly when the elasticity of the air in the syringe exceeds that of the air in the receiver; for the piston must be pushed down a certain length before the air from the syringe bubbles up through the water, and the piston must be farther down at each successive stroke before this appearance is observed. When the air has thus been accumulated in the receiver, it presses the sides of it outward, and will burst it if not strong enough. It also presses on the surface of the water; and if we now shut the cock, unscrew the syringe, and open the cock again, the air will force the water through the pipe with great velocity, causing it to rise in a beautiful jet. When a metal-receiver is used, the condensation may be pushed to a great length, and the jet will then rise to a great height; which gradually diminishes as the water is expended, and room given to the air to expand itself.

Methods of judging of the condensation, &c.

We judge of the condensation of air in the vessel E, by the number of strokes, and the proportion of the capacity of the syringe to that of the vessel. Suppose the first to be one-tenth of the last; then we know, that after ten strokes the quantity of air in the vessel is doubled, and therefore its density double, and so on after any number of strokes. Let the capacity of the syringe (when the piston is drawn to the top) be *a*, and that of the vessel be *b*, and the number of strokes be *n*, the density of air in the vessel will be $\frac{b+na}{b}$, or $1+\frac{na}{b}$.

But this is on the supposition that the piston accurately fills the barrel, the bottom of the one applying close to that of the other, and that no force is necessary for opening either of the valves; but the first cannot be insured, and the last is very far from being true. In the construction now described, it will require at least one-twentieth part of the ordinary pressure of the air to open the piston valve; therefore the air which gets in will want at least this proportion of its complete elasticity; and there is always a similar part of the elasticity employed in opening the nozzle valve. The condensation therefore is never nearly equal to what is here determined.

It is accurately enough measured by a gage fitted to the instrument. A glass tube GH of a cylindric bore, and close at the end, is screwed into the side of the cap on the mouth of the vessel E. A small drop of mercury is taken into this tube by warming it a little in the hand, which expands the contained air, so that when the open end is dipped into mercury, and the whole allowed to cool, the mercury advances a little into the tube. The tube is furnished with a scale divided into small equal parts, numbered from the close end of the tube. Since this tube communicates with the vessel, it is evident that the condensation will force the mercury along the tube, acting like a piston on the air beyond it, and the air in the tube and vessel will always be of one density. Suppose the number at which the drop stands before the condensation is made to be *c*, and that it stands at *d* when the condensation has attained the degree required, the density of the air in the remote end of the gage, and consequently in the vessel, will be $\frac{c}{d}$.

Sometimes there is used any bit of tube close at one end, having a drop of mercury in it, simply laid into the vessel E, and furnished with a scale; but this can only be used with glass vessels, and these are with difficulty made strong enough to resist the pressure arising from great condensation. In such experiments metalline vessels are generally used, fitted with a variety of apparatus for different experiments.

Syringes for great condensations.

It must be observed in this place, that very great condensations require great force, and therefore small syringes. It is therefore convenient to have them of various sizes, and to begin with those of a larger diameter, which operate more quickly; and when the condensation becomes fatiguing, to change the syringe for a smaller.

For this reason, and in general to make the condensing apparatus more convenient, it is proper to have a stop-cock interposed between the syringe and the vessel, or, as it is usually called, the receiver. This consists of a brass pipe, which has a well-ground cock in its middle, and has a hollow screw at one end, which receives the nozzle screw of the syringe, and a solid screw at the other end, which fits the screw of the receiver. (See fig. 3.)

Instances of great condensation.

By these gages, or contrivances similar to them, we have been able to ascertain very great degrees of condensation in the course of some experiments. Dr. Hales found, that when dry wood was put into a strong vessel, which it almost filled, and the remainder was filled with water, the swelling of the wood, occasioned by its imbibition of water, condensed the air of his gage into the thousandth of its original bulk. He found that pease, treated in the same way, generated elastic air, which, pressing on the air in the gage, condensed it into the fifteen-hundredth part of its bulk. This is the greatest condensation that has been ascertained with precision, although in other experiments it has certainly been carried much farther; but the precise degree could not be ascertained.

Some opinions respecting elasticity, &c.

Another important observation is, that in every state of density in which we find it, it retains its perfect fluidity, transmitting all pressures which are applied to it with undiminished force, as appears by the equality constantly observed between the opposing columns of water or other fluid by which it is compressed, and by the facility with which all motions are performed in it in the most compressed states in which we can make observations of this kind. This fact is totally incompatible with the opinion of those who ascribe the elasticity of air to the springy ramified structure of its particles, touching each other like so many pieces of sponge or foot-balls. A collection of such particles might indeed be pervaded by solid bodies with considerable ease, if they were merely touching each other, and not subjected to any external pressure. But the moment such pressure is exerted, and the assemblage squeezed into a smaller space, each presses on its adjoining particles: they are individually compressed, flattened in their touching surfaces, and before the density is doubled they are squeezed into the form of perfect tubes, and compose a mass, which may indeed propagate pressure from one place to another in an imperfect manner, and with great diminution of its intensity, but will no more be fluid than a mass of soft clay.

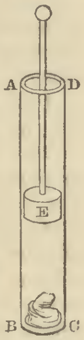
Consequences of the air's elasticity.

We have seen the air is heavy and compressible, and might now proceed to deduce in order the explanation of the appearances consequent on each of these properties. But, as has been already observed, the elasticity of air modifies the effects of its gravity so remarkably, that they would be imperfectly understood if both qualities were not combined in our consideration of either. At any rate, some farther consequences of its elasticity must be considered, before we understand the means of varying at pleasure the effects of its gravity.

Its great expansibility proved by experiment.

Since air is heavy, the lower strata of a mass of air must support the upper; and, being compressible, they must be condensed by their weight. In this state of compression the elasticity of the lower strata of air acts in opposition to the weight of the incumbent air, and balances it. There is no reason which should make us suppose that its expanding force belongs to it only when in such a state of compression. It is more probable that, if we could free it from this pressure, the air would expand itself into still greater bulk. This is most distinctly seen in the following experiment.

Fig. 11.

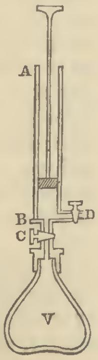


Into the cylindric jar ABCD, (fig. 11,) which has a small hole in its bottom, and is furnished with an air-tight piston E, put a small flaccid bladder, having its mouth tied tight with a string. Having pushed the piston near to the bottom, and noticed the state of the bladder, stop up the hole in the bottom of the jar with the finger, and draw up the piston, which will require a considerable force. You will observe the bladder swell out, as if air had been blown into it; and it will again collapse on allowing the piston to descend. Nothing can be more unexceptionable than the conclusion from this experiment, that ordinary air is in a state of compression, and that its elasticity is not limited to this state. The bladder being flaccid, shews that the included air is in the same state with the air which surrounds it; and the same must be affirmed of it while it swells but still remains flaccid. We must conclude that the whole air within the vessel expands, and continues to fill it, when its capacity has been enlarged. And since this is observed to go on as long as we give it more room, we conclude, that by such experiments we have not yet given it so much room as it can occupy.

Attempts to discover the limits of this expansion.

It was a natural object of curiosity to discover the limits of this expansion; to know what was the natural unconstrained bulk of a quantity of air, beyond which it would not expand though all external compressing force were removed. Accordingly philosophers constructed instruments for *rarefying* the air. The common water-pump had been long familiar, and appeared very proper for this purpose. The most obvious is the following.

Fig. 12.



Let the barrel of the syringe AB communicate with the vessel V, with a stopcock C between them. Let it communicate with the external air by another orifice D, in any convenient situation, also furnished with a stopcock. Let this syringe have a piston very accurately fitted to it so as to touch the bottom all over when pushed down, and have no vacancy about the sides.

Now, suppose the piston at the bottom, the cock C open, and the cock D shut, draw the piston to the top. The air which filled the vessel V will expand so as to fill both that vessel and the barrel AB; and, as no reason can be given to the contrary, we must suppose that the air will be uniformly diffused through both. Calling V and B the capacity of the vessel and barrel, it is plain that the bulk of the air will now be $V+B$; and since the quantity of matter remains the same, and the density of a fluid is as its quantity of matter directly and its bulk inversely, the density of the expanded air will be $\frac{V}{V+B}$, the density of common air being 1; for $V+B : V = 1 : \frac{V}{V+B}$.

The piston requires force to raise it, and it is raised in opposition to the pressure of the incumbent atmosphere; for this had formerly been balanced by the elasticity of the common air; and we conclude from the fact, *that force is required to raise the piston*, that the elasticity of the expanded air is less than that of air in its ordinary state; and an accurate observation of the force necessary to raise it would shew how much the elasticity is diminished. When therefore the piston is let go, it will descend as long as the pressure of the atmosphere exceeds the elasticity of the air in the barrel; that is, till the air in the barrel is in a state of ordinary density. To put it further down will require force, because the air must be compressed in the barrel; but if we open the cock D, the air will be expelled through it, and the piston will reach the bottom.

Now shut the *discharging cock* D, and open the cock C, and draw the piston. The air which occupied the space V, with the density $\frac{V}{V+B}$, will now occupy the space $V+B$, if it expands so far. To have its density D, say, As its present bulk $V+B$ is to its former bulk V, so its former density $\frac{V}{V+B}$ to its new density; which will therefore be $\frac{V\times V}{\overline{V+B}\times\overline{V+B}}$, or $\overline{\frac{V}{V+B}}\Big|^{2}$.

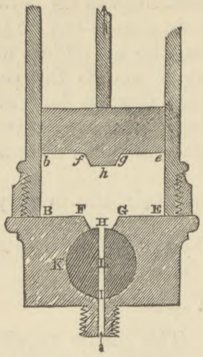
It is evident, that if the air continues to expand, the density of the air in the vessel after the third drawing up of the piston will be $\overline{\frac{V}{V+B}}\Big|^{3}$, after the fourth it will be $\overline{\frac{V}{V+B}}\Big|^{4}$, and after any number of strokes n will be $\overline{\frac{V}{V+B}}\Big|^{n}$. Thus, if the vessel is four times as large as the barrel, the density after the fifth stroke will be $\frac{1024}{3125}$, nearly $\frac{1}{3}$ of its ordinary density.

On the other hand, the number n of strokes necessary for reducing air to the density D is $\frac{\log D}{\log V - \log \overline{(V+B)}}$.

Some inconveniences of this instrument.

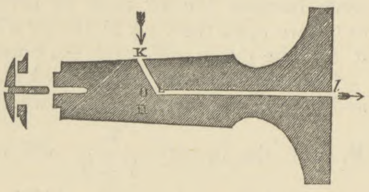
Thus we see that this instrument can never abstract the whole air in consequence of its expansion, but only rarefy it continually as long as it continues to expand; nay, there is a limit beyond which the rarefaction cannot go. When the piston has reached the bottom, there remains a small space between it and the cock C filled with common air. When the piston is drawn up, this small quantity of air expands, and also a similar quantity in the neck of the other cock; and no air will come out of the receiver V till the expanded air in the barrel is of a smaller density than the air in the receiver. This circumstance evidently directs us to make these two spaces as small as possible, or by some contrivance to fill them up altogether. Perhaps this may be done effectually in the following manner.

Fig. 13.



Let BE represent the bottom of the barrel, and let the circle HKI be the section of the key of the cock, of a large diameter, and place it as near to the barrel as can be. Let this communicate with the barrel by means of a hole FG widening upwards, as the frustum of a hollow obtuse cone. Let the bottom of the piston *b f h g e* be shaped so as to fit the bottom of the barrel and this hole exactly. Let the cock be pierced with two holes. One of them, HI, passes perpendicularly through its axis, and forms the communication between the receiver and barrel. The other hole, KL, has one extremity K on the same circumference with H, so that when the key is turned a fourth part round, K will come into the place of H: but this hole is pierced obliquely into the key, and thus keeps clear of the hole HI. It goes no further than the axis, where it communicates with a hole bored along the axis and terminating at its extremity. This hole forms the communication with the external air, and serves for discharging the air in the barrel.

Fig. 14.



(A side view of the key is seen in fig. 14.) Fig. 13 shows the position of the cock while the piston is moving upwards, and fig. 14 shows its position while the piston is moving downwards. When the piston has reached the bottom, the conical piece *f h g* of the piston, which may be of firm leather, fills the hole FHG, and therefore completely expels the air from the barrel. The canal KL *l* of the cock contains air of the common density; but this is turned aside into the position KL (fig. 13), while the piston is still touching the cock. It cannot extend into the barrel during the ascent of the piston. In place of it the perforation HLI comes under the piston, filled with air that had been turned aside with it when the piston was at the top of the barrel, and therefore of the same density with the air of the receiver. It appears therefore that there is no limit to the rarefaction as long as the air will expand.

This instrument is called an Exhausting Syringe. It is more generally made in another form, which is much less expensive, and more convenient in its use. Instead of being furnished with *cocks* for establishing the communications and shutting them, as is necessary, it has *valves* like those of the condensing syringe, but opening in the opposite direction from those in fig. 10.

This syringe is evidently more easy in its use, requiring no attention to the cocks to open and shut them at the proper times. On this account this construction of an exhausting syringe is much more generally used.

But it is greatly inferior to the syringe with cocks, with respect to its power of rarefaction. It is evident that no air will come out of the receiver unless its elasticity *exceed* that of the air in the barrel by a difference able to lift up the valve fig. 10. A piece of waxed silk tied across this hole can hardly be made tight and certain of clapping to the hole without some small straining, which must therefore be overcome. It must be very gentle indeed not to require a force equal to the weight of two inches of water, and this is equal to about the 200th part of the whole elasticity of the ordinary air; and therefore this syringe, for this reason alone, cannot rarefy air above 200 times, even though air were capable of an indefinite expansion. In like manner the valve in the piston cannot be raised without a similar prevalence of the elasticity of the air in the barrel above the weight of the atmosphere. These causes united, make it difficult to rarefy the air more than 100 times, and very few such syringes will rarefy it more than 50 times; whereas the syringe with cocks, when new and in good order, will rarefy it 1000 times.

But, on the other hand, syringes with cocks are much more expensive, especially when furnished with apparatus for opening and shutting the cocks. They are more difficult to make equally tight, and (which is the greatest objection) do not remain long in good order. The cocks, by so frequently opening and shutting, grow loose, and allow the air to escape. No method has been found of preventing this. They must be ground tight by means of emery or other cutting powders. Some of these unavoidably stick in the metal, and continue to wear it down. For this reason philosophers, and the makers of philosophical instruments, have turned their chief attention to the improvement of the syringe with valves.

OF THE AIR-PUMP.

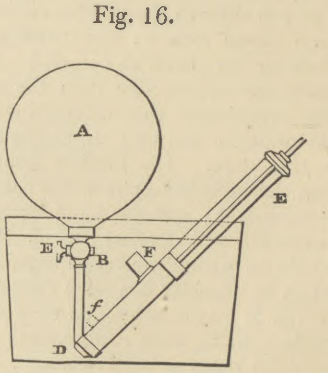
Invention of the air-pump by Guericke.

An Air-Pump is nothing but an exhausting syringe accommodated to a variety of experiments. It was first invented by Otto Guericke, a gentleman of Magdeburgh in Germany, about the year 1654. We trust that it will not be unacceptable to our readers to see this instrument in its first form, and to trace it through its successive steps to its present state of improvement.

Guericke gave a minute description of all his pneumatic apparatus to Gaspar Schottus, professor of mathematics at Wirtemberg, who immediately published it with the author's consent, with an account of some of his performances, first in 1657, in his *Mechanica Hydraulico-pneumatica;* and then in his *Technica Curiosa,* in 1664.

Construction of his pump.

Fig. 16.



Otto Guericke's air-pump consists of a glass receiver A of a form nearly spherical, fitted up with a brass cap and cock B. The nozzle of the cap was fixed to a syringe DE, also of brass, bent at D into half a right angle. This had a valve at D, opening from the receiver into the syringe, and shutting when pressed in the opposite direction. In the upper side of the syringe there is another valve F, opening from the syringe into the external air, and shutting when pressed inwards. The piston had no valve. The syringe, the cock B, and the joint of the tube, were immersed in a cistern filled with water. From this description, it is easy to understand the operation of the instrument. When the piston was drawn up from the bottom of the syringe, the valve F was kept shut by the pressure of the external air, and the valve D opened by the elasticity of the air in the receiver. When it was pushed down again, the valve D immediately shut by the superior elasticity of the air in the syringe; and when this was sufficiently compressed, it opened the valve F, and was discharged. It was immersed in water, that no air might find its way through the joints or cocks.

Its imperfections.

It would seem that this machine was not very perfect; for Guericke says, that it took several hours to produce an evacuation of a moderate-sized vessel; but he says, that when it was in good order, the rarefaction was so great, that

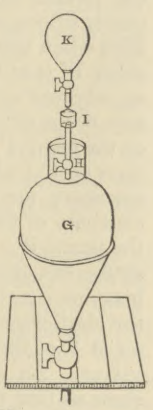
Air-pump.

when the cock was opened, and water admitted, it filled the receiver so as sometimes to leave no more than the bulk of a pea filled with air. This is a little surprising; for if the valve F be placed as far from the bottom of the syringe as in Schottus' figure,[1] it would appear that the rarefaction could not be greater than what must arise from the air in DF, expanding till it filled the whole syringe: because, as soon as the piston in its descent passes F, it can discharge no more air, but must compress it between F and the bottom, to be expanded again when the piston is drawn up. It is probable that the piston was not very tight, but that on pressing it down, it allowed the air to pass it; and the water in which the whole was immersed prevented the return of the air when it was drawn up again; and this accounts for the great time necessary for producing the desired rarefaction.

His improvement of it.

Guericke added a part to the machine, which saved his numerous visitants the trouble of hours' attendance, before they could see the curious experiments with rarefied air. He made a large copper vessel G (fig. 17.), having a pipe and cock below, which passed through the floor of the chamber into an under apartment, where it was joined to the syringe immersed in the cistern of water, and worked by a lever. The upper part of the vessel terminated in a pipe, furnished with a stopcock H, surrounded with a small brim to hold water for preventing the ingress of air. On the top was another cap I, also filled with water, to protect the junction of the pipes with the receiver K. This great vessel was always kept exhausted, and workmen attended below. When experiments were to be performed in the receiver K, it was set on the top of the great vessel, and the cock H was opened. The air in K immediately diffused itself equally between the two vessels, and was so much more rarefied as the receiver K was smaller than the vessel G. When this rarefaction was not sufficient, the attendants below immediately worked the pump.

Fig. 17.



Guericke's method of excluding air from all the joints of his apparatus, by immersing these joints in water, is the only method that has to this day been found effectual; and there frequently occur experiments where this exclusion for a long time is absolutely necessary. In such cases it is necessary to construct little cups or cisterns at every joint, and to fill them with water or oil. In a letter to Schottus, 1662–3, he describes very ingenious contrivances for producing complete rarefaction after the elasticity of the remaining air has been so far diminished that it is not able to open the valves. He opens the exhausting valves by a plug, which is pushed in by the hand; and the discharging valve is opened by a small pump placed on its outside, so that it opens into a void instead of opening against the pressure of the atmosphere.[2] These contrivances have been lately added to air-pumps by Haas and Hurter as new inventions.

Merits of Guericke.

It must be acknowledged, that the application of the pump or syringe to the exhaustion of air was a very obvious thought on the principle exhibited in fig. 3; and in this way it was also employed by Guericke, who first filled the receiver with water, and then applied the syringe. But this was by no means either his object or his principle. His object was not solely to procure a vessel void of air, but to exhaust the air which was already in it; and his principle was the power which he suspected to be in air of expanding itself into a greater space when the force was removed which he supposed to compress it. He expressly says,[3] that the contrivance occurred to him accidentally when occupied with experiments in the Toricellian tube, in which he found that the air would really expand, and completely fill a much larger space than what it usually occupied, and that he had found no limits to the expansion, evincing this by facts which we shall perfectly understand by and bye. This was a doctrine quite new, and required a philosophical mind to view it in a general and systematic manner; and it must be owned, that his manner of treating the subject is equally remarkable for ingenuity and for modesty.

Air-pump.

Progress of experimental philosophy.

His doctrine and his machine were soon spread over Europe. It was the age of literary ardour and philosophical curiosity; and it is most pleasant to us, who, standing on the shoulders of our predecessors, can see far around us, to observe the eagerness with which every new, and to us frivolous, experiment was repeated and canvassed.

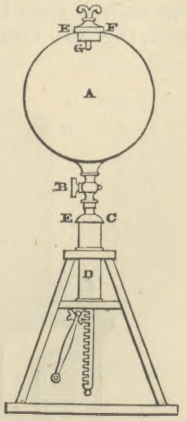
Ardour of Mr. Boyle.

About this time the foundations of the Royal Society of London were laid. Mr. Boyle, Mr. Wren, Lord Brounker, Dr. Wallis, and others, held meetings at Oxford, in which were received accounts of whatever was doing in the study of nature; and many experiments were exhibited. The researches of Galileo, Toricelli, and Pascal, concerning the pressure of the air, greatly engaged their attention, and many additions were made to their discoveries. Mr. Boyle, the most ardent and successful studier of nature, had the principal share in these improvements, his inquisitive mind being aided by an opulent fortune. In a letter to his nephew Lord Dungarvon, he says that he had made many attempts to see the appearances exhibited by bodies freed from the pressure of the air. He had made Toricellian tubes, having a small vessel a-top, into which he put some bodies before filling the tubes with mercury; so that when the tube was set upright, and the mercury run out, the bodies were *in vacuo*. He had also abstracted the water from a vessel by a small pump, by means of its weight, in the manner shewn in fig. 3, having previously put bodies into the vessel along with the water. But all these ways were very troublesome and imperfect. He was delighted when he learned from Schottus' first publication, that Guericke had effected this by the expansive power of the air; and immediately set about constructing a machine from his own ideas, no description of Guericke's being then published.

His air-pump.

It consisted of a receiver A, (fig. 18.) furnished with a stopcock B, and syringe CD placed in a vertical position below the receiver. Its valve C was in its bottom, close adjoining to the entry of the pipe of communication; and the hole by which the air issued was farther secured by a plug which could be removed. The piston was moved by a wheel and rack-work. The receiver of Guericke's pump was but ill adapted for any considerable variety of experiments; and accordingly very few were made in it. Mr. Boyle's receiver had a large opening EF, with a strong glass margin. To this was fitted a strong brass cap, pierced with a hole G in its middle, to which was fitted a

Fig. 18.



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[1] In Guericke's own account of these discoveries, published in 1672, eight years after the *Technica Curiosa*, the valve is represented at *f*, close to the bottom of the syringe; hence it would appear that the representing it in the middle at F was a blunder of Schottus.—Ed.

[2] See Schotti *Technica Curiosa*, p. 68—70.

[3] *Tractatus de Experimentis Magdeburgicis, et Epistolæ ad Schottum.*

plug ground into it, and shaped like the key of a cock. The extremity of this key was furnished with a screw, to which could be affixed a hook, or a variety of pieces for supporting what was to be examined in the receiver, or for producing various motions within it, without admitting the air. This was farther guarded against by means of oil poured round the key, where it was retained by the hollow cup-like form of the cover. With all these precautions, however, Mr. Boyle ingenuously confesses, that it was but seldom, and with great difficulty, that he could produce an extreme degree of rarefaction; and it appears by Guericke's letter to Schottus that in this respect the Magdeburgh machine had the advantage. But most of Boyle's very interesting experiments did not require this extreme rarefaction; and the variety of them, and their philosophic importance, compensated for this defect, and soon eclipsed the fame of the inventor to such a degree, that the state of air in the receiver was generally denominated the *vacuum Boyleanum*, and the air-pump was called *machina Boyleana*.

His contrivances to make air-vessels tight.

Mr. Boyle found, that to make a vessel air-tight, it was sufficient to place a piece of wet or oiled leather on its brim, and to lay a flat plate of metal on this. The pressure of the external air squeezed the two solid bodies so hard together, that the soft leather effectually excluded it. This enabled him to render the whole machine incomparably more convenient for a variety of experiments. He caused the conduit-pipe to terminate in a flat plate which he covered with leather, and on this he set the glass ball or receiver, which had both its upper and lower brim ground flat. He covered the upper orifice in like manner with a piece of oiled leather and a flat plate, having cocks and a variety of other perforations and contrivances suited to his purposes. This he found infinitely more expeditious, and also tighter than the clammy cements which he had formerly used for securing the joints.

Dr Hooke's improvement of Boyle's air-pump.

He was now assisted by Dr. Hooke, the most ingenious and inventive mechanic that the world has ever seen. This person made a great improvement on the air-pump, by applying two syringes AA, (fig. 19), whose pistons P and P′ are both worked by one wheel, O pitching in the racks or piston rods R and R′, the pistons being thus raised and depressed alternately by turning the winch W backwards and forwards. In the bottom of each of the barrels there is an opening communicating with the receiver or bell glass B, placed on the plate A, (fig. 20). Over these openings valves of oiled silk are so placed as to admit of the passage of the air from the receiver to the syringe or barrel, but to oppose its passage from the barrel to the receiver. Now, suppose either of the pistons to be at the bottom of its barrel, it is obvious, that on drawing it up a vacuum will be found in the lower portion of the barrel, until the air in the receiver, by its elastic force, opening the valve V or V′, rushes in, distributing itself equally betwixt the barrel and receiver, but as the pistons are furnished with valves P and P′ similar to and opening in the same direction as VV′; on the descent of the piston the air which occupies the space betwixt the piston and bottom of the barrel being prevented from returning to the receiver by the valve V or V′, opens the valve in the piston and escapes into the apartment, with the air of which the piston valve communicates. This evidently doubled the expedition of the pump's operation; but it also greatly diminished the labour of pumping; for it must be observed, that the piston P must be drawn up against the pressure of the external air, and when the rarefaction is nearly perfect, this requires a force of nearly fifteen pounds for every inch of the area of the piston. Now when one piston P is at the bottom of the barrel, the other P′ is at the top of the barrel, and the air below P′ is equally rare with that in the receiver. Therefore the pressure of the external air on the piston P′ is *nearly* equal to that on the piston P. Both, therefore, are acting in opposite directions on the wheel which gave them motion; and the force necessary for raising P is only the difference between the elasticity of the air in the barrel P, and that of the air in the barrel P′. This is very small in the beginning of the stroke, but gradually increases as the piston P′ descends, and becomes equal to the whole excess of the air's pressure above the elasticity of the remaining air of the receiver, when the air at P of the natural density begins to open the piston valves. An accurate attention to the circumstances will show us that the force requisite for working the pump is greatest at first, and gradually diminishes as the rarefaction advances; and when this is nearly complete, hardly any more force is required than what is necessary for overcoming the friction of the pistons, except during the discharge of the air at the end of each stroke. This is therefore the form of the air-pump which is most generally used over all Europe; though in the various modifications some traces of national prepossession remain. We shall give a description of Boyle's air-pump as finally improved by Hawkesbee, which, with some small accommodations to particular views, continued for many years the most approved form.

Fig. 19.

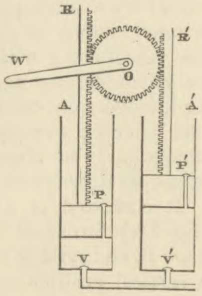
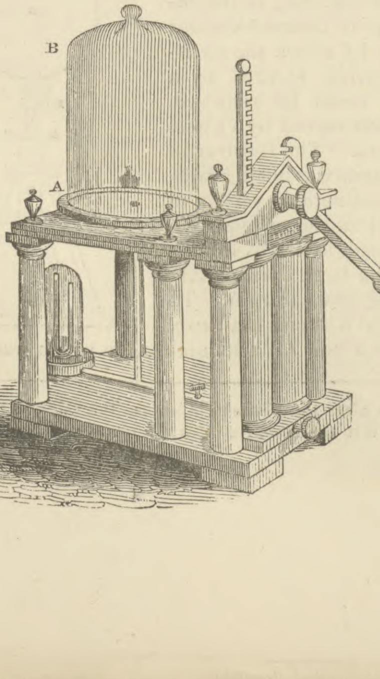


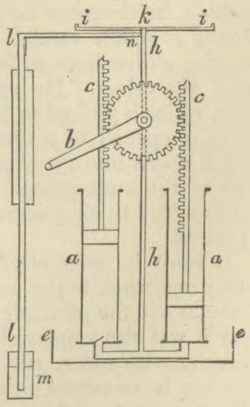
Fig. 20.



Hawkesbee's improvements

It consists of two brass barrels *a a*, (fig. 21.) twelve inches high, and two wide. The pistons are raised and depressed by turning the winch *b*. This is fastened to an axis passing through a strong toothed wheel, which lays hold of the teeth of the racks *c c*. Then the one is raised while the other is depressed; by which means the valves, which are made of limber bladder, fixed in the upper part of each piston, as well as in the openings into the bottom of the barrels, perform their office of discharging the air from the barrels, and admitting into them the air from the receiver to be afterwards discharged; and when the receiver comes to be pretty well exhausted of its air, the pressure of the atmosphere in the descending piston is nearly so great, that the power required to raise the other is little more than is necessary for overcoming the friction of the piston, which renders this pump preferable to all

Fig. 21.



others, which require more force to work them as the rarefaction of the air in the receiver advances.

The barrels are set in a brass dish *ee*, about two inches deep, filled with water or oil to prevent the insinuation of air. The barrels are screwed tight down by two nuts, which force the frontispiece down on them, through which the two pillars pass; for the sake of distinctness, these are omitted in this figure, but are shown in fig. 20.

From between the barrels rises a slender brass pipe *h h*, communicating with each by a perforation in the transverse piece of brass on which they stand. The upper end of this pipe communicates with another perforated piece of brass, which screws on underneath the plate *i i*, of ten inches diameter, and surrounded with a brass rim to prevent the shedding of water used in some experiments. This piece of brass has three branches. 1st, An horizontal one communicating with the conduit pipe *h h*. 2d, An upright one, screwed into the middle of the pump plate, and terminating in a small pipe, rising about an inch above it. 3d, A perpendicular one, looking downwards in the continuation of this pipe, and having a hollow screw in its end receiving the brass cap of the gage-pipe *l l*, which is of glass, thirty-four inches long, and immersed in a glass cistern *m* filled with mercury. This is covered a-top with a cork float, carrying the weight of a light wooden scale divided into inches, which are numbered from the surface of the mercury in the cistern. This scale will therefore rise and fall with the mercury in the cistern, and indicate the true elevation of that in the tube.

There is a stop-cock immediately above the insertion of the gage-pipe, by which its communication may be cut off. There is another at *n*, by which a communication is opened with the external air, for allowing its readmission; and there is sometimes another immediately within the insertion of the conduit-pipe for cutting off the communication between the receiver and the pump. This is particularly useful when the rarefaction is to be continued long, as there are by these means fewer chances of the insinuation of air by the many joints.

The receivers are made tight by simply setting them on the pump-plate, with a piece of wet or oiled leather between; and the receivers, which are open a-top, have a brass cover set on them in the same manner. In these covers there are various perforations and contrivances for various purposes. The one in fig. 26 has a slip wire passing through a collar of oiled leather, having a hook or a screw in its lower end, for hanging any thing on, or producing a variety of motions.

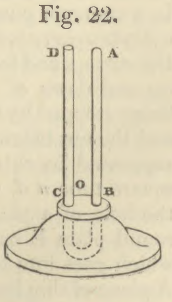
Sometimes the receivers are set on another plate, which has a pipe screwed into its middle, furnished with a stop-cock and a screw, which fits the middle pipe *k*. When the rarefaction has been made in it, the cock is shut, and then the whole may be unscrewed from the pump, and removed to any convenient place. This is called a *transporter plate.*

It only remains to explain the gage *ll*. In the ordinary state of the air, its elasticity balances the pressure of the incumbent atmosphere. We find this from the force that is necessary to squeeze it into less bulk in opposition to this elasticity. Therefore the elasticity of the air increases with the vicinity of its particles. It is therefore reasonable to expect, that when we allow it to occupy more room, and its particles are further asunder, its elasticity will be diminished though not annihilated; that is, it will no longer balance the WHOLE pressure of the atmosphere, though it may still balance part of it. If therefore an upright pipe have its lower end immersed in a vessel of mercury, and communicate by its upper end with a vessel containing rarefied, therefore less elastic air, we should expect that the pressure of the air will prevail, and force the mercury into the tube, and cause it to rise to such a height that the weight of the mercury, joined to the elasticity of the rarefied air acting on its upper surface, shall be exactly equal to the whole pressure of the atmosphere. The height of the mercury is the exact measure of that part of the whole pressure which is not balanced by the elasticity of the rarefied air, and its deficiency from the height of the mercury in the Toricellian tube is the exact measure of this remaining elasticity.

It is evident, therefore, that the pipe will be a scale of the elasticity of the remaining air, and will indicate in some sort the degree of rarefaction; for there must be some relation between the density of the air and its elasticity; and we have no reason to imagine that they do not increase and diminish together, although we may be ignorant of the law, that is, of the change of elasticity corresponding to a known change of density. This is to be discovered by experiment; and the air-pump itself furnishes us with the best experiments for this purpose. After rarefying till the mercury in the gage has attained half the height of that in the Toricellian tube, shut the communication with the barrels and gage, and admit the water into the receiver. It will go in till all is again in equilibrio with the pressure of the atmosphere; that is, till the air in the receiver has collapsed into its natural bulk. This we can accurately measure, and compare with the whole capacity of the receiver; and thus obtain the precise degree of rarefaction corresponding to half the natural elasticity. We can do the same thing with the elasticity reduced to one-third, one-fourth, &c. and thus discover the whole law.

This gage must be considered as one of the most ingenious and convenient parts of Hawkesbee's pump; and it is well disposed, being in a situation protected against accidents; but it necessarily increases greatly the size of the machine, and cannot be applied to the table-pump represented in fig. 20. When it is wanted here, a small plate is added behind, or between the barrels and receiver; and on this is set a small tubulated (as it is termed) receiver, covering a common weather-glass tube. This receiver being rarefied along with the other, the pressure on the mercury in the cistern arising from the elasticity of the remaining air, is diminished so as to be no longer able to support the mercury at its full height; and it therefore descends till the height at which it stands puts it in equilibrio with the elasticity. In this form, therefore, the height of the mercury is directly a measure of the remaining elasticity; while in the other it measures the remaining unbalanced pressure of the atmosphere. But this gage is extremely cumbersome, and liable to accidents. We are seldom much interested in the rarefaction till it is great; a contracted form of this gage is therefore very useful, and was early used. A syphon ABCD (fig. 22.) each branch of which is about four inches long, close at A and open at D, is filled with boiling mercury till it occupies the branch AB, and a very small part of CD, having its surface at O. This is fixed to a small stand, and fixed into the receiver, along with the things that are to be exhibited in the rarefied air. When the air has been rarefied till its remaining elasticity is not able to support the column BA, the mercury descends in AB, and rises in CD, and the remaining elasticity will always be measured by the elevation of the mercury in AB above that in the leg CD. Could the exhaustion be perfected, the surfaces in both legs would be on a level. Another gage might be put into the same foot, having a small bubble of air at A. This would expand from the beginning of the rarefaction; but our knowledge of the relation between the density and elasticity does not warrant us in using it as a measure of either.

Fig. 22.



A complete exhaustion not effected by the air-pump.

It is enough for our present purpose to observe, that the barometer gage is a perfect indication and measure of the performance of an air-pump, and that a pump is, *cæteris paribus*, so much the more perfect, as it is able to raise the mercury higher in the gage. It is in this way that we discover that none can produce a complete exhaustion, and that their operation is only a very great rarefaction: for none can raise the mercury to that height at which it stands in the Toricellian tube, well purged of air. Few pumps will bring it within one-tenth of an inch. Hawkesbee's, fitted up according to his instructions, will seldom bring it within one-fifth. Pumps with cocks, when constructed according to the principles mentioned when speaking of the exhausting syringe, and new and in fine order, will in favourable circumstances bring it within one-fortieth. None with valves fitted up with wet leather, or when water or volatile fluids are allowed access into any part, will bring it nearer than one-fifth. Nay, a pump of the best kind, and in the finest order, will have its rarefying power reduced to the lowest standard, as measured by this gage, if we put into the receiver the tenth part of a square inch of white sheep-skin, fresh from the shops, or of any substance equally damp. This is a discovery made by means of the improved air-pump, and leads to very extensive and important consequences in general physics, some of which will be treated of under this article; and the observation is made thus early, that our readers may better understand the improvements which have been made on this celebrated machine.

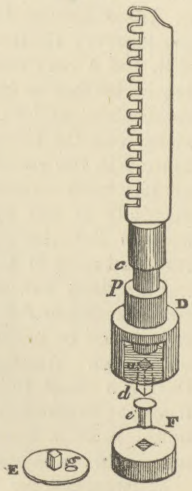
Various improvements of this machine.

It would require a volume to describe all the changes which have been made on it. An instrument of such multifarious use, and in the hands of curious men, each diving into the secrets of nature in his favourite line, must have received many alterations and real improvements in many particular respects. But these are beside our present purpose; which is to consider it merely as a machine for rarefying elastic or expansive fluids. We must therefore confine ourselves to this view of it; and shall carefully state to our readers every improvement founded on principle, and on pneumatical laws. All who used it perceived the limit set to the rarefaction by the resistance of the valves, and tried to perfect the construction of the cocks. The Abbé Nollet and s'Gravesande, two of the most eminent experimental philosophers in Europe, were the most successful.

s'Gravesande's improvement.

Mr. s'Gravesande justly preferred Hooke's plan of a double pump, and contrived an apparatus for turning the cocks by the motion of the pump's handle. This is far from either being simple or easy in working; and occasions great jerks and concussions in the whole machine. This, however, is not necessarily connected with the truly pneumatical improvement. His piston has no valve, and the rod is connected with it by a stirrup D (fig. 23), as in a common pump. The rod has a cylindric part *c p*, which passes through the stirrup, and has a stiff motion in it up and down of about half an inch; being stopped by the shoulder *c* above and the nut below. The round plate supported by this stirrup has a short square tube *n d*, which fits tight into the hole of a piece of cork F. The round plate E has a square shank *g*, which goes into the square tube *n d* A piece of thin leather, soaked in oil, is put between the cork and the plate E, and another between the cork and the plate which forms the sole of the stirrup. All these pieces are screwed together to form the piston by the nail *e*, whose flat head covers the hole *n*. Suppose, therefore, the piston touching the bottom of the barrel, and the winch turning to raise it again, the friction of the piston on the barrel keeps it in its place, and the rod is drawn up through the stirrup D. Thus the wheel has liberty to turn about an inch; and this is sufficient for turning the cock, so as to cut off the communication with the external air, and to open the communication with the receiver. This being done, and the motion of the winch continued, the piston is raised to the top of the barrel. When the winch is turned in the opposite direction, the piston remains fixed till the cock is turned, so as to shut the communication with the receiver, and open that with the external air.

Fig. 23.



This is a pretty contrivance, and does not at first appear necessary; because the cocks might be made to turn at the beginning and end of the stroke without it. But this is just possible; and the smallest error of adjustment, or wearing of the apparatus, will cause them to be open at improper times. Besides, the cocks are not turned in an instant, and are improperly open during some very small time; but this contrivance completely obviates the difficulty.

The cock is precisely similar to that formerly described, having one perforation diametrically through it, and another entering at right angles to this, and after reaching the centre, it passes along the axis of the cock, and comes out to the open air.

Its inconveniences remedied.

It is evident, that by this construction of the cock, the ingenious improvement of Dr. Hooke, by which the pressure of the atmosphere on one piston is made to balance, in great part, the pressure on the other, is given up: for, whenever the communication with the air is opened, it rushes in, and immediately balances the pressure on the upper side of the piston in this barrel; so that the whole pressure in the other must be overcome by the person working the pump. Gravesande, aware of this, put a valve on the orifice of the cock; that is, tied a slip of wet bladder or oiled leather across it; and now the piston is pressed down, as long as the air in the barrel is rarer than the outward air, in the same manner as when the valve is in the piston itself.

This is all that is necessary to be described in Mr. s'Gravesande's air pump. Its performance is highly extolled by him, as far exceeding his former pumps with valves. The same preference was given to it by his successor Muschenbrock. But, while they both prepared the pistons and valves and leathers of the pump, by steeping them in oil, and then in a mixture of water and spirits of wine, we are certain that no just estimate could be made of its performance. For with this preparation it could not bring the gage within one-fifth of an inch of the barometer. We even see other limits to its rarefaction: from its construction, it is plain that a very considerable space is left between the piston and cock, not less than an inch, from which the air is never expelled; and if this be made extremely small, it is plain that the pump must be worked very slow, otherwise there will not be time for the air to diffuse itself from the receiver into the barrel, especially towards the end, when the expelling force, viz. the elasticity of the remaining air, is very small. There is also the same limit to the rarefaction, as in Hooke's or Hawkesbee's pump, opposed by the valve, which will not open till the air below the piston is considerably denser than the external air; and this pump soon lost any advantages it possessed when fresh from the workman's hands, by the cock's growing loose and admitting air. It is surprising that Gravesande omitted Hawkesbee's security against this, by placing the barrels in a dish filled with oil; which would effectually have prevented this inconvenience.

Advantage of short barrels

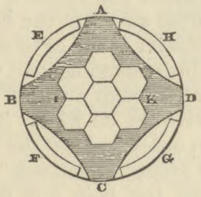
We must not omit a seemingly paradoxical observation of s'Gravesande, that in a pump constructed with valves, and worked with a determined uniform velocity, the required degree of rarefaction is sooner produced by short barrels than by long ones. It would require too much time to give a general demonstration of this, but it will easily be seen by an example. Suppose the long barrel to have equal capacity with the receiver, then at the end of the first stroke the air in the receiver will have one-half its natural density. Now, let the short barrels have half this capacity: at the end of the first stroke the density of the air in the receiver is two-thirds, and at the end of the second stroke it is four-ninths, which is less than one-half, and the two strokes of the short barrel are supposed to be made in the same time with one of longest, &c.

The valve pump improved by Smeaton.

Hawkesbee's pump maintained its pre-eminence without rival in Britain, till about the year 1750, when it engaged the attention of Mr. John Smeaton. He was then a maker of philosophical instruments, and made many attempts to perfect the pumps with cocks, but found, that whatever perfection he could bring them to, he could not enable them to preserve it; and he never would sell one of this construction. He therefore attached himself solely to the valve pumps.

The first thing was to diminish the resistance to the entry of the air from the receiver into the barrels; and this he rendered almost nothing, by enlarging the surface on which this feebly elastic air was to press. Instead of making these valves to open by its pressure on a circle of one-twentieth of an inch in diameter, he made the valve-hole one inch in diameter, enlarging the surface 400 times; and, to prevent this piece of thin leather from being burst by the great pressure on it, when the piston in its descent was approaching the bottom of the barrel, he supported it by a delicate but strong grating, dividing the valve-hole like the section of a honey-comb, as represented in fig. 24; and the ribs of this grating are seen edgewise in fig. 25, at *a b c*.

Fig. 24.



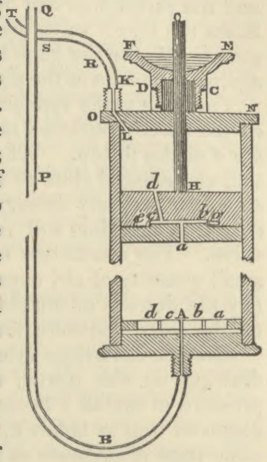
The valve was a piece of thin membrane or oiled silk, gently strained over the mouth of the valve-hole, and tied on by a fine silk thread wound round it in the same manner that the narrow slips had been tied on formerly. This done, he cut with a pointed knife the leather round the edge, nearly four quadrantal arcs, leaving a small tongue between each, as in fig. 24. The strained valve immediately shrinks inwards, as represented by the shaded parts; and the strain by which it is kept down is now greatly diminished, taking place only at the corners. The gratings being reduced nearly to an edge (but not quite, lest they should cut), there is very little pressure to produce adhesion by the clammy oil. Thus it appears, that a very small elasticity of the air in the receiver will be sufficient to raise the valve; and Mr. Smeaton found, that when it was not able to do this at first, when only about $\frac{1}{600}$ of the natural elasticity, it would do it after keeping the piston up eight or ten seconds, the air having been all the while undermining the valve, and gradually detaching it from the grating.

Unfortunately he could not follow this method with the piston valve. There was not room round the rod for such an expanded valve; and it would have obliged him to have a great space below the valve, from which he could not expel the air by the descent of the piston. His ingenuity hit on a way of increasing the expelling force through the common valve. He inclosed the rod of the piston in a collar of leather D C (fig. 25,) through which it moved freely without allowing any air to get past its sides. For greater security, the collar of leather was contained in a box terminating in a cup filled with oil. As this makes a material change in the principle of construction of the air-pump, and indeed of pneumatic engines in general, and as it has been adopted in all the subsequent attempts to improve them, it merits a particular consideration.

Structure of his piston.

The piston itself consists of two pieces of brass fastened by screws from below. The uppermost, which is of one solid piece with the rod GH (fig. 25), is of a diameter somewhat less than the barrel; so that when they are screwed together, a piece of leather soaked in a mixture of boiled oil and tallow, is put between them; and when the piston is thrust into the barrel from above, the leather comes up around the side of the piston, and fills the barrel, making the piston perfectly air-tight. The lower half of the piston projects upwards into the upper, which has a hollow *g b c e* to receive it. There is a small hole through the lower half at *a* to admit the air; and a hole *c d* in the upper half to let it through, and there is a slip of oiled silk strained across the hole *a* by way of valve, and there is room enough left at *b c* for this valve to rise a little when pressed from below. The rod GH passes through the piece of brass which forms the top of the barrel so as to move freely, but without any sensible shake: this top is formed into a hollow box, consisting of two pieces ECDF and CNOD, which screw together at CD. This box is filled with rings of oiled leather exactly fitted to its diameter, each having a hole in it for the rod to pass through. When the piece ECDF is screwed down, it compresses the leathers; squeezing them to the rod, so that no air can pass between them; and, to secure us against all ingress of air, the upper part is formed into a cup EF, which is kept filled with oil.

Fig. 25.



The top of the barrel is also pierced with a hole LK, which rises above the flat surface NO, and has a slip of oiled silk tied over it to act as a valve; opening when pressed from below, but shutting when pressed from above.

The communication between the barrel and receiver is made by means of the pipe ABPQ; and there goes from the hole K in the top of the barrel a pipe KRST, which either communicates with the open air or with the receiver, by means of the cock at its extremity T. The conduit pipe ABPQ has also a cock at Q, by which it is made to communicate either with the receiver or with the open air. These channels of communication are variously conducted and terminated, according to the views of the maker. The sketch in this figure is sufficient for explaining the principle, and is suited to the general form of the pump, as it has been frequently made by Nairne and other artists in London.

Superiority of this construction.

Let us now suppose the piston at the top of the barrel, that it applies to it all over, and that the air in the barrel is very much rarefied: In the common pump the piston valve is pressed hard down by the atmosphere, and continues shut till the piston gets far down, condenses the air below it beyond its natural state, and enables it to force up the valves. But here, as soon as the piston quits the top of the barrel, it leaves a void behind it; for no air gets in round the piston rod, and the valve at K is shut by the pressure of the atmosphere. There is nothing now to oppose the elasticity of the air below but the stiffness of the valve *b c*; and thus the expelling (or more accurately the liberating) force is prodigiously increased.

The superiority of this construction will be best seen by an example. Suppose the stiffness of the valve equal to the weight of 1-10th of an inch of mercury, when the barometer stands at 30 inches, and that the pump-gage stands at 29·9; then, in an ordinary pump, the valve in the piston will not rise till the piston has got within the 300th part of the bottom of the barrel, and it will leave the valve-hole filled with air of the ordinary density. But in this pump the valve will rise as soon as the piston quits the top of the barrel; and when it is quite down, the valve-hole *a* will contain only the 300th part of the air which it would have contained in a pump of the ordinary form. Suppose, farther, that the barrel is of equal capacity with the receiver, Air-pump.

and that both pumps are so badly constructed, that the space left below the piston is the 300th part of the barrel. In the common pump the piston valve will rise no more, and the rarefaction can be carried no farther, however delicate the barrel valve may be; but in this pump the next stroke will raise the gage to 29·95, and the piston valve will again rise as soon as the piston gets half way down the barrel.

The limit to the rarefaction by this pump depends chiefly on the space contained in the hole LK, and in the space *b c d* of the piston. When the piston is brought up to the top, and applied close to it, those spaces remain filled with air of the ordinary density, which will expand as the piston descends, and thus will retard the opening of the piston valve. The rarefaction will stop when the elasticity of this small quantity of air, expanded so as to fill the whole barrel (by the descent of the piston to the bottom), is just equal to the force requisite for opening the piston valve.

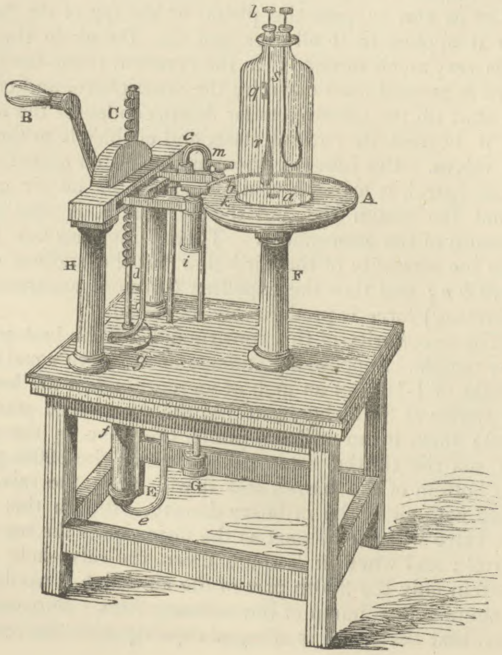
Another advantage attending this construction is, that in drawing up the piston, we are not resisted by the whole pressure of the air; because the air is rarefied above this piston as well as below it, and the piston is in precisely the same state of pressure as if connected with another piston in a double pump. The resistance to the ascent of the piston is the excess of the elasticity of the air above it over the elasticity of the air below; this, toward the end of the rarefaction, is very small, while the piston is near the bottom of the barrel, but gradually increases as the piston rises, and reduces the air above it into smaller dimensions, and becomes equal to the pressure of the atmosphere, when the air above the piston is of the common density. If we should raise the piston still farther, we must condense the air above it; but Mr. Smeaton has here made an issue for the air by a small hole in the top of the barrel, covered with a delicate valve. This allows the air to escape, and shuts again as soon as the piston begins to descend, leaving almost a perfect void behind it as before.

This pump has another advantage. It may be changed in a moment from a rarefying to a condensing engine, by simply turning the cocks at Q and T. Whilst T communicates with the open air and Q with the receiver, it is a rarefying engine or air-pump; but when T communicates with the receiver, and Q with the open air, it is a condensing engine.

Description of Smeaton's pump.

Fig. 26 represents Mr. Smeaton's air-pump as it was usually made by Nairne. Upon a solid base or table are set up three pillars F, H, H; the pillar F supports the pump-plate A, and the pillars H, H, support the front or head, containing a brass cog-wheel, which is turned by the handle B, and works in the rack C fastened to the upper end of the piston rod. The whole is still farther steadied by two pieces of brass *n* and *h*, which connect the pump-plate with the front, and have perforations communicating between the hole *a* in the middle of the plate and the barrel, as will be described immediately. DE is the barrel of the pump, firmly fixed to the table by screws through its upper flanch; *e f d c* is a slender brass tube screwed to the bottom of the barrel, and to the under side of the horizontal canal *n*. In this canal there is a cock *m*, which opens a communication between the barrel and the receiver, when the key is in the position represented here; but when the key is at right angles with this position, this communication is cut off. If that side of the key which is here drawn next to the pump-plate be turned outward, the external air is admitted into the receiver; but if turned inwards, the air is admitted into the barrel.

Fig. 26.



g h is another slender brass pipe, leading from the discharging valve at *g* to the horizontal canal *h k*, to the under side of which it is screwed fast. In this horizontal canal there is a cock *n* which opens a passage from the barrel to the receiver when the key is in the position here drawn; but opens a passage from the barrel to the external air when the key is turned outwards, and from the receiver to the external air when the key is turned inwards. This communication with the external air is not immediate but through a sort of box *i*; the use of this box is to receive the oil which is discharged through the top valve *g*. In order to keep the pump tight, and in working order, it is proper sometimes to pour a table-spoonful of olive oil into the hole *a* of the pump-plate, and then to work the pump. The oil goes along the conduit *b c d f e*, gets into the barrel and through the piston-valve, when the piston is pressed to the bottom of the barrel, and is then drawn up, and forced through the discharging valve *g* along the pipe *g h*, the horizontal passage *h n*, and finally into the box *i*. This box has a small hole in its side near the top, through which the air escapes.

From the upper side of the canal *n* there arises a slender pipe which bends outward and then turns downwards, and is joined to a small box, which cannot be seen in this view. From the bottom of this box proceeds downwards the gage-pipe of glass, which enters the cistern of mercury G fixed below.

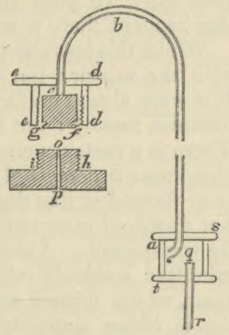
On the upper side of the other canal there is a small stud, having a short pipe of glass projecting horizontally from it, close by and parallel to the front piece of the pump, and reaching to the other canal. This pipe is close at the farther end, and has a small drop of mercury or oil in it. This serves as a gage in condensing, indicating the degree of condensation by the place of the drop; for this drop is forced along the pipe, condensing the air before it in the same degree that it is condensed in the barrel and receiver.

Method of joining together the different pipes, &c.

In constructing this pump, Mr. Smeaton introduced a method of joining together the different pipes and other pieces, which has great advantages over the usual manner of screwing them together with leather between, and which is now much used in hydraulic and pneumatic engines. We shall explain this to our readers by a description of the manner in which the exhausting gage is joined to the horizontal duct *c b*.

The piece *h i p*, in fig, 27, is the same with the little cylinder observable on the upper side of the horizontal canal *n*, in fig. 26. The upper part *h i* is formed into an outside screw, to fit the hollow screw of the piece *d e e d*. The top of this last piece has a hole in its middle, giving an easy passage to the bent tube *c b a*, so as to slip along it with freedom. To the end *c* of this bent tube is soldered a piece of brass *c f g*, perforated in continuation of the tube, and having its end ground flat on the top of the piece *h i p*, and also covered with a slip of thin leather strained across it and pierced with a hole in the middle.

Fig. 27.



It is plain from this form, that if the surface *f g* be applied to the top of *h i*, and the cover *d e e d* be screwed down on it, it will draw or press them together, so that no air can escape by the joint, and this without turning the whole tube *c b a* round, as is necessary in the usual way. This method is now adopted for joining together the conducting pipes of the machines for extinguishing fires, an operation which was extremely troublesome before this improvement.

The conduit pipe E *e f c* (fig. 26), is fastened to the bottom of the barrel, and the discharging pipe *g h* to its top, in the same manner. But to return to the gage; the bent pipe *c b a* (fig. 27), enters the box *s t* near one side, and obliquely, and the gage-pipe *q r* is inserted through its bottom towards the opposite side. The use of this box is to catch any drops of mercury which may sometimes be dashed up through the gage-pipe by an accidental oscillation. This, by going through the passages of the pump, would corrode them, and would act particularly on the joints, which are generally soldered with tin. When this happens to an air-pump, it must be cleaned with the most scrupulous attention, otherwise it will be quickly destroyed.

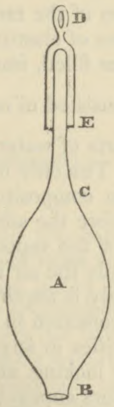
Great powers of this pump.

This account of Smeaton's pump is sufficient for enabling the reader to understand its operation and to see its superiority. It is reckoned a very fine pump of the ordinary construction which will rarefy 200 times, or raise the gage to 29·85, the barometer standing at 30. But Mr. Smeaton found, that his pump, even after long using, raised it to 29·95, which we consider as equivalent to rarefying 600 times. When in fine order, he found no bounds to its rarefaction, frequently raising the gage as high as the barometer; and he thought its performance so perfect,[1] that the barometer-gage was not sufficiently delicate for measuring the rarefaction. He therefore substituted the syphon-gage already described, which he gives some reasons for preferring; but even this he found not sufficiently sensible.

Another contrivance of Smeaton's.

He contrived another, which could be carried to any degree of sensibility. It consisted of a glass body A (fig. 28), of a pear shape, and was therefore called the pear-gage. This had a small projecting orifice at B, and at the other end a tube CD, whose capacity was the hundredth part of the capacity of the whole vessel. This was suspended at the slip-wire of the receiver, and there was set below it a small cup with mercury. When the pump was worked, the air in the pear-gage was rarefied along with the rest. When the rarefaction was brought to the degree intended, the gage was let down till B reached the bottom of the mercury. The external air being now let in, the mercury was raised into the pear, and stood at some height E in the tube CD. The length of this tube being divided into 100 parts, and those numbered from D, it is evident that $\frac{DE}{DB}$ will express the degree of rarefaction which had been produced when the gage was immersed into the mercury; or if DC be $\frac{1}{100}$ of the whole capacity, and be divided into 100 parts by a scale annexed to it, each unit of the scale will be $\frac{1}{10000}$ of the whole.

Fig. 28.



This was a very ingenious contrivance, and has been the means of making some very curious and important discoveries. By this gage Mr. Smeaton found, that his pump frequently rarefied a thousand, ten thousand, nay, an hundred thousand times. But though he in every instance saw the great superiority of his pump above all others, he frequently found irregularities which he could not explain, and a want of correspondence between the pear and the barometer gages which puzzled him. The pear-gage frequently indicated a prodigious rarefaction, when the barometer-gage would not show more than 600.

These unaccountable phenomena excited the curiosity of philosophers, who by this time were making continual use of the air-pump in their meteorological researches, and much interested in everything connected with the state or constitution of elastic fluids. Mr. Nairne, a most ingenious and accurate maker of philosophical instruments, made many curious experiments in the examination and comparison of Mr. Smeaton's pump with those of the usual construction, attending to every circumstance which could contribute to the inferiority of the common pumps or to their improvement, so as to bring them nearer to this rival machine. This rigorous comparison brought into view several circumstances in the constitution of the atmospheric air, and its relation to other bodies, which are of the most extensive and important influence in the operations of nature. We shall notice at present such only as have a relation to the operation of the air-pump in extracting AIR from the receiver.

Experiments with it by Mr. Nairne.

Mr. Nairne found, that when a little water, or even a bit of paper damped with water, was exposed under the receiver of Mr. Smeaton's air-pump, when in the most perfect condition, raising the mercury in the barometer-gage to 29·95, he could not make it rise above 29·8 if Fahrenheit's thermometer indicated the temperature 47°, nor above 29·7 if the thermometer stood at 55°; and that to bring the gage to this height and keep it there, the operation of the pump must be continued for a long time after the water had disappeared or the paper become perfectly dry. He found that a drop of spirits, or paper moistened with spirits, could not in those circumstances allow the mercury in the gage to rise to near that height; and that similar effects followed from admittting any volatile body whatever into the receiver or any part of the apparatus. This showed him at once how improper were the directions which had been given by Guericke, Boyle, Gravesande, and others, for fitting up the air-pump for experiment, by soaking the leather in water, covering the joints with water, or in short, admitting water or any volatile body near it.

He therefore took his pumps to pieces, cleared them of all the moisture which he could drive from them by heat, and then leathered them anew with leather soaked in a mixture of olive oil and tallow, from which he had expelled all the water it usually contains, by boiling it till the first frothing was over. When the pumps were fitted up in this manner, he uniformly found that Mr. Smeaton's pump rarefied the gage to 29·95, and the best common pump to 29·87, the first of which he computed to indicate a rarefaction to 600, and the other to 230. But in this state he again found that a piece of damp paper, leather, wood, &c. in the receiver, reduced the performance in the same manner as before.

Remarkable phenomenon.

But the most remarkable phenomenon was, that when he made use of the pear-gage with the pump cleared from all moisture, it indicated the same degree of rarefaction with the barometer-gage; but when he exposed a bit of paper moistened with spirits, and thus reduced the rarefaction of the pump to what he called 50, the barometer-gage standing at 29·4, the pear-gage indicated a rarefaction exceeding 100,000. In short, it was not measurable; and this phenomenon was almost constant. Whenever he exposed any substance susceptible of evaporation, he found the rarefaction indicated by the barometer-gage greatly reduced, whilst that indicated by the pear-gage was prodigiously increased; and both these effects were the more remarkable as the subject was of easier evaporation, or the temperament of the air of the chamber was warmer.

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[1] This can only be explained by supposing that Mr. Smeaton employed an imperfect barometer.

This uniform result suggested the true cause. Water boils at the temperature of 212°, that is, it is then converted into a vapour which is permanently elastic while of that temperature, and its elasticity balances the pressure of the atmosphere. If this pressure be diminished by rarefying the air above it, a low temperature will now allow it to be converted into elastic vapour, and keep it in that state. Water will boil in the receiver of an air-pump at the temperature of 96°, or even under it. Philosophers did not think of examining the state of the vapour in temperatures lower than what produced ebullition. But it now appears, that in much lower heats than this the superficial water is converted into elastic vapour, which continues to exhale from it as long as the water lasts, and, supplying the place of air in the receiver, exerts the same elasticity, and hinders the mercury from rising in the gage in the same manner as so much air of equal elasticity would have done.

Experiments illustrative of this account.

When Mr. Nairne was exhibiting these experiments to the Hon. Henry Cavendish in 1770, this gentleman informed him that it appeared from a series of experiments of his father Lord Charles Cavendish, that when water is of the temperature 72°, it is converted into vapour, under any pressure less than three-fourths of an inch of mercury, and at 41° it becomes vapour when the pressure is less than one-fourth of an inch: even mercury evaporates in this manner when all pressure is removed. A dewy appearance is frequently observed covering the inside of the tube of a barometer, where we usually suppose a vacuum. This dew, when viewed through a microscope, appears to be a set of detached globules of mercury, and upon inclining the tube so that the mercury may ascend along it, these globules will be all licked up, and the tube become clear. The dew which lined it was the vapour of the mercury condensed by the side of the tube; and it is never observed but when one side is exposed to a stream of cold air from a window, &c.

To return to the vapour in the air-pump receiver; it must be observed, that as long as the water continues to yield it, we may continue to work the pump; and it will be continually abstracted by the barrels, and discharged in the form of water, because it collapses as soon as exposed to the external pressure. All this while the gage will not indicate any more rarefaction, because the thing immediately indicated by the barometer-gage is *diminished elasticity*, which does not happen here. When all the water which the temperature of the room can keep elastic has evaporated under a certain pressure, suppose half an inch of mercury, the gage standing at 29·5, the vapour which now fills the receiver expands, and by its diminished elasticity the gage rises, and now some more water which had been attached to bodies by chemical or corpuscular attraction is detached, and a new supply continues to support the gage at a greater height; and this goes on continually till *almost* all has been abstracted. But there will remain some which no art can take away; for as it passes through the barrels, and gets between the piston and the top, it successively collapses into water during the ascent of the piston, and again expands into vapour when we push the piston down again. Whenever this happens there is an end of the rarefaction.

Air and vapour not uniformly mixed together.

Whilst this operation is going on, the air comes out along with the vapour; but we cannot say in what proportion. If it were always uniformly mixed with the vapour, it would diminish rapidly; but this does not appear to be the case. There is a certain period of rarefaction in which a transient cloudiness is perceived in the receiver. This is watery vapour formed at that degree of rarefaction, mingled with, but not dissolved in or united with, the air, otherwise it would be transparent. A similar cloud will appear if damp air be admitted suddenly into an exhausted receiver. The vapour, which formed an uniform transparent mass with the air, is either suddenly expanded and thus detached from the other ingredient, or is suddenly let go by the air, which expands more than it does. We cannot affirm with probability which of these is the case. Different compositions of air, that is, air loaded with vapours from different substances, exhibit remarkable differences in this respect. But we see from this and other phenomena, which shall be mentioned in their proper places, that the air and vapour are not always intimately united; and therefore will not always be drawn out together by the air-pump. But let them be ever so confusedly blended, we see that the air must come out along with the vapour, and its quantity remaining in the receiver must be prodigiously diminished by this association, probably much more than could be, had the receiver only contained pure air.

Consequences of this.

Let us now consider what must happen in the pear-gage. As the air and vapour are continually drawn off from the receiver, the air in the pear expands and goes off with it. We shall suppose that the generated vapour hinders the gage from rising beyond 29·5. During the continued working of the pump, the air in the pear, whose elasticity is 0·5, slowly mixes with the vapour at the mouth of the pear, and the mixture even advances into its inside, so that if the pumping be long enough continued, what is in the pear is nearly of the same composition with what is in the receiver, consisting perhaps of 20 parts of vapour and one part of air, all of the elasticity of 0·5. When the pear is plunged into the mercury, and the external air allowed to get into the receiver, the mercury rises in the pear-gage, and leaves not $\frac{1}{60}$, but $\frac{1}{60\times 20}$ or $\frac{1}{1200}$ of it filled with common air, the vapour having collapsed into an invisible atom of water. Thus the pear-gage will indicate a rarefaction of 1200, while the barometer-gage only showed 60, that is, showed the elasticity of the included substance diminished 60 times. The conclusion to be drawn from these two measures (the one of the rarefaction of air, and the other of the diminution of elasticity) is, that the matter with which the receiver was filled, immediately before the readmission of the air, consisted of one part of incondensible air, and $\frac{1200}{60}$, or 20 parts of watery vapour.

Difficulty in accounting for some of these.

The only obscure part of this account is what relates to the composition of the matter which filled the pear-gage before the admission of the mercury. It is not easy to see how the vapour of the receiver comes in by a narrow mouth while the air is coming out by the same passage. Accordingly it requires a very long time to produce this extreme rarefaction in the pear-gage; and there are great irregularities in any two succeeding experiments, as may be seen by looking at Mr. Nairne's account of them.[1] Some vapours appear to have mixed much more readily with the air than others; and there are some unaccountable cases where vitriolic acid and sulphureous bodies were included, in which the dimunition of density indicated by the pear-gage was uniformly less than the diminution of elasticity indicated by the barometer-gage. It is enough for us at present to have established, by unquestionable facts, this production of elastic vapour, and the necessity of attending to it, both in the construction of the air-pump, and in drawing results from experiments exhibited in it.

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[1] *Phil. Trans.* vol. lxvii.

Two new improvements.

Mr. Smeaton's pump, when in good order, and perfectly free from all moisture, will in dry weather rarefy air about 600 times, raising the barometer-gage to within $\frac{1}{20}$th of an inch of a fine barometer. This was a performance so much superior to that of all others, and by means of Mr. Nairne's experiments opened so new a field of observation, that the air-pumps once more became a capital instrument among the experimental philosophers. The causes of its superiority were also so distinct, that artists were immediately excited to a farther improvement of the machine; so that this becomes a new epoch in its history.

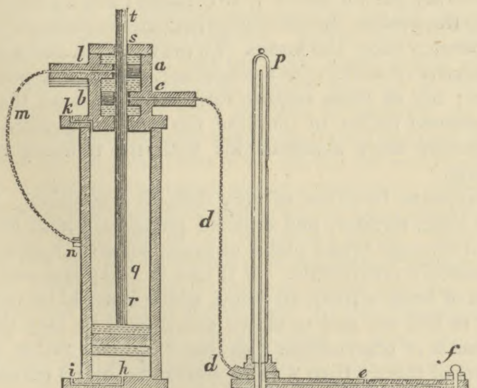
Improvements in this pump attempted.

There is one imperfection which Mr. Smeaton has not attempted to remove. The discharging valve is still opened against the pressure of the atmosphere. An author of the Swedish academy adds a subsidiary pump to this valve, which exhausts the air from above it, and thus puts it in the situation of the piston valve. We do not find that this improvement has been adopted so as to become general. Indeed the quantity of air which remains in the passage to this valve is so exceedingly little, that it does not seem to merit attention. Supposing the valve hole $\frac{1}{20}$th of an inch wide and as deep (and it need not be more), it will not occupy more than $\frac{1}{9000}$th part of a barrel twelve inches long and two inches wide.

Mr. Smeaton, by his ingenious construction, has greatly diminished, but has not annihilated, the obstructions to the passage of the air from the receiver into the barrel. His success encouraged farther attempts. One of the first and most ingenious was that of Professor Russell of the University of Edinburgh, who, about the year 1770, constructed a pump in which both cocks and valves were avoided.

The piston is solid, as represented in fig. 28, and its rod passes through a collar of leather on the top of the barrel. This collar is divided into three portions by two brass rings *a*, *b*, which leave a very small space round the piston rod. The upper ring *a* communicates by means of a lateral perforation with the bent tube, *l m n*, which enters the barrel at its middle *n*. The lower ring *b* communicates with the bent tube *c d*, which communicates with the horizontal passage *d e* going to the middle *e* of the pump plate. By the way, however, it communicates also with a barometer gage *p o*, standing in a cistern of mercury *o*, and covered with a glass tube close at the top. Beyond *e*, on the opposite circumference of the receiver plate, there is a cock or plug *f* communicating with the atmosphere.

Fig. 28.



The piston rod is closely embraced by the three collars of leather; but, as already said, has a free space round it in the two brass rings. To produce this pressure of the leathers to the rod, the brass rings which separate them are turned thinner on the inner side, so that their cross section along a diameter would be a taper wedge. In the side of the piston rod are two cavities *q r*, *t s*, about one-tenth of an inch wide and deep, and of a length equal to the thickness of the two rings *a b*, and the intermediate collar of leathers. These cavities are so placed on the piston-rod, that when the piston is applied to the bottom of the barrel, the cavity *t s* in the upper end of the rod has its upper end opposite to the ring *a*, and its lower end opposite to the ring *b*, or to the mouth of the pipe *c d*. Therefore, if there be a void in the barrel, the air from the receiver will come from the pipe *c d*, into the cavity in the piston-rod, and by it will get past the collar of leather between the rings, and thus will get into the small interstice between the rod and the upper ring, and then into the pipe *l m n*, and into the empty barrel. When the piston is drawn up, the solid rod immediately shuts up this passage, and the piston drives the air through the discharging valve *k*. When it has reached the top of the barrel, and is closely applied to it, the cavity *q r* is in the situation in which *t s* formerly was, and the communication is again opened between the receiver and the empty barrel, and the air is again diffused between them. Pushing down the piston expels the air by the lower discharging pipe and valve *h i*; and thus the operation may be continued.

This must be acknowledged to be a most simple and ingenious construction, and can neither be called a cock nor a valve. It seems to oppose no obstruction whatever; and it has the superior advantage of rarefying both during the ascent and the descent of the piston, doubling the expedition of the performance, and the operator is not opposed by the pressure of the atmosphere except towards the end of each stroke. The expedition, however, is not so great as one should expect; for nothing is going on while the piston is in motion, and the operator must stop a while at the end of each stroke, that the air may have time to come through this long, narrow, and crooked passage, to fill the barrel. But the chief difficulty which occurred in the execution arose from the clammy oil with which it was necessary to impregnate the collar of leathers. These were always in a state of strong compression, that they might closely grasp the piston rod, and prevent all passage of air during the motion of the piston. Whenever therefore the cavities in the piston rod come into the situations necessary for connecting the receiver and barrel, this oil is squeezed into them, and choaks them up. Hence it always happened that it was some time after the stroke before the air could force its way round the piston rod, carrying with it the clammy oil which choaked up the tube *l m n*; and when the rarefaction had proceeded a certain length, the diminished elasticity of the air was not able to make its way through these obstructions.

Mr. Cavallo[1] has given the description of an air-pump contrived and executed by Messrs Hans and Hurter, instrument makers in London, where these artists revived Guericke's method of opening the barrel-valve during the last strokes of the pump by a force acting from without. We shall insert as much of this description as relates to the distinguishing circumstance of its construction.

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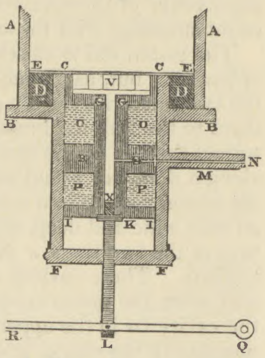
[1] *Phil. Trans.* vol. lxxiii.

Air-pump. Fig. 29 represents a section of the bottom of the barrel, where AA is the barrel, and BB the bottom, which has in its middle a hollow cylinder CCFF, projecting about half an inch into the barrel at CC, and extending a good way downwards to FF. The space between this projection and the sides of the barrel is filled up by a brass ring DD, over the top of which is strained a piece of oiled silk EE, which performs the office of a valve, covering the hole CC. But this hole is filled up by a piece of brass, or rather an assemblage of pieces screwed together GG, HH, II. It consists of three projecting fillets or shoulders GG, HH, II, which form two hollows between them, and which are filled with rings of oiled leather OO, PP, firmly screwed together. The extreme fillets GG, II, are of equal diameter with the inside of the cylinder, so as to fill it exactly, and the whole stuffed with oiled leather, slide up and down without allowing any air to pass. The middle fillet HH is not so broad, but thicker. In the upper fillet GG there is formed a shallow dish about $\frac{1}{8}$ of an inch deep and $\frac{3}{4}$ wide. This dish is covered with a thin plate, pierced with a grating like Mr. Smeaton's valve plate. There is a perforation VX along the axis of this piece, which has a passage out at one side H, through the middle fillet. Opposite to this passage, and in the side of the cylinder CC,FF, is a hole M, communicating with the conduit pipe MN, which leads to the receiver. Into the lower end of the perforation is screwed the pin KL, whose tail L passes through the cap FF. The tail L is connected with a lever RQ, moveable round the joint Q. This lever is pushed upwards by a spring, and thus the whole piece which we have been describing is kept in contact with the slip of oiled silk or valve EE. This is the usual situation of things.

Fig. 29.

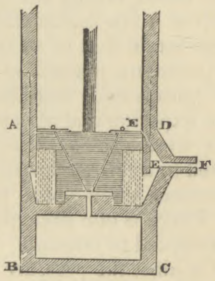


Now suppose a void formed in the barrel by drawing up the piston; the elasticity of the air in the receiver, in the pipe MN, and in the passage XV, will press on the great surface of the valve exposed through the grating, will raise it, and the pump will perform precisely as Mr. Smeaton's does. But suppose the rarefaction to have been so long continued, that the air is no longer able to raise the valve; this will be seen by the mercury rising no more in the pump-gage. When this is perceived, the operator must press with his foot on the end R of the lever RQ. This draws down the pin KL, and with it the whole hollow plug with its grated top. And thus, instead of raising the valve from its plate, the plate is here drawn down from the valve. The air now gets in without any obstruction whatever, and the rarefaction proceeds as long as the piston rises. When it is at the top of the barrel, the operator takes his foot from the lever, and the spring presses up the plug again and shuts the valve. The piston rod passes through a collar of leather, as in Mr. Smeaton's pump, and the air is finally discharged through an outward valve in the top of the barrel. These parts have nothing peculiar in them.

This is an ingenious contrivance, similar to what was adapted by Guericke himself; and we have no doubt of these pumps performing extremely well if carefully made; and it seems not difficult to keep the plug perfectly air-tight by supplying plenty of oil to the leathers. We cannot say, however, with precision, what may be expected from it, as no account has been given of its effects, besides what Mr. Cavallo published in the *Philosophical Transactions* for 1783, where he only says, that when it had been long used, it had, in the course of some experiments, rarefied 600 times.

Air-pump. Prince. Aiming still at the removing the obstructions to the entry of the air from the receiver into the barrels, Mr. Prince, an American, has constructed a pump in which there is no valve or cock whatever between them. In this pump the piston rod passes through a collar of leather, and the air is finally discharged through a valve, as in the two last. But we are chiefly to attend, in this place, to the communication between the barrel and the receiver. The barrel widens below into a sort of cistern ABCD, communicating with the receiver by the pipe EF. As soon, therefore, as the piston gets into this wider part, where there is a vacancy all round it, the air of the receiver expands freely through the passage FEE into the barrel, in which the descent of the piston had made a void. When the piston is again drawn up, as soon as it gets into the cylindric part of the barrel, which it exactly fills, it carries up the air before it, and expels it by the top valve; and, that this may be done more completely, this valve opens into a second barrel or air-pump whose piston is rising at the same time, and therefore the valve of communication (which is the discharging valve of the primary pump) opens with the same facility as Mr. Smeaton's piston valve. While the piston is rising, the air in the receiver expands into the barrel; and when the piston descends, the air in the barrel again collapses till the piston gets again into the cistern, when the air passes out, and fills the evacuated barrel, to be expelled by the piston as before.

Fig. 30.



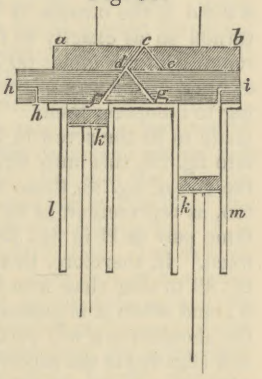
No distinct account has yet been given of the performance of this pump. We only learn that great inconveniences were experienced from the oscillations of the mercury in the gage. As soon as the piston comes into the cistern, the air from the receiver immediately rushes into the barrel, and the mercury shoots up in the gage, and gets into a state of oscillation. The subsequent rise of the piston will frequently keep time with the second oscillation, and increase it. The descent of the piston produces a downward oscillation, by allowing the air below it to collapse; and by improperly timing the strokes, this oscillation becomes so great as to make the mercury enter the pump. To prevent this, and a greater irregularity of working as a condenser, valves were put in the piston; but as these require force to open them, the addition seemed rather to increase the evil, by rendering the oscillations more simultaneous with the ordinary rate of working.

It appears, however, of very difficult execution. It has many long, slender, and crooked passages, which must be drilled through broad plates of brass, some of them appearing scarcely practicable. It is rare to find plates and other pieces of brass without air-holes, which it would be very difficult to find out and to close; and it must be very difficult to clear it of obstructions; so that it appears rather a suggestion of theory than a thing warranted by its actual performance.

Lavoisier M. Lavoisier, or some of the philosophers who were occupied in concert with him in the investigation of the different species of gas which are disengaged from bodies in the course of chemical operations, contrived an air-pump which has great appearance of simplicity, and, being very different from all others, deserves to be taken notice of.

It consists of two barrels *l*, *m*, (fig. 31) with solid pistons *k k*. The pump plate *a b* is pierced at its centre *c* with a hole which branches towards each of the barrels, as represented by *c d*, *c e*. Between the plate and the barrels slides another plate *h i*, pierced in the middle with a branched hole *f d g*, and near the ends with two holes *h h*, *i i*, which go from its under side to the ends. The holes in these two plates are so adjusted, that when the plate *h i* is drawn so far towards *h* that the hole *i* comes within the barrel *m*, the branch *d f* of the hole in the middle plate coincides with the branch *cd* of the upper plate, and the holes *e g* are shut. Thus a communication is established between the barrel *l* and the receiver on the pump-plate, and between the barrel *m* and the external air. In this situation the barrel *l* will exhaust, and *m* will discharge. When the piston of *l* is at its mouth, and that of *m* touches its bottom, the sliding plate is shifted over to the other side, so that *m* communicates with the receiver through the passage *gd*, *ec*, and *l* communicates with the air by the passage *h h*.

Fig. 31.



It is evident that this sliding plate performs the office of four cocks in a very beautiful and simple manner, and that if the pistons apply close to the ends of the barrels so as to expel the whole air, the pump will be perfect. It works, indeed, against the whole pressure of the external air. But this may be avoided by putting valves on the holes *h i*; and these can do no harm, because the air remaining in them never gets back into the barrel till the piston be at the farther end, and the exhaustion of that stroke completed. But the best workmen of London think that it will be incomparably more difficult to execute this cock (for it is a cock of an unusual form), in such a manner that it shall be air-tight and yet move with tolerable ease, and that it is much more liable to wearing loose than common cocks. No accurate accounts have been received of its performance. It must be acknowledged to be ingenious, and it may suggest to an intelligent artist a method of combining common conical cocks upon one axis so as to answer the same purposes much more effectually; for which reason we have inserted it here.

Cuthbertson.

The last improvement which we shall mention, is that published by Mr. Cuthbertson. His pump has given such evidences of its perfection, that we can hardly expect or wish for any thing more complete. But we must be allowed to observe, beforehand, that the same construction was invented, and in part executed, before the end of 1779, by Dr. Daniel Rutherford, then professor of botany in the University of Edinburgh, who was at that time engaged in experiments on the production of air during the combustion of bodies in contact with nitre, and who was vastly desirous of procuring a more complete abstraction of pure aerial matter than could be effected by Mr. Smeaton's pump. The compiler of this article had then an opportunity of perusing the Doctor's dissertation on this subject, which was read in the Philosophical Society of Edinburgh. In this dissertation he appears fully apprised of the existence of pure vital air in the nitrous acid, as its chief ingredient, and as the cause of its most remarkable phenomena, and to want but a step to the discoveries which have ennobled the name of M. Lavoisier. He was particularly anxious to obtain *apart* this distinguishing ingredient in its composition, and, for this purpose, to abstract completely from the vessel in which he subjected it to examination, every particle of elastic matter. The writer of this article proposed to him to cover the bottom of Mr. Smeaton's piston with some clammy matter, which should take hold of the bottom valve, and *start it* when the piston is drawn up. A few days after, the Doctor showed him a drawing of a pump, having a conical metal valve in the bottom, furnished with a long slender wire, sliding in the inside of the piston-rod with a gentle friction, sufficient for lifting the valve, and secured against all chance of failure by a spring a-top, which took hold of a notch in the inside of the piston-rod about a quarter of an inch from the lower end, so as certainly to lift the valve during the last quarter of an inch of the piston's motion. Being an excellent mechanic, he had executed a valve on this principle, and was fully satisfied with its performance. But having already confirmed his doctrines respecting the nitrous acid by incontrovertible experiments, his wishes to improve the air-pump lost their incitement, and he thought no more of it; and not long after this the ardour of the philosophers of the Teylerian Society at Haerlem and Amsterdam excited the efforts of Mr. Cuthbertson, their instrument maker, to the same purpose, and produced the most perfect air-pump that has yet appeared. We shall give a description of it, and an account of its performance, in the inventor's own words.

Cuthbertson's Air-Pump.—On fig. 32 is a perspective view of Cuthbertson's pump, with its two principal gages screwed into their places. These need not be used together, except in cases where the utmost exactness is required. In common experiments one of them is removed, and a stop-screw put in its place. When the pear-gage is used, a small round plate, on which the receiver may stand, must be first screwed into the hole at A; but this hole is stopped on other occasions with a screw. When all the three gages are used, and the receiver is exhausted, the stop-screw B, at the bottom of the pump, must be unscrewed, to admit the air into the receiver; but when they are not all used, either of the other stop-screws will answer this purpose.

Fig. 32.

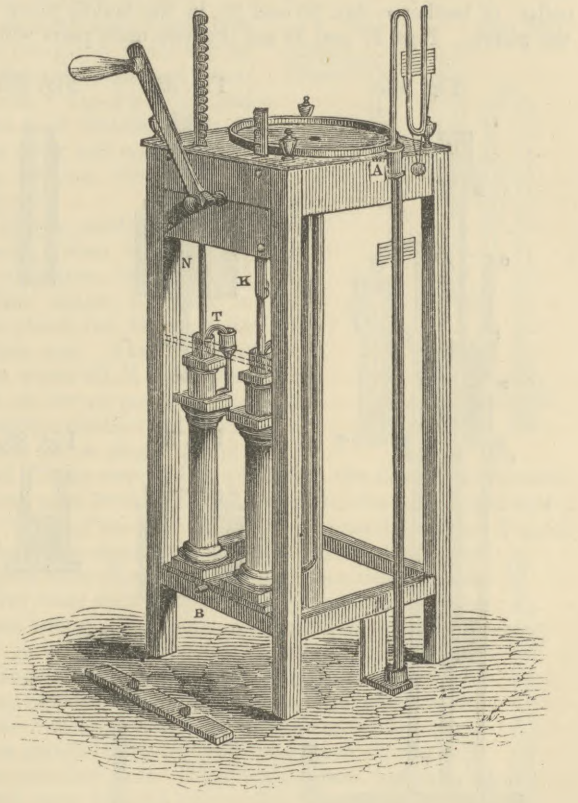


Fig 33 represents a cross bar for preventing the barrels from being shaken by working the pump or by any accident. Its place in fig. 32 is represented by the dotted lines.

Fig. 33.

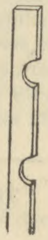


Fig. 34 is a section of one of the barrels, with all its internal parts; and figs. 35, 36, 37, and 38, are different parts of the piston, proportioned in size to one another.[1]

In fig. 34 CD represents the barrel, F the collar of leathers, G a hollow cylindrical vessel to contain oil, R is also an oil-vessel to receive the oil which is drawn, along with the air, through the hole *a a*, when the piston is drawn upwards; and, when this is full, the oil is carried over with the air, along the tube T, into the oil-vessel G; *c c* is a wire which is driven upwards from the hole *a a* by the passage of the air; and as soon as this has escaped, it falls down again by its own weight, shuts up the hole, and prevents all return of the air into the barrel. At *d d* are fixed two pieces of brass, to keep the wire *c c* in a vertical direction, that it may accurately shut the hole. H is a cylindrical wire or rod which carries the piston I, and is made hollow to receive a long wire *g g*, which opens and shuts the hole L; and on the other end of the wire O is screwed a nut, which, by stopping in the narrowest part of the hole, prevents the wire from being driven up too far. This wire and screw are more clearly seen in figs. 35 and 39; they slide in a collar of leather *r*, figs. 35 and 38, in the middle piece of the piston. Figs. 37 and 38 are the two main parts which compose the piston, and when the pieces 36 and 39 are added to it the whole is represented by fig. 35. Fig. 38 is a piece of brass of a conical form, with a shoulder at the bottom. A long hollow screw is cut in it, about two-thirds of its length, and the remainder of the hole, in which there is no screw, is of about the same diameter with the screwed part, except a thin plate at the end, which is of a width exactly equal to the thickness of *g g*, fig. 34. That part of the inside of the conical brass in which no thread is cut, is filled with oiled leathers with holes through which *g g* can slide stifly. There is also a male screw with a hole in it, fitted to *g g*, serving to compress the leathers *r*. In fig. 37, *a a a a* is the outside of the piston, the inside of which is turned so as exactly to fit the outside of fig. 38; *b b* are round leathers about 60 in number, *c c* is a circular piece of brass of the size of the leathers, and *d d* is a screw serving to compress them. The screw at the end of fig. 36 is made to fit the screw in fig. 38. Now if fig. 39 be pushed into fig. 38, this into fig. 37, and fig. 36 be screwed into the end of fig. 38, these will compose the whole of the piston, as represented in fig. 34. H, in fig. 34, represents the same part as H in fig. 35, and is that to which the rack is fixed. If, therefore, this be drawn upwards, it will cause fig. 38 to shut close into fig. 37, and drive out the air above it; and when it is pushed downwards it will open as far as the shoulder *a a* will permit, and suffer air to pass through. AA (fig. 40) is the receiver plate, BB is a long square piece of brass, screwed into the under side of the plate, through which a hole is drilled corresponding to that in the centre of the receiver-plates and with three female screws *a*, *b*, *c*.

Fig. 34.

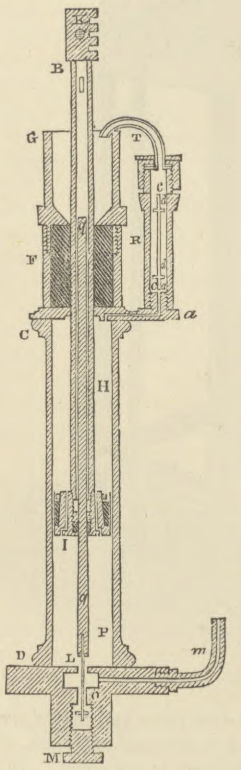


Fig. 35.

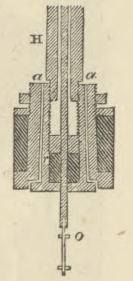


Fig. 36.

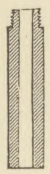


Fig. 37.

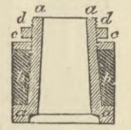


Fig. 38.

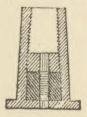


Fig 39.

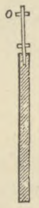
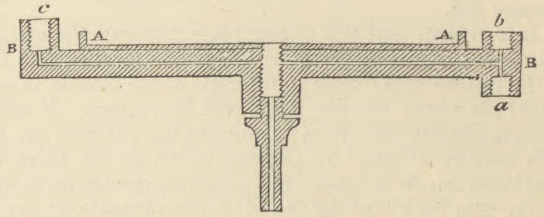


Fig. 40.



The rarefaction of the air in the receiver is effected as follows. Suppose the piston at the bottom of the barrel. The inside of the barrel, from the top of the piston to *a*, (fig. 34) contains common air. When the rod is drawn up, the outer part of the piston sticks fast in the barrel till the conical part connected with the rod shuts the conical hole, and its shoulder applies close to its bottom. The piston is now shut, and therefore the *whole* is drawn up by the rack-work, driving the air before it through the hole *a c*, into the oil-vessel at R, and out into the room by the tube T. The piston will then be at the top of the barrel at *a*, and the wire *g g* will stand nearly as represented in the figure just raised from the hole L, and prevented from rising higher by the nut O. During this motion the air will expand in the receiver, and come along the bent tube *m* into the barrel. Thus the barrel will be filled with air, which, as the piston rises, will be rarefied in proportion as the capacity of the receiver, pipes, and barrel, is to the barrel alone. When the piston is moved down again by the rack-work, it will force the conical part (fig. 38) out of the hollow part (fig. 37) as far as the shoulders *a a*; fig. 35 will rest on *a a* (fig. 37) which will then be so far open as to permit the air to pass freely through it, while at the same time the end of *g g* is forced against the top of the hole, and shuts it, in order to prevent any air from returning into the receiver. Thus the piston, moving downwards, suffers tne air to pass out between the sides of figs. 37 and 38; and, when it is at the bottom of the barrel, will have the column of air above it; and, consequently, when drawn upwards it will shut, and drive out this air, and, by opening the hole L at the same time, will give a free passage to more air from the receiver. This process being continued, the air of the receiver will be rarefied as far as its expansive power will permit. For in this machine there are no valves to be forced open by the elasticity of the air in the receiver, which at last it is unable to effect. There is therefore nothing to prevent the air from expanding to its utmost degree.

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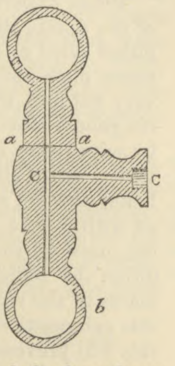
[1] The piston and barrel are 1·65 inches in diameter, in proportion to which the scale is drawn. Figures 35, 36, 37, and 38, are, however, of double size.

It may be suspected here, that as the air must escape through the discharging passage *ac*, fig. 34, against the pressure of a column of oil and the weight of the wire, there will remain in this passage a quantity of air of considerable density, which will expand again into the barrel during the descent of the piston, and thus put a stop to the progress of rarefaction. This is the case in Mr. Smeaton's pump, and all which have valves in the piston. But it is the peculiar excellency of this pump, that whatever be the density of the air remaining in *ac*, the rarefaction will still go on. It is worth while to be perfectly convinced of this. Let us suppose that the air contained in *ac* is $\frac{1}{100}$th part of the common air which would fill the barrel, and that the capacity of the barrel is equal to that of the receiver and passages, and that the air in the receiver and barrel is of the same density, the piston being at the bottom of the barrel: the barrel will therefore contain $\frac{10}{1000}$ parts of its natural quantity, and the receiver $\frac{10}{1000}$. Now let the piston be drawn up. No air will be discharged at *ac*, because it will contain the whole air which was in the barrel, and which has now collapsed into its ordinary bulk. But this does not in the least hinder the air of the receiver from expanding into the barrel, and diffusing itself equally between both. Each will now contain $\frac{5}{1000}$ of their ordinary quantity when the piston is at the top, and *ac* will contain $\frac{1}{100}$ as before, or $\frac{10}{1000}$. Now push down the piston. The hole L is instantly shut, and the air in *ac* expands into the barrel, and the barrel now contains $\frac{15}{1000}$. When the piston has reached the bottom, let it be again drawn up. There will be $\frac{5}{1000}$ discharged through *c*, and the air in the receiver will again be equally distributed between it and the barrel. Therefore the receiver will now contain $\frac{2\frac{1}{2}}{1000}$. When the piston reaches the bottom, there will be $\frac{12\frac{1}{2}}{1000}$ in the barrel. When again drawn up to the top, there will be $\frac{2\frac{1}{2}}{1000}$ discharged, and the receiver will contain $\frac{1\frac{1}{4}}{1000}$; and when the piston reaches the bottom, there will be $\frac{11\frac{1}{4}}{1000}$. At the next stroke the receiver will contain only $\frac{0\cdot\frac{5}{8}}{1000}$, &c. &c.

Thus it appears, that notwithstanding the $\frac{10}{1000}$ which always expands back again out of the hole *ac* into the barrel, the rarity of the air in the receiver will be doubled at every stroke. There is therefore no need of a subsidiary air-pump at *c*, as in the American air-pump, and in the Swedish attempt to improve Smeaton's.

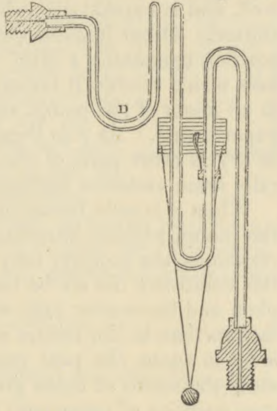
In using this air-pump no particular directions are necessary, nor is any peculiar care necessary for keeping it in order, except that the oil-vessel G be always kept about half full of oil. When the pump has stood long without being used, it will be proper to draw a table-spoonful of olive-oil through it, by pouring it into the hole in the middle of the receiver-plate when the piston is at the bottom of the barrel. Then by working the piston, the oil will be drawn through all the parts of the pump, and the surplus will be driven through the tube T into the oil-vessel G. Near the top of the piston rod at H, there is a hole which lets some oil into the inside of the rod, which gets at the collar of leathers *rr*, and keeps the wire *gg* air-tight.

Fig. 41.



When the pump is used for condensation at the same time that it rarifies, or separately, the piece containing the bent tube T must be removed, and fig. 41 put into its place, and fixed by its screws. Fig. 41, as drawn in the plate, is intended for a double-barrelled pump. But for a single barrel only one piece is used, represented by *b a a*, the double piece being cut off at the dotted line *a a*. In this piece is a female screw to receive the end of a long brass tube, to which a bladder (if sufficient for the experiment of condensation,) or a glass, properly secured for this purpose, must be screwed. Then the air which is abstracted from the receiver on the pump-plate will be forced into the bladder or glass. But if the pump be double, the apparatus fig. 41 is used, and the long brass tube screwed on at *c*.[1]

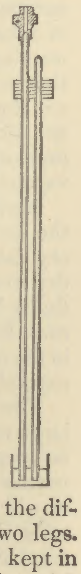
Fig. 42.



Figs. 42 and 43 represent the two gages, which will be sufficiently explained afterwards. Fig. 42 is screwed into *b*, or into the screw at the other end *c*, fig. 40, and fig 43 into the screw *a*, fig. 40.

If it be used as a single pump, either to rarefy or to condense, the screw K, which fastens the rack to the piston rod H, must be taken out. Then turning the winch till H is depressed as low as possible, the machine will be fitted to exhaust as a single pump; and if it be required to condense, the directions formerly given must be observed with regard to the tube T, and fig. 41.

Fig. 43.



"I took," says Mr. Cuthbertson, "two barometer tubes of an equal bore with that fixed to the pump. These were filled with mercury four times boiled. They were then compared, and stood exactly at the same height. The mercury in one of them was boiled in it four times more, without making any change in their height; they were therefore judged very perfect. One of these was immersed in the cistern of the pump gage, and fastened in a position parallel to it, and a sliding scale of one inch was attached to it. This scale, when the gage is used, must have its upper edge set equal with the surface of the mercury in the boiled tube after exhaustion, and the difference between the height of the mercury in this and in the other barometer tube may be observed to the $\frac{1}{100}$ of an inch; and being close together, no error arises from their not being exactly vertical, if they are only parallel. This gage will be better understood by inspecting fig. 43.

"I used a second gage, which I shall call a double syphon. (See fig. 42.) This was also prepared with the utmost care. I had a scale for measuring the difference between the height of the columns in the two legs. It was an inch long, and divided as the former, and kept in a truly vertical position by suspending it from a point with a weight hung to it, as represented in the figure. Upon comparing these two gages, I always found them to indicate the same degree of rarefaction. I also used a pear-gage, though the most imperfect of all, in order to repeat the curious experiments of Mr. Nairne and others."

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[1] An air-pump of this description is by far too delicate to be employed without risk of injury in experiments on condensed air.

When experiments require the utmost rarefying power of the pump, the receiver must not be placed on leather, either oiled or soaked in water, as is usually done. The pump plate and the edge of the receiver must be ground very flat and true, and this with very fine emery, that no roughness may remain. The plate of the pump must then be wiped very clean and very dry, and the receiver rubbed with a warm cloth till it become electrical. The receiver being now set on the plate, hog's lard, either alone or mixed with a little oil which has been cleared of water by boiling, must be smeared round its outside edge. In this condition the pump will rarefy its utmost, and what still remains in the receiver will be permanent air. Or a little of this composition may be thinly smeared on the pump plate; this will prevent all risk of scratching it with the edge of the receiver. Leather of very uniform thickness, long dried before a fire, and well soaked in this composition, which must be cleared of all water by the first boiling, will answer very well, and is expeditious, when receivers are to be frequently shifted. Other leathers should be at hand soaked in a composition containing a little rosin. This gives it a clamminess which renders it impermeable to air, and is very proper at all joints of the pump, and all apparatus for pneumatic experiments. As it is impossible to render the pear-gage as dry as other parts of the apparatus, there will be generally some variation between this and the other gages.

When it is only intended to show the utmost power of the pump, without intending to ascertain the quality of the residuum, the receiver may be set on wet leather. If, in this condition, the air be rarefied as far as possible, the syphon and barometer gage will indicate a less degree of rarefaction than in the former experiments. But when the air is let in again, the pear gage will point out a rarefaction some thousands of times greater than it did before. If the true quantity of permanent air after exhaustion be required, the pear gage will be nearest the truth; for when the air is rarefied to a certain degree, the moistened leather emits an expansible fluid, which, filling the receiver, forces out the permanent air; and the two first gages indicate a degree of exhaustion which relates to the whole elastic matter remaining in the receiver, viz. to the expansible fluid together with the permanent air; whereas the pear gage points out the degree of exhaustion, with relation to the permanent air alone, which remains in the receiver; for by the pressure of the air admitted into the receiver, the elastic vapour is reduced to its former bulk, which is imperceptible.

Many bodies emit this elastic fluid when the pressure of the air is much diminished; a piece of leather, in its ordinary damp state, about an inch square, or a bit of green or dry wood, will supply this for a great while. When such fluids have been generated in any experiments, the pump must be carefully cleared of them, for they remain not only in the receiver, but in the barrels and passages, and will again expand when the exhaustion has been carried far.

The best method of clearing the pump is to take a very large receiver, and, using every precaution, to exhaust it as far as possible. Then the expansible matter lurking in the barrels and passes will be diffused through the receiver also, or will be carried off along with its air. It will be as much rarer than it was before, as the aggregate capacity of the receiver, barrels and passes is larger than that of the two last.

The performance of the pump may be judged of from the four following experiments: The two gages being screwed into their places, and the hole in the receiver-plate shut up the pump was made to exhaust as far as it could. The mercury in the legs of the syphon was only $\frac{1}{40}$ of an inch out of the level, and that in the boiled barometer-tube $\frac{1}{40}$ of an inch higher than in the one screwed to the pump. A standard barometer then stood at 30 inches, and therefore the pump rarefied the permanent air 1200 times. This is twice as much as Mr. Nairne found Mr. Smeaton's do in its best state. Mr. Cavallo seems disposed to give a favourable account of Haas and Hurter's pump, and it appears never to have exceeded 600 times. Mr. Cuthbertson has often found the mercury within $\frac{1}{100}$ of an inch of the level in the syphon-gage, indicating a rarefaction of 3000.[1]

To one end of a glass tube, two inches diameter and thirty inches long, was fitted a brass cap and collar of leather, through which a wire was inserted, reaching about two inches within the tube. This was connected with the conductor of an electric machine. The other end was ground flat and set on the pump plate. When the gages indicated a rarefaction of 300, the light became steady and uniform, of a pale colour, though a little tinged with purple; at 600 the light was of a pale dusky white; when 1200 it disappeared in the middle of the tube, and the tube conducted so well that the prime conductor only gave sparks so faint and short as to be scarcely perceptible. After taking off the tube, and making it as dry as possible, it was again connected with the conductor, which was giving sparks two inches long. When the air in it was rarefied ten times, the sparks were of the same length. Sometimes a pencil of light darted along the tube. When the rarefaction was 20, the spark did not exceed an inch, and light streamed the whole length of the tube. When the rarefaction was 30, the sparks were half an inch, and the light rushed along the tube in great streams. When the rarefaction was 100, the sparks were about $\frac{1}{8}$ long, and the light filled the tube in an uninterrupted body. When 300, the appearances were as before. When 600, the sparks were $\frac{1}{10}$, and the light was of a faint white colour in the middle, but tinged with purple toward the ends. When 1200, the light was hardly perceptible in the middle, and was much fainter at the ends than before, but still ruddy. When 1400, which was the most the pump could produce, six inches of the middle of the tube were quite dark, and the ends free of any tinge of red, and the sparks did not exceed $\frac{1}{40}$ of an inch.[2]

The best improvements of the air-pump made in Britain.

We trust that our readers will not be displeased with the preceding history of the air-pump. The occasional information which it gives will be of great use to every person much engaged in pneumatic experiments, and help him in the contrivance and construction of the necessary apparatus. We may be indulged in one remark, that although this noble instrument originated in Germany, all its improvements were made in this kingdom. Both the mechanical and pneumatical principles of Mr. Boyle's construction were extremely different from the German, and, in respect of expedition and conveniency, much superior. The double barrel and gage by Hawkesbee were capital improvements, and on principle; and Mr. Smeaton's method of making the piston work in rarefied air made a complete change in the whole process.

Utility of the air-pump.

Aided by this machine, we can make experiments establishing and illustrating the gravity and elasticity of the air, in a much more perspicuous manner than could be done by the spontaneous phenomena of nature. It allows us in the first place to show the materiality of air in a very distinct manner. Bodies cannot move about in the atmosphere without displacing it. This requires force; and the resistance of the air always diminishes the velocity of bodies moving in it. A heavy body therefore has the velocity of its fall diminished; and if the quantity of air displaced be very great, the diminution will be very considerable. This is the reason why light bodies, such as feathers, fall very slowly. Their moving force is very small, and can therefore displace a great quantity of air only with a very small velocity. But if the same body be dropped *in vacuo*, when there is no air to be displaced, it falls with the whole velocity competent to its gravity. Fig. 44 represents an apparatus by which a guinea and a downy feather are dropped at the same instant. If this be done after the air has been pumped out, the guinea and the feather will be observed to reach the bottom at the same instant.

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[1] We are disposed to place most reliance on the experiment where $\frac{1}{1200}$ is stated as the limit of exhaustion, particularly as this result corresponds with the best information we have been able to obtain, regarding the performance of various very fine instruments.

[2] Since this article was written, Mr Dunn, a mathematical instrument maker of Edinburgh has invented an air-pump, possessing all the ad-

Fig. 44.

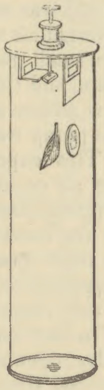
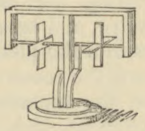


Fig. 45 represents another apparatus for showing the same thing. It consists of two sets of brass vanes put on separate axles, in the manner of windmill sails. One set has their edges placed in the direction of their whirling motion, that is, in a plane to which the axis is perpendicular. The planes of the other set pass through the axis, and they are therefore trimmed so as directly to front the air through which they move. Two springs act upon pins projecting from the axis; and their strength or tensions are so adjusted, that when they are disengaged *in vacuo*, the two sets continue in motion equally long. If they are disengaged in the air, the vanes which beat the air with their planes will stop long before those which cut it edgewise.

Fig. 45.

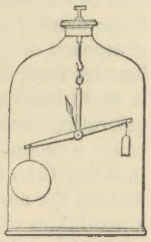


We can now abstract the air most completely from a dry vessel, so as to know the precise weight of the air which filled it. The first experiment we have of this kind, done with accuracy, is that of Dr. Hooke, February 10, 1664, when he found 114 pints of air to weigh 945 grains. One pint of water was $8\frac{7}{32}$ ounces. This gives for the specific gravity of air $\frac{1}{850}$ very nearly.

The effect of air on the weight of bodies immersed in it.

Since we are thus immersed in a gravitating fluid, it follows, that every body preponderates only with the excess of its own weight above that of the air which it displaces; for every body loses by this immersion the weight of the displaced air. A cubic foot loses about 521 grains in frosty weather. We see balloons even rise in the air, as a piece of cork rises in water. A mass of water which really contains 850 pounds will load the scale of a balance with 849 only, and will be balanced by about $849\frac{1}{8}$ pounds of brass. This is evinced by a very pretty experiment, represented in fig. 46. A small beam is suspended within a receiver. To one end of the beam is appended a thin glass or copper ball, close in every part. This is balanced by a small piece of lead hung on the other arm. As the air is pumped out of the receiver, the ball will gradually preponderate, and will regain its equilibrium when the air is re-admitted.

Fig. 46.



Some philosophers have proposed, and even used, a large globe of light make, suspended at a beam, for a barometer. If its capacity be a cubic foot, $1\frac{7}{10}$ grains will indicate the

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vantages of Mr. Cuthbertson's, with this other in addition, that it is much simpler in its construction. Fig. 1 presents a view of this pump. A A are the barrels. B the pipe leading from them to C the receiver plate, D the barometer gage, E a stop-cock for re-admitting the air, or for attaching a syphon gage, or other piece of apparatus. Fig. 2 is a section of the piston, and of the under part of one of the barrels, shewing the whole of the internal construction; A A, *a a* is the barrel, O N the piston, G I the piston rod containing the rod *r*, which slides in the collar of leathers T, and opens the valve *v e*; in this respect it is precisely the same as Cuthbertson's, but the maker dispenses with all the apparatus at the top of Cuthbertson's barrels, and has only an oiled silk valve S. in the piston, which is exposed to the atmosphere, as in Hook's pump. The exclusion of the atmosphere from the piston valve, the maker considers as unnecessary. From the account previously given of the performance of Cuthbertson's, and of the other pumps described, as well as from his own experience, he is of opinion that the action of the best air pump is stopped, either by the formation of elastic vapour from the oil necessarily present, or from some unknown property of the air itself, long before it has been so much rarefied as to be unable to open the piston valves. His reason for this opinion is, that the capacity of the barrels of any well-constructed pump is several thousand times greater than the space which exists between the valves, when the piston has reached the bottom of the barrel; in short, this may be limited to the small hole S N. For example, in an air-pump, the length of the stroke of which is 12 inches, the diameter of the barrels $2\frac{1}{2}$ in. the diameter of the hole S N $\frac{1}{10}$th of an inch, and its length one inch, the capacity of the hole S N is 7500 times less than the capacity of the barrel, and consequently air 7500 times rarer than the atmosphere when filling the whole barrel, will, by the descent of the piston, become of the same density, but as it is known from the performance of Hook's pump, that air $\frac{1}{100}$th part of the density of the atmosphere has sufficient elastic force to open an oil silk valve, it follows that the pump we have supposed, will exhaust 7425 times, but as this degree of exhaustion has never yet been attained, it is evident that some other reason must be sought for in explanation of this, than the imperfection of the mechanical arrangement. A metallic valve T *p*, may be placed in the piston instead of the oiled silk one, having a projecting point *p* to open it, on the piston reaching the bottom of the barrel, and a space O T filled with oil, to prevent the return of the air during the time which elapses betwixt the commencement of the ascent of the piston and the complete shutting of the valve.

Fig. 1.

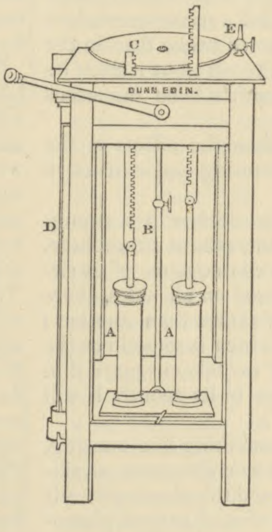
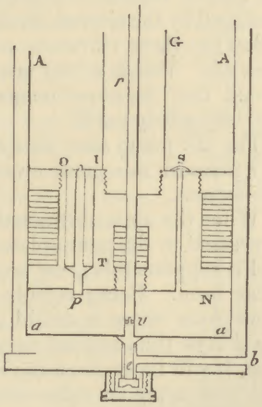


Fig. 2.



same change that is indicated by $\frac{1}{10}$ of an inch of an ordinary barometer. But a vessel of this size will load a balance too much to leave it sufficiently sensible to small changes of density. Besides, it is affected by heat and cold, and would require a very troublesome equation to correct their effects.

It may perhaps be worth while to attend to this in buying and selling precious commodities; such as pearls, diamonds, silk, and some drugs. As they are generally sold by brass or leaden weights, the buyer will have some advantage when the air is heavy and the barometer high. On the other hand, he will have the advantage in buying gold and mercury when the air is light. It is needless to confine this observation to precious commodities, for the advantage is the same in all in proportion to their levity.

There is a case in which this observation is of consequence to the philosopher: we mean the measuring of time by pendulums. As the accelerating force on a pendulum is not its whole weight, but the excess of its weight over that of the displaced air, it follows that a pendulum will vibrate more slowly in the air than *in vacuo*. A pendulum composed of lead, iron, and brass, may be about 8400 times heavier than the air which it displaces when the barometer is at 30 inches and the thermometer is at 32°, and the accelerating force will be diminished about $\frac{1}{16800}$. This will cause a second pendulum to make about five vibrations less in a day than it would do *in vacuo*. In order therefore to deduce the accelerative power of gravity from the length of a pendulum vibrating in the air, we must make an allowance of 0″.17, or $\frac{17}{100}$ of a second per day, for every inch that the barometer stands lower than 30 inches. But we must also note the temperature of the air; because when the air is warm it is less dense when supporting by its elasticity the same weight of atmosphere, and we must know how much its density is diminished by an increase of temperature. The correction is still more complicated; for the change of density affects the resistance of the air, and this affects the time of the vibration, and this by a law that is not yet well ascertained. As far as we can determine from any experiments that have been made, it appears that the change arising from the altered resistance takes off about 2-5ths of the change produced by the altered density, and that a second pendulum makes but three vibrations a-day more *in vacuo* than in the open air. This is a very unexpected result; but it must be owned that the experiments have neither been numerous nor very nicely made.

The air-pump also allows us to shew the effects of the air's pressure in a great number of amusing and instructive phenomena.

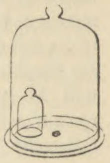
Experiments to shew the effects of the pressure of the air.

When the air is abstracted from the receiver, it is strongly pressed to the pump-plate by the incumbent atmosphere, and it supports this great pressure in consequence of its circular form. Being equally compressed on all sides, there is no place where it should give way rather than another; but if it be thin, and not very round, which is sometimes the case, it will be crushed to pieces. If we take a square thin vial, and apply an exhausting syringe to its mouth, it will not fail being crushed.

As the operation of pumping is something like sucking, many of these phenomena are in common discourse ascribed to suction, a word much abused; and this abuse misleads the mind exceedingly in its contemplation of natural phenomena. Nothing is more usual than to speak of the suction of a syringe, the suction and draught of a chimney, &c. The following experiment puts the true cause of the strong adhesion of the receiver beyond a doubt.

Place a small receiver, or cupping-glass on the pump-plate without covering the central hole, as represented in fig. 47, and cover it with a larger receiver. Exhaust the air from it; then admit it as suddenly as possible. The outer receiver, which, after the rarefaction, adhered strongly to the plate, is now loose, and the cupping-glass will be found sticking fast to it. While the rarefaction was going on, the air in the small receiver also expanded, escaped from it, and was abstracted by the pump. When the external air was suddenly admitted, it pressed on the small receiver, and forced it down to the plate, and thus shut up all entry. The small receiver must now adhere; and there can be no suction, for the pipe of the pump was on the outside of the cupping-glass.

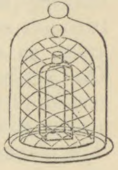
Fig 47.



This experiment sometimes does not succeed, because the air occasionally finds a passage under the brim of the cupping-glass. But if the cupping-glass be pressed down by the hand on the greasy leather or plate, every thing will be made smooth, and the glass will be so little raised by the expansion of its air during the pumping, that it will instantly clap close when the air is re-admitted.

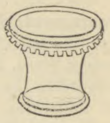
In like manner, if a thin square phial be furnished with a valve, opening from within, but shutting when pressed from without, and if this phial be put under a receiver, and the air be abstracted from the receiver, the air in the phial will expand during the rarefaction, escape through the valve, and be at last in a very rarefied state within the phial. If the air be now admitted into the receiver, it will press on the flat sides of the included phial and crush it to pieces. (See fig. 48.)

Fig. 48.



If a piece of wet ox-bladder be laid over the top of a receiver whose orifice is about four inches wide, and the air be exhausted from within it, the incumbent atmosphere will press down the bladder into a hollow form, and then burst it inward with a prodigious noise. (See fig. 49.) Or if a piece of thin flat glass be laid over the receiver, with an oiled leather between them to make the juncture air-tight, the glass will be broken downwards. This must be done with caution, because the pieces of glass sometimes fly about with great force.[1]

Fig. 49.



If there be formed two hemispherical cups of brass, with very flat thick brims, and one of them be fitted with a neck and stopcock, as represented by fig. 50, the air may be abstracted from them by screwing the neck into the hole in the pump-plate. To prevent the insinuation of air, a ring of oiled leather may be put between the rims. Now unscrew the sphere from the pump, and fix hooks to each, and suspend them from a strong nail, and hang a scale to the lowest. It will require a considerable weight to separate them; namely, about 15 pounds for every square inch of the great circle of the sphere. If this be four inches diameter, it will require near 190 pounds. This pretty experiment was first made by Otto Guericke, and on a very great scale. His sphere was of a large size, and when exhausted, the hemispheres could not be drawn asunder by 20 horses. It was exhibited, along with many others equally curious and magnificent, to the emperor of

Fig. 50.

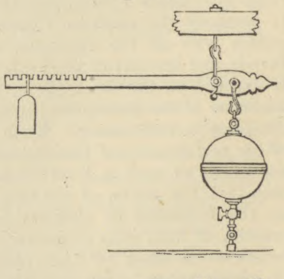
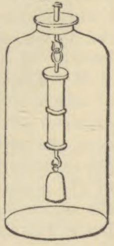


Fig. 51.



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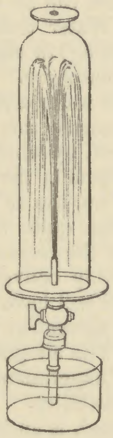
[1] Such experiments should never be performed with a good pump; for fragments of the glass will get into the pump and impair its working, in spite of the utmost skill of the operator.

Experiments on air.

Germany and his court, at the breaking up of the diet of Ratisbon in 1654. If a loaded syringe be suspended by its piston from the hook in the top plate of the receiver, as in fig. 51, and the air be abstracted by the pump, the syringe will gradually descend (because the elasticity of the air, which formerly balanced the pressure of the atmosphere, is now diminished by its expansion, and is therefore no longer able to press the syringe to the piston), and it will at last drop off. If the air be admitted before this happens, the syringe will immediately rise again.

Screw a short brass pipe into the neck of a transporter, on which is set a tall receiver, and immerse it into a cistern of water. On opening the cock, the pressure of the air on the surface of the water in the cistern will force it up through the pipe, and cause it to spout into the receiver with a strong jet, because there is no air within to balance by its elasticity the pressure of the atmosphere. (See fig. 52.)

Fig. 52.

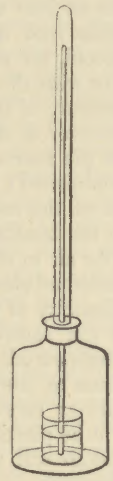


By this pressure the gage of an air-pump acts

It is in the same way that the gage of the air-pump performs its office. The pressure of the atmosphere raises the mercury in the gage till the weight of the mercury, together with the remaining elasticity of the air in the receiver, are in equilibrio with the whole pressure of the atmosphere: therefore the height and weight of the mercury in the gage is the excess of the weight of the atmosphere above the elasticity of the included air; and the deficiency of this height from that of the mercury in the Toricellian tube is the measure of this remaining elasticity.

If a Toricellian tube be put under a tall receiver, as shown in fig. 53, and the air be exhausted, the mercury in the tube will descend, while that in the gage will rise; and the sum of their heights will always be the same, that is, equal to the height in an ordinary barometer. The height of the mercury in the receiver is the effect and measure of the remaining elasticity of the included air, and the height in the pump-gage is the unbalanced pressure of the atmosphere. This is a very instructive experiment, perfectly similar to Mr. Auzout's, and completely establishes and illustrates the whole doctrine of atmospheric pressure.

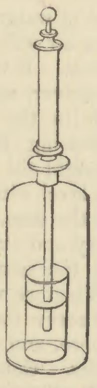
Fig. 53.



Water rises in pumps.

We get a similar illustration and confirmation (if such a thing be now needed) of the cause of the rise of water in pumps, by screwing a syringe into the top plate of a receiver, which syringe has a glass pipe plunging into a small cup of water. (See fig. 54.) When the piston-rod is drawn up, the water rises in the glass pipe, as in any other pump, of which this is a miniature representation. But if the air has been previously exhausted from the receiver, there is nothing to press on the water in the little jar; and it will not rise in the glass pipe though the piston of the syringe be drawn to the top.

Fig. 54.



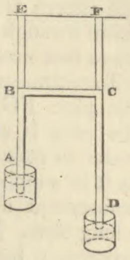
It moves in syphons.

Analogous to the rise of water in pumps is its rise and motion in syphons. Suppose a pipe ABCD, fig. 55, bent at right angles at B and C, and having its two ends immersed in the cisterns of water A and D. Let the leg CD be longer than the leg BA, and let the whole be full of water.

Experiments on air.

The water is pressed upwards at A with a force equal to the weight of the column of air EA reaching to the top of the atmosphere; but it is pressed downwards by the weight of the column of water BA. The water at D is pressed downwards by the weight of the column CD, and upwards by the weight of the column of air FD reaching to the top of the atmosphere. The two columns of air differ very little in their weight, and may without any sensible error be considered as equal. Therefore there is a superiority of pressure downwards at D, and the water will flow out there. The pressure of the air will raise the water in the leg AB, and thus the stream will be kept up till the vessel A is emptied as low as the orifice of the leg BA, provided that the height of AB is not greater than what the pressure of the atmosphere can balance, that is, does not exceed 32 or 33 feet for water, 30 inches for mercury, &c.

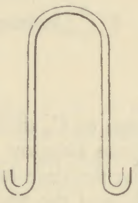
Fig. 55.



A syphon then will always run from that vessel whose surface is highest; the form of the pipe is indifferent, because the hydrostatical pressures depend on the vertical height only. It must be filled with water by some other contrivance, such as a funnel, or a pump applied a-top; and the funnel must be stopped up, otherwise the air would get in, and the water would fall in both legs.

If the syphon have equal legs, and be turned up at the ends, it will remain full of water, and be ready for use. One end of it need only be dipped into any vessel of water, and the water will then flow out at the other end of the syphon. This is called the Wirtemberg syphon, and is represented in fig. 56.

Fig. 56.

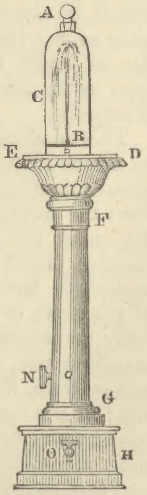


The syphon fountain.

What is called the *syphon fountain*, constructed on this principle, is shown in fig. 57, where AB is a tall receiver, standing in a wide bason DE, which is supported on the pedestal H, by the hollow pillar FG. In the centre of the receiver is a jet pipe C, and in the top a ground stopper A. Near the base of the pillar is a cock N, and in the pedestal is another cock O.

Fill the bason DE with water within half an inch of the brim. Then pour in water at the top of the receiver (the cock N being shut) till it is about half full, and then put in the stopper. A little water will run out into the vessel DE. But before it runs over, open the cock N, and the water will run into the cistern H; and by the time that the pipe C appears above water, a jet will rise from it, and continue as long as water is supplied from the bason DE. The passage into the base cistern may be so tempered by the cock N that the water within the receiver shall keep at the same height, and what runs into the base may be received from the cock O into another vessel, and returned into DE, to keep up the stream.

Fig. 57



Manner of its construction and operation.

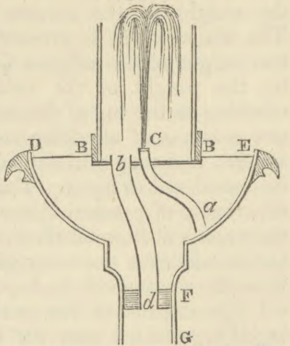
This pretty philosophical toy may be constructed in the following manner. BB, (fig. 58,) is the ferril or cap into which the receiver is cemented. From its centre descends the jet pipe C*a*, sloping outwards, to give room for the discharge pipe *bd* of larger diameter, the lower extremity of which *d* fits tightly into the top of the hollow pillar FG.

The operation of the toy is easily understood. Suppose the distance from C to H (fig. 57,) three feet, which is about $\frac{1}{11}$ of the height at which the atmosphere would support a column of water. The water poured into AB would descend through FG (the hole A being shut) till the air has

Experiments on air.

expanded $\frac{1}{10}$, and then it would stop. If the pipe C*a* be now opened, the pressure of the air on the surface of the water in the cistern DE will cause it to spout through C to the height of three feet nearly, and the water will continue to descend through the pipe FG. By tempering the cock N so as to allow the water to pass through it as fast as it is supplied by the jet, the amusement may be continued a long time. It will stop at last, however; because, as the jet is made into rarefied air, a little air will be extricated from the water, which will gradually accumulate in the receiver, and diminish its rarefaction, which is the moving cause of the jet. This indeed is an inconvenience felt in every employment of syphons, so much the more remarkably as their top is higher than the surface of the water in the cistern of supply.

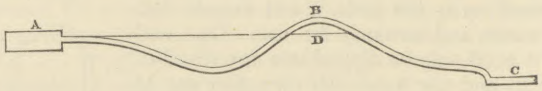
Fig. 58.



Syphons are often used thus.

Cases of this employment of a syphon are not unfrequent. When water collected at A (fig. 59,) is to be conducted in a pipe to C, situated in a lower part of the country, it sometimes happens that the intervening ground is higher than the fountain-head as at B. A forcing pump is erected at A, and the water forced along the pipe. Once it runs out at C, the pump may be removed, and the water will continue to run on the syphon principle, provided BD do not exceed 33 feet. But the water in that part of the conduit which is above the horizontal plane AD, is in the same state as in a receiver of rarefied air, and gives out some of the air which is united with it. This gradually accumulates in the elevated part of the conduit, and at last chokes it entirely.

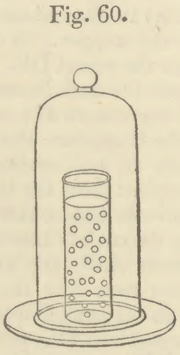
Fig. 59.



The air-pump discovers the combination of air with water, &c.

This combination of air with water is very distinctly seen by means of the air-pump. If a small glass containing cold water, fresh drawn from the spring, be exposed, as in fig. 60, under the receiver, and the air rarefied, small bubbles will be observed to form on the inner surface of the glass, or on the surface of any body immersed in it, which will increase in size, and then detach themselves from the glass and reach the top; as the rarefaction advances, the whole water begins to show very minute air-bubbles rising to the top; and this appearance will continue for a very long time, till it be completely disengaged. Warming the water will occasion a still farther separation of air, and a boiling heat will separate all that can be disengaged. The reason assigned for these air-bubbles first appearing on the surface of the glass, &c. is, that air is attracted by bodies, and adheres to their surface. This may be so. But it is more probably owing to the attraction of the water for the glass, which causes it to quit the air which it held in solution, in the same manner as we see it happen when it is mixed with spirits-of-wine, with vitriolic acid, &c., or when salts or sugar are dissolved in it. For if we pour out the water which has been purged of air by boiling *in vacuo*, and fill the glass with fresh water, we shall observe the same thing, although a film of the purified water was left adhering to the glass. In this case there can be no air adhering to the glass.

Fig. 60.



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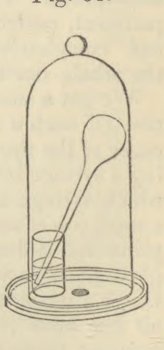
Water thus purged of air by boiling (or even without boiling) *in vacuo*, will again absorb air when exposed to the atmosphere. The best demonstration of this is to fill with this water a phial, leaving about the size of a pea not filled. Immerse this in a vessel of water, with the mouth undermost, by which means the air-bubble will mount up to the bottom of the phial. After some days standing in this condition, the air-bubble will be completely absorbed, and the vessel quite filled with water. A glass of beer placed under the receiver and treated in the same way will be almost wholly converted into froth by the escape of its fixed air, and will have lost entirely the prickling smartness which is so agreeable, and become quite vapid.

Experiments illustrative of the elasticity and expansibility of the air.

The air-pump gives us, in the next place, a great variety of experiments illustrative of the air's elasticity and expansibility. The very operation of exhaustion, as it is called, is an instance of its great expansibility. But this is not palpably exhibited to view. The following experiments show it most distinctly. First, put a flaccid bladder, of which the neck is firmly tied with a thread, under a receiver, and work the pump. The bladder will gradually swell, and will even be fully distended. Upon readmitting the air into the receiver, the bladder gradually collapses again into its former dimensions; while the bladder is flaccid, the air within it is of the same density and elasticity with the surrounding air, and its elasticity balances the pressure of the atmosphere. When part of the air of the receiver is abstracted, the remainder expands so as still to fill the receiver; but by expanding, its elasticity is plainly diminished; for we see by the fact, that the elasticity of the air of the receiver no longer balances the elasticity of that in the bladder, as it no longer keeps it in its dimensions. The air in the bladder expands also; it expands till its diminished elasticity is again in equilibrio with the diminished elasticity of the air in the receiver; that is, till its density is the same. When all the wrinkles of the bladder have disappeared, its air can expand no more, although we continue to diminish the elasticity of the air of the receiver by further rarefaction. The bladder now tends to burst; and if it be pierced by a point or knife fastened to the slip-wire, the air will rush out, and the mercury descend rapidly in the gage.

If a phial or tube (fig. 61) be partly filled with water, and immersed in a vessel of water with the mouth downwards, the air will occupy the upper part of the phial. If this apparatus be put under a receiver, and the air be abstracted, the air in the phial will gradually expand, allowing the water to run out by its weight till the surface of the water be on a level within and without. When this is the case, we must grant that the density and elasticity of the air in the phial is the same with that in the receiver. When we work the pump again, we shall observe the air in the phial expand still more, and come out of the water in bubbles. Continuing the operation, we shall see the air continually escaping from the phial; when this is over, it shows that the pump can rarefy no more. If we now admit the air into the receiver, we shall see the water rise into the phial, and at last almost completely fill it, leaving only a very small bubble of air at the top. This bubble had expanded so as to fill the whole phial.

Fig. 61.



Every one must have observed a cavity at the big end of an egg between the shell and the white. The white and

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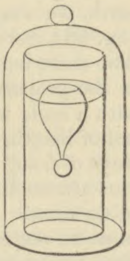
yolk are contained in a thin membrane or bladder which adheres loosely to the shell, but is detached from it at that part; and this cavity increases by keeping the egg in a dry place. One may form a judgment of its size, and therefore of the freshness of the egg, by touching it with the tongue; for the shell, where it is not in contact with the contents, will presently feel warm, being quickly heated by the tongue, whilst the rest of the egg will feel cold.

If a hole be made in the opposite end of the egg, and it be set on a little tripod, and put under a receiver, the expansion of the air in the cavity of the egg will force the contents through the hole till the egg be quite emptied; or, if nearly one-half of the egg be taken away at the other end, and the white and yolk taken out, and the shell be put under a receiver, and the air abstracted, the air in the cavity of the egg will expand, gradually detaching the membrane from the shell, till it causes it to swell out, and gives the whole the appearance of an entire egg. In like manner shrivelled apples and other fruits will swell in vacuo by the expansion of the air confined in their cavities.

If a piece of wood, a twig with green leaves, charcoal, plaster of Paris, &c. be kept under water in vacuo, a prodigious quantity of air will be extracted; and if we readmit the air into the receiver, it will force the water into the pores of the body. In this case the body will not swim in water as it did before, showing that the vegetable fibres are specifically heavier than water. It is found, however, that the air contained in the pith and bark, such as cork, is not all extricated in this way; and that much of it is contained in vesicles which have no outlet; being secreted into them in the process of vegetation, as it is secreted in the air-bladder of fishes, where it is generally found in a pretty compressed state, considerably denser than the surrounding air. The air-bladder of a fish is surrounded by circular and longitudinal muscles, by which the fish can compress the air still further; and, by ceasing to act with them, allow it to swell out again. It is in this manner that the fish can suit its specific gravity to its situation in the water, so as to have no tendency either to rise or sink; but if the fish be put into the receiver of an air-pump, the rarefaction of the air obliges the fish to act more strongly with these contracting muscles, in order to adjust its specific gravity; and if too much air has been abstracted from the receiver, the fish is no longer able to keep its air-bladder in the proper degree of compression. It becomes therefore too buoyant, and comes to the top of the water, and is obliged to struggle with its tail and fins in order to get down; frequently in vain. The air-bladder sometimes bursts, and the fish goes to the bottom, and can no longer keep above without the continual action of its tail and fins. When fishes die, they commonly float at top, their contractive action being now at an end. All this may in some degree be illustrated by a small half-blown bladder, to which is appended a bit of lead, just so heavy as to make it sink in water; when this is put under a receiver, and the air abstracted, the bubble will rise to the top; and, by nicely adjusting the rarefaction, it may be kept at any height.

Fig. 62.



The playthings called *Cartesian devils* are similar to this. They are hollow glass figures, having a small aperture in the lower part of the figures, as at the point of the foot; their weight is adjusted so that they swim upright in water. When put into a tall jar filled to the top, and having a piece of leather tied over it, they will sink in the water, by pressing on the leather with the ball of the hand. This, by compressing the water, forces some of it to enter into the figure, and makes it heavier than the water; for which reason it sinks, but rises again on removing the pressure of the hand. (See figs. 63 and 64.)

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If a half-blown ox-bladder be put into a box, and great weights laid on it, and the whole be put under a receiver, and the air abstracted; the air will, by expanding, lift up the weights, though above an hundred pounds. (See fig. 65.)

Fig. 63.

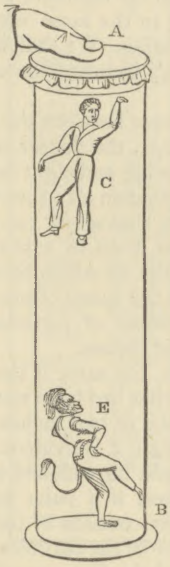
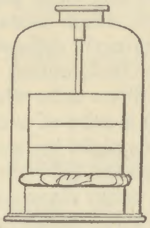


Fig. 64.

Fig. 65.



Compressibility and expansibility are in no state of the air very dissimilar.

By such experiments, the great expansibility of the air is abundantly illustrated, as its compressibility was formerly by means of the condensing syringe. We now see that the two sets of experiments form an uninterrupted chain; and that there is no particular state of the air's density where the compressibility and expansibility are remarkably dissimilar. Air in its ordinary state expands; because its ordinary state is a state of compression by the weight of the atmosphere; and if there were a pit about thirty-three miles deep, the air at the bottom would probably be as dense as water; and if it were fifty miles deep, it would be as dense as gold, if it did not become a liquid before this depth; nay, if a bottle with its mouth undermost were immersed six miles under water, it would probably be as dense as water; we say probably, for this depends on the nature of its compressibility; that is, on the relation which subsists between the compression and the force which produces it.

Relation between compression and the force producing it.

This is the circumstance of its constitution, which we now proceed to examine; and it is evidently a very important circumstance. We have long ago observed, that the great compressibility and permanent fluidity of air, observed in a vast variety of phenomena, is totally inexplicable, on the supposition that the particles of air are like so many balls of sponge or so many foot-balls. Give to those what compressibility you please, common air could no more be fluid than a mass of clay; it could no more be fluid than a mass of such balls pressed into a box. It may be demonstrated, that before a parcel of such balls, just touching each other, can be squeezed into half their present dimensions, their globular shape will be entirely gone, and each will have become a perfect cube, touching six other cubes with its whole surface; and these cubes will be strongly compressed together, so that motion could never be performed through among them by any solid body without a very great force. Whereas we know that in this state air is just as permeable to every body as the common air that we breathe. There is no way in which we can represent this fluidity to our imagination, but by conceiving air to consist of particles, not only discrete, but distant from each other, and actuated by repulsive forces, or

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something analogous to them. It is an idle subterfuge, to which some physicists have recourse, saying, that they are kept asunder by an intervening ether, or elastic fluid of any other name. This is only removing the difficulty a step farther off; for the elasticity of this fluid requires the same explanation; and therefore it is necessary, in obedience to the rules of just reasoning, to begin the inquiry here; that is, to determine from the phenomena what is the analogy between the distances of the particles and the repulsive forces exerted at these distances, proceeding in the same way as in the examination of planetary gravitation. We shall learn the analogy by attending to the analogy between the compressing force and the density.

Density explained as applied to air.

For the density depends on the distance between the particles; the nearer they are to each other, the denser is the air. Suppose a square pipe one inch wide and eight inches long, shut at one end, and filled with common air; then suppose a plug so nicely fitted to this pipe that no air can pass by its sides; suppose this piston thrust down to within an inch of the bottom: it is evident that the air which formerly filled the whole pipe now occupies the space of one cubic inch, which contains the same number of particles as were formerly diffused over eight cubic inches.

The condensation would have been the same if the air which fills a cube whose side is two inches had been squeezed into a cube of one inch, for the cube of two inches also contains eight inches. Now, in this case it is evident that the distance between the particles would be reduced to its half in every direction. In like manner, if a cube whose side is three inches, and which therefore contains 27 inches, be squeezed into one inch, the distance of the particles will be one-third of what it was: in general the distance of the particles will be as the cube-root of the space into which they are compressed. If the space be $\frac{1}{8}$, $\frac{1}{27}$, $\frac{1}{64}$, $\frac{1}{125}$, &c. of its former dimensions, the distance of the particles will be $\frac{1}{2}$, $\frac{1}{3}$, $\frac{1}{4}$, $\frac{1}{5}$, &c. Now the term *density*, in its strict sense, expresses the vicinity of the particles; thus, *densi arbores* are trees growing near each other. The measure of this vicinity therefore is the true measure of the density; and when 27 inches of air are compressed into one, we should say that it is three times as dense; but we say, that it is 27 times denser.

Density is therefore used in a sense different from its strictest acceptation; it expresses the comparative number of equidistant particles contained in the same bulk. This is also abundantly precise, when we compare bodies of the same kind, differing in density only; but we also say, that gold is 19 times denser than water, because the same bulk of it is 19 times heavier. This assertion proceeds on the assumption, or the fact, that every ultimate atom of terrestrial matter is equally heavy. A particle of gold may contain more or fewer atoms of matter than a particle of water. In such a case, therefore, the term density has little or no reference to the vicinity of the particles; and is only a term of comparison of other qualities or accidents. But when we speak of the respective densities of the same substance in its different states of compression, the word *density* is strictly connected with vicinity of particles, and we may safely take either of the measures. We shall abide by the common acceptation, and call that air eight times as dense which has eight times as many particles in the same bulk, although the particles are only twice as near to each other.

Analogy.

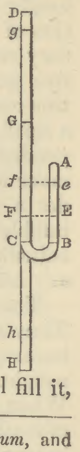
Thus then we see, that by observing the analogy between the compressing force and the density, we shall discover the analogy between the compressing force and the distance of the particles. Now the force which is necessary for compressing two particles of air to a certain vicinity is a proper measure of the elasticity of the particles corresponding to that vicinity or distance; for it balances it, and forces which balance must be esteemed equal. Elasticity is a distinctive name for that corpuscular force which keeps the particles at that distance; therefore observations made on the analogy between the compressing force and the density of air will give us the law of its corpuscular force, in the same way that observations on the simultaneous deflections of the planets towards the sun gives us the law of celestial gravitation.

But the sensible compressing forces which we are able to apply is at once exerted on unknown thousands of particles, whilst it is the law of action of a single particle that we want to discover. We must therefore know the proportion of the numbers of particles on which the compressing force is exerted. It is easy to see, that since the distance of the particles is as the cube root of the density inversely, the number of particles in physical contact with the compressing surface must be as the square of this root. Thus, when a cube of eight inches is compressed into one inch, and the particles are twice as near each other as they were before, there must be four times the number of particles in contact with each of the sides of this cubical inch; or, when we have pushed down the square piston of the pipe spoken of above to within an inch of the bottom, there will be four times the number of particles *immediately* contiguous to the piston, and resisting the compression; and in order to obtain the force really exerted on one particle, and the elasticity of that particle, we must divide the whole compressing force by 4. In like manner, if we have compressed air into $\frac{1}{27}$th of its former bulk, and brought the particles into $\frac{1}{3}$d of their former distance, we must divide the compressing force by 9. In general, if d express the density, $\frac{1}{\sqrt[3]{d}}$ will express the distance x of the particles; $\sqrt[3]{d}$, or $d^{\frac{1}{3}}$ will express the vicinity or real density; and $d^{\frac{2}{3}}$ will express the number of particles acting on the compressing surface; and if f express the accumulated external compressing force, $\frac{f}{d^{\frac{2}{3}}}$ will express the force acting on one particle; and therefore the elasticity of that particle corresponding to the distance x.

Compressibility of air.

We now proceed to consider the experiments by which the law of compression is to be established.[1] In order to examine the compressibility of air that is not rarer than the atmosphere at the surface of the earth, we employ a bent tube or syphon ABCD (fig. 66), hermetically sealed at A, and open at D. The short leg AB must be very accurately divided in the proportion of its solid contents, and fitted with a scale whose units denote equal increments, not of length, but of capacity. There are various ways of doing this; but it requires the most scrupulous attention, and without this the experiments are of no value. In particular, the arched form at A must be noticed. A small quantity of mercury must then be poured into the tube, and passed backwards and forwards till it stands (the tube being held in a vertical position) on a level at B and C. Then we are certain that the included air is of the same density with that of the contiguous atmosphere. Mercury is now poured into the leg DC, which will fill it,

Fig. 66.



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[1] The first experiments to this purpose were those made by Mr. Boyle, published in his *Defensio Doctrinæ de Aere contra Linum*, and exhibited before the Royal Society the year before. Mariotte made experiments of the same kind, which were published in 1676 in his *Essai sur la Nature de l'Air*, and *Traité des Mouvemens des Eaux*. The most copious experiments are those by Sulzer (*Mem. Berlin*, ix.) those by Fontana (*Opuscula Physico-Mathematica*), and those by Sir George Shuckburgh and General Roy in the *Philosophical Transactions*.

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suppose to G, and will compress the air into a smaller space AE. Draw the horizontal line EF; the new bulk of the compressed air is evidently AE, measured by the adjacent scale, and the addition made to the compressing force of the atmosphere is the weight of the column GF. Produce GF downwards to H, till FH is equal to the height shown by a Toricellian tube filled with the *same mercury;* then the whole compressing force is HG. This is evidently the measure of the elasticity of the compressed air in AE, for it balances it. Now, pour in more mercury, and let it rise to *g*, compressing the air into A *e*. Draw the horizontal line *e f*, and make *f h* equal to FH; then A *e* will be the new bulk of the compressed air, $\frac{AB}{A e}$ will be its new density, and *h g* will be the measure of the new elasticity. This operation may be extended as far as we please, by lengthening the tube CD, and taking care that it be strong enough to resist the great pressure. Great care must be taken to keep the whole in a constant temperature, because the elasticity of air is greatly affected by heat, and the change by any increase of temperature is different according to its density or compression.

Experiments of Boyle, &c. The experiments of Boyle, Mariotte, Amontons, and others, were not extended to very great compressions, the density of the air not having been quadrupled in any of them; nor do they seem to have been made with very great nicety. It may be collected from them in general, that the elasticity of the air is very nearly proportioned to its density; and accordingly this law was almost immediately acquiesced in, and was called the *Boylean law;* it is accordingly assumed by almost all writers on the subject as exact. Of late years, however, there occurred questions in which it was of importance that this point should be more scrupulously settled, and the former experiments were repeated and extended. The result has been, that the compression of atmospheric air and most other gases increases rather faster than is strictly proportional to the pressure.

Varieties in these experiments. Considerable varieties and irregularities are to be observed in these experiments. It is extremely difficult to preserve the temperature of the apparatus, particularly of the leg AB, which is most handled. A great quantity of mercury must be employed; and it does not appear that philosophers have been careful to have it precisely similar to that in the barometer, which gives us the unit of compressing force and of elasticity. The mercury in the syphon as well as in the barometer should be pure and boiled. If the mercury in the syphon is adulterated with bismuth and tin, which it commonly is to a considerable degree, the compressing force, and consequently the elasticity, will appear greater than the truth. If the barometer has not been nicely filled, it will be lower than it should be, and the compressing force will appear too great, because the unit is too small; and this error will be most remarkable in the smaller compressions.

Heterogeneous nature of the air. The greatest source of error and irregularity in the experiments is the very heterogeneous nature of the air itself. Air is a solvent of all fluids, all vapours, and perhaps of many solid bodies. It is highly improbable that the different compounds shall have the same elasticity, or even the same law of elasticity; and it is well known, that air loaded with water or other volatile bodies, is much more expansible by heat than pure air; nay, it would appear from many experiments, that certain determinate changes both of density and of temperature, cause air to let go the vapours which it holds in solution. Cold causes it to precipitate water, as appears in dew; so does rarefaction, as is seen in the receiver of an air-pump.

The elasticity of air. In general, it appears that the elasticity of air does not increase quite so fast as its density. This will be best seen by the following tables, calculated from the experiments of Mr. Sulzer. The column E in each set of experiments expresses the length of the column GH, the unit being FH, whilst the column D expresses $\frac{AB}{AE}$.

First set.		Second set.		Third set.	
D	E	D	E	D	E
1·000	1·000	1·000	1·000	1·000	1·000
1·100	1·093	1·236	1·224	1·091	1·076
1·222	1·211	1·294	1·288	1·200	1·183
1·375	1·284	1·375	1·332	1·333	1·303
1·571	1·559	1·466	1.417	1·500	1·472
1·692	1·669	1·571	1·515	1·714	1·659
1·833	1·796	1·692	1·647		
2·000	1·958	2·000	1·964	2·000	1·900
2·288	2·130				
2·444	2·375	2·444	2·392	2·400	2·241
3·143	2·936	3·143	3·078	3·000	2·793
3·666	3·391	3·666	3·575		
4·000	3·706			4·000	3·631
4·444	4·035	4·444	4·320		
4·888	4·438				
5·500	4·922	5·500	5·096		
5·882	5·522			6·000	5·297
		7·333	6·694		
				8·000	6·835

There appears in these experiments to be sufficient grounds for calling in question the Boylean law; and the writer of this article thought it incumbent on him to repeat them with some precautions, which probably had not been attended to by Mr. Sulzer. He was particularly anxious to have the air as free as possible from moisture. For this purpose, having detached the short leg of the syphon, which was 34 inches long, he boiled mercury in it, and filled it with mercury boiling hot. He took a tinplate vessel of sufficient capacity, and put into it a quantity of powdered quicklime just taken from the kiln; and having closed the mouth, he agitated the lime through the air in the vessel, and allowed it to remain there all night. He then emptied the mercury out of the syphon into this vessel, keeping the open end far within it. By this means the short leg of the syphon was filled with very dry air. The other part was now joined, and boiled mercury put into the bend of the syphon; and the experiment was then prosecuted with mercury which had been recently boiled, and was the same with which the barometer had been carefully filled.

The results of the experiments are expressed in the following table:

First set.		Second set.		Third set.	
D	E	D	E	D	E
1·000	1·000	1·000	1·000	1·000	1·000
2·000	1·957	2·000	1·920	2·000	1·909
3·000	2·848	3·000	3·839	3·000	2·845
4·000	3·737	4·000	3·726	4·000	3·718
5·500	4·930	5·500	5·000	5·500	5·104
6·000	5·342	6·000	5·452	6·000	5·463
7·620	6·490	7·620	6·775	7·620	6·812

Here it appears again in the clearest manner that the elasticities do not increase as fast as the densities, and the differences are even greater than in Mr. Sulzer's experiments.

The second set contains the results of experiments which

Experiments on air.

were made on very damp air in a warm summer's morning. In these it appears that the elasticities are almost precisely proportional to the densities + a small constant quantity, nearly 0·11, deviating from this rule chiefly between the densities 1 and 1·5, within which limits we have very nearly $D=E^{1\cdot0017}$. As this air is nearer to the constitution of atmospheric air than the former, this rule may be safely followed in cases where atmospheric air is concerned, as in measuring the depths of pits by the barometer.

The third set shows the compression and elasticity of air strongly impregnated with the vapours of camphire. Here the Boylean law appears pretty exact, or rather the elasticity seems to increase a little faster than the density.

Dr. Hooke examined the compression of air by immersing a bottle to great depths in the sea, and weighing the water which got into it without any escape of air. But this method was liable to great uncertainty, on account of the unknown temperature of the sea at great depths.

Mode of examining the elasticity of rarefied air.

Hitherto we have considered only such air as is not rarer than what we breathe; we must take a very different method for examining the elasticity of rarefied air. Let gh (fig. 67,) be a long tube, formed a-top into a cup, and of sufficient diameter to receive another smaller tube af, open at first at both ends. Let the outer tube and cup be filled with mercury, which will rise in the inner tube to the same level. Let af now be stopped at a. It contains air of the same density and elasticity with the adjoining atmosphere. Note exactly the space ab which it occupies. Draw it up into the position of fig. 68, and let the mercury stand in it at the height de, whilst ce is the height of the mercury in the barometer. It is evident that the column de is in equilibrio between the pressure of the atmosphere and the elasticity of the air included in the space ad. And since the weight of ce would be in equilibrio with the whole pressure of the atmosphere, the weight of cd is equivalent to the elasticity of the included air. Whilst therefore ce is the measure of the elasticity of the surrounding atmosphere, cd will be the measure of the elasticity of the included air; and since the air originally occupied the space ab, and has now expanded into ad, we have $\frac{ab}{ad}$ for the measure of its density. N.B. ce and cd are measured by the *perpendicular heights* of the columns, but ab and ad must be measured by their *solid capacities*.

By raising the inner tube still higher, the mercury will also rise higher, and the included air will expand still farther, and we obtain another cd, and another $\frac{ab}{ad}$; and in this manner the relation between the density and elasticity of rarefied air may be discovered.

Fig. 67.

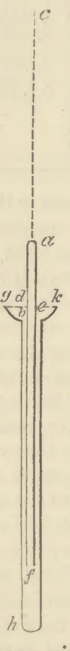


Fig. 68.

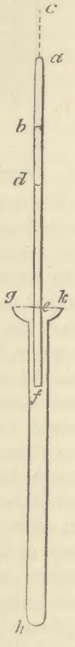
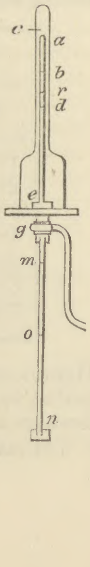


Fig. 69.



An easier method.

This examination may be managed more easily by means of the air-pump. Suppose a tube ae (fig. 69) containing a small quantity of air ab, set up in a cistern of mercury, which is supported in the tube at the height cb, and let ec be the height of the mercury in the barometer. Let this apparatus be set under a tubulated receiver on the pump-plate, and let gn be the pump-gage, and mn be made equal to ce.

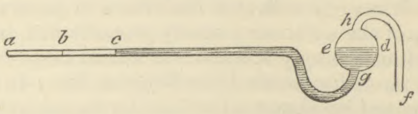
Then, as has been already shown, cb is the measure of the elasticity of the air in ab, corresponding to the bulk ab. Now let some air be abstracted from the receiver. The elasticity of the remainder will be diminished by its expansion; and therefore the mercury in the tube ae will descend to some point d. For the same reason, the mercury in the gage will rise to some point o, and mo will express the elasticity of the air in the receiver. This would support the mercury in the tube ae at the height er, if the space ar were entirely void of air. Therefore rd is the effect and measure of the elasticity of the included air when it has expanded to the bulk ad; and thus its elasticity, under a variety of other bulks, may be compared with its elasticity when of the bulk ab. When the air has been so far abstracted from the receiver that the mercury in ae descends to e, then mo will be the precise measure of its elasticity.

In all these cases it is necessary to compare its bulk ab with its natural bulk, in which its elasticity balances the pressure of the atmosphere. This may be done by laying the tube ac horizontally, and then the air will collapse into its ordinary bulk.

Another method.

Another easy method may be taken for this examination. Let an apparatus $abcdef$ (fig. 70,) be made, consisting of a horizontal tube ae of even bore, a ball dge of a large diameter, and a swan-neck tube hf. Let the ball and part of the tube geb be filled with mercury, so that the tube may be in the same horizontal plane with the surface de of the mercury in the ball. Then seal up the end a, and connect f with an air-pump. When the air is abstracted from the surface de, the air in ab will expand into a larger bulk ac, and the mercury in the pump-gage will rise to some distance below the barometric height. It is evident that this distance, without any farther calculation, will be the measure of the elasticity of the air pressing on the surface dc, and therefore of the air in ae.

Fig. 70.



The most exact mode.

The most exact of all methods is to suspend in the receiver of an air-pump a glass vessel, having a very narrow mouth, over a cistern of mercury, and then abstract the air till the gage rises to some determined height. The difference e between this height and the barometric height determines the elasticity of the air in the receiver and in the suspended vessel. Now, lower down that vessel by the slip-wire till its mouth is immersed into the mercury, and admit the air into the receiver; it will press the mercury into the little vessel. Lower it still further down, till the mercury within it is level with that without; then stop its mouth, take it out and weigh the mercury, and let its weight be w. Subtract this weight from the weight v of the mercury, which would completely fill the whole vessel; then the natural bulk of the air will be $v-w$, whilst its bulk, when of the elasticity e in the rarefied receiver, was the bulk or capacity w of the vessel. Its density therefore, corresponding to this elasticity e, was $\frac{v-w}{w}$. And thus may the relation between density and elasticity in all cases be obtained.

Various experiments made to this purpose.

A great variety of experiments to this purpose have been made, with different degrees of attention, according to the interest which the philosophers had in the result. Those made by M. de Luc, General Roy, Mr. Trembley, and Sir George Shuckburgh, are by far the most accurate; but they are all confined to very moderate rarefactions. The gene-

Boylean Law.

ral result has been, that the elasticity of rarefied air is very nearly proportional to its density. We cannot say with confidence that any regular deviation from this law has been observed, there being as many observations on one side as on the other; but we think that it is not unworthy the attention of philosophers to determine it with precision in the cases of extreme rarefaction, where the irregularities are most remarkable. The great source of error is a certain adhesive sluggishness of the mercury when the impelling forces are very small; and other fluids can hardly be used, because they either smear the inside of the tube and diminish its capacity, or they are converted into vapour, which alters the law of elasticity.

The Boylean law may be assumed.

Let us, upon the whole, assume the Boylean law, viz. that the elasticity of the air is proportional to its density. The law deviates not in any sensible degree from the truth in those cases which are of the greatest practical importance, that is, when the density does not much exceed or fall short of that of ordinary air.

Investigation.

Let us now see what information this gives us with respect to the action of the particles on each other. The investigation is extremely easy. We have seen that a force eight times greater than the pressure of the atmosphere will compress common air into the eighth part of its common bulk, and give it eight times its common density; and in this case we know, that the particles are at half their former distance, and that the number which are now acting on the surface of the piston employed to compress them is quadruple of the number which act on it when it is of the common density. Therefore, when this eightfold compressing force is distributed over a fourfold number of particles, the portion of it which acts on each is double. In like manner, when a compressing force 27 is employed, the air is compressed into $\frac{1}{27}$ of its former bulk, the particles are at $\frac{1}{3}$ of their former distance, and the force is distributed among 9 times the number of particles; the force on each is therefore 3. In short, let $\frac{1}{x}$ be the distance of the particles, the number of them in any given vessel, and therefore the density will be as x^3, and the number pressing by their elasticity on its whole internal surface will be as x^2. Experiment shews, that the compressing force is as x^3, which being distributed over the number as x^2, will give the force on each as x. Now, this force is in immediate equilibrium with the elasticity of the particle immediately contiguous to the compressing surface. This elasticity is therefore as x; and it follows from the nature of perfect fluidity, that the particle adjoining to the compressing surface presses with an equal force on its adjoining particles on every side. Hence we must conclude, that the corpuscular repulsions exerted by the adjoining particles are inversely as their distances from each other, or that the adjoining particles tend to recede from each other with forces inversely proportional to their distances.

Sir Isaac Newton first reasoned properly.

Sir Isaac Newton was the first who reasoned in this manner from the phenomena. Indeed he was the first who had the patience to reflect on the phenomena with any precision. His discoveries in gravitation naturally gave his thoughts this turn, and he very early hinted his suspicions that all the characteristic phenomena of tangible matter were produced by forces which were exerted by the particles at small and insensible distances. And he considers the phenomena of air as affording an excellent example of this investigation, and deduces from them the law which we have now demonstrated; and says, that air consists of particles which avoid the adjoining particles with forces inversely proportional to their distances from each other. From this he deduces (in the second book of his Principles) several beautiful propositions, determining the mechanical constitution of the atmosphere.

Limits.

But it must be noticed that he limits this action to the *adjoining* particles; and this is a remark of immense consequence, though not attended to by the numerous experimenters who adopt the law.

Height of the atmosphere.

It is plain that the particles are supposed to act at a distance, and that this distance is variable, and that the forces diminish as the distances increase. A very ordinary air-pump will rarefy the air 125 times. The distance of the particles is now 5 times greater than before; and yet they still repel each other; for air of this density will still support the mercury in a syphon-gage at the height of 0·24, or $\frac{24}{100}$ of an inch; and a better pump will allow this air to expand twice as much, and still leave it elastic. Thus we see that whatever is the distance of the particles of common air, they can act five times further off. The question comes now to be, Whether, in the state of common air, they really do act five times further than the distance of the adjoining particles? Whilst the particle a acts on the particle b with the force 5, does it also act on the particle c with the force 2·5, on the particle d with the force 1·667, on the particle e with the force 1·25, on the particle f with the force 1, on the particle g with the force 0.833, &c.

Sir Isaac Newton shows in the plainest manner, that this is by no means the case; for if this were the case, he makes it appear that the sensible phenomena of condensation would be totally different from that we observe. The force necessary for a quadruple condensation would be eight times greater, and for a nonuple condensation the force must be 27 times greater. Two spheres filled with condensed air must repel each other, and two spheres containing air that is rarer than the surrounding air must attract each other, &c. &c. All this will appear very clearly, by applying to air the reasoning which Sir Isaac Newton has employed in deducing the sensible law of mutual tendency of two spheres, which consist of particles attracting each other with forces proportional to the square of the distance inversely.

If we could suppose that the particles of air repelled each other with invariable forces at all distances within some small and insensible limit, this would produce a compressibility and elasticity similar to what we observe. For if we consider a row of particles, within this limit, as compressed by an external force applied to the two extremities, the action of the whole row on the extreme points would be proportional to the number of particles, that is, to their distance inversely and to their density: and a number of such parcels, ranged in a straight line, would constitute a row of any sensible magnitude having the same law of compression. But this law of corpuscular force is unlike every thing we observe in nature, and to the last degree improbable.

We must therefore continue the limitation of this mutual repulsion of the particles of air, and be contented for the present with having established it as an experimental fact, that the adjoining particles of air are kept asunder by forces inversely proportional to their distances; or perhaps it is better to abide by the sensible law, that the density of air is proportional to the compressing force. This law is abundantly sufficient for explaining all the subordinate phenomena, and for giving us a complete knowledge of the mechanical constitution of our atmosphere.

The height of the air investigated.

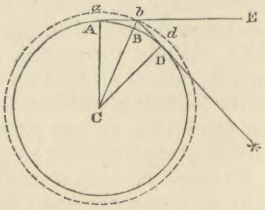
And, in the first place, this view of the compressibility of the air must give us a very different notion of the height of the atmosphere from what we deduced on a former occasion from our experiments. It is found, that when the air is of the temperature 32° of Fahrenheit's thermometer, and the mercury in the barometer stands at 30 inches, it will descend one-tenth of an inch if we take it to a place 87 feet higher. Therefore, if the air were equally dense and heavy throughout, the height of the atmosphere would be 30 × 10 × 87 feet, or 5 miles and 100 yards. But the loose reasoning adduced on that occasion was enough to

Height of the atmosphere.

show us that it must be much higher; because every stratum as we ascend must be successively rarer as it is less compressed by incumbent weight. Not knowing to what degree air expanded when the compression was diminished, we could not tell the successive diminutions of density and consequent augmentation of bulk and height; we could only say, that several atmospheric appearances indicated a much greater height. Clouds have been seen much higher; but the phenomenon of the twilight is the most convincing proof of this. There is no doubt that the visibility of the sky or air is owing to its want of perfect transparency, each particle, whether of matter purely aerial or heterogeneous, reflecting a little light.

Let *b* (fig. 71) be the last particle of illuminated air which can be seen in the horizon by a spectator at A. This must be illuminated by a ray SD *b*, touching the earth's surface at some point D. Now it is a known fact, that the degree of illumination called *twilight* is perceived when the sun is 18° below the horizon of the spectator, that is, when the angle E *b* S or ACD is 18 degrees; therefore *b* C is the secant of 9 degrees (it is less, viz. about 8½ degrees, on account of refraction). We know the earth's radius to be about 3970 miles: hence we conclude *b* B to be about 45 miles; nay, a very sensible illumination is perceptible much farther from the sun's place than this, perhaps twice as far, and the air is sufficiently dense for reflecting a sensible light at the height of nearly 200 miles.

Fig. 71.



Experiment fixes no limit to the air's expansibility.

We have now seen that air is prodigiously expansible. None of our experiments have distinctly shown us any limit. But it does not follow that it is expansible without end; nor is this at all likely. It is much more probable that there is a certain distance of the parts in which they no longer repel each other; and this would be the distance at which they would arrange themselves if they were not heavy. But at the very summit of the atmosphere they will be a very small matter nearer to each other, on account of their gravitation to the earth. Till we know precisely the law of this mutual repulsion, we cannot say what is the height of the atmosphere.

Farther observations.

But if the air be an elastic fluid whose density is always proportionable to the compressing force, we can tell what is its density at any height above the surface of the earth: and we can compare the density so calculated with the density discovered by observation: for this last is measured by the height at which it supports mercury in the barometer. This is the direct measure of the pressure of the external air; and as we know the law of gravitation, we can tell what would be the pressure of air having the calculated density in all its parts.

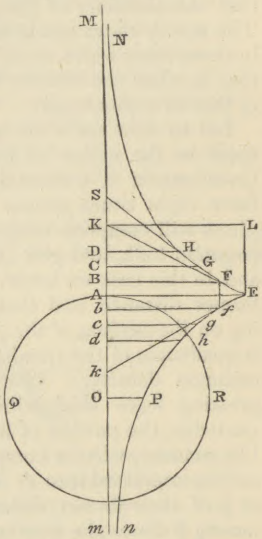
Let us therefore suppose a prismatic or cylindric column of air reaching to the top of the atmosphere. Let this be divided into an indefinite number of strata of very small and equal depths or thickness; and let us, for greater simplicity, suppose at first that a particle of air is of the same weight at all distances from the centre of the earth.

The absolute weight of any one of these strata will on these conditions be proportional to the number of particles or the gravity of air contained in it; and since the depth of each stratum is the same, this quantity of air will evidently be as the density of the stratum. But the density of any stratum is as the compressing force; that is, as the pressure of the strata above it; that is, as their weight; that is, as their quantity of matter: therefore the quantity of air in each stratum is proportional to the quantity of air above it. The quantity in each stratum, however, is the difference between the column incumbent on its bottom and on its top; therefore these differences are proportional to the quantities of which they are the differences. But when there is a series of quantities which are proportional to their own differences, both the quantities and the differences are in continual or geometrical progression: for let *a*, *b*, *c*, be three such quantities that $b : c = a - b : b - c$, then by alternation and composition $a : b = b : c$, therefore the densities of these strata decrease in a geometrical progression; that is, when the elevations above the centre or surface of the earth increase, or their depths under the top of the atmosphere decrease, in an arithmetical progression, the densities decrease in a geometrical progression.

Height of the atmosphere.

Let ARQ (fig. 72), represent the section of the earth by a plane through its centre O, and let *m*OAM be a vertical line, and AE perpendicular to OA will be a horizontal line through A, a point on the earth's surface. Let AE be taken to represent the density of the air at A; and let DH, parallel to AE, be taken to AE as the density at D is to the density at A: it is evident, that if a logistic or logarithmic curve EHN be drawn, having AN for its axis, and passing through the points E and H, the density of the air at any other point C, in this vertical line, will be represented by CG, the ordinate to the curve in that point: for it is the property of this curve, that if portions AB, AC, AD, of its axis to be taken in arithmetical progression, the ordinates AE, BF, CG, DH, will be in the geometrical progression.

Fig. 72.



It is another fundamental property of this curve, that if EK or HS touch the curve in E or H, the subtangent AK or DS is a constant quantity.

And a third fundamental property is, that the infinitely extended area MAEN is equal to the rectangle KAEL of the ordinate and subtangent; and, in like manner, the area MDHN is equal to SD × DH, or to KA × DH; consequently the area lying beyond any ordinate is proportional to that ordinate.

These geometrical properties of this curve are all analogous to the chief circumstances in the constitution of the atmosphere, on the supposition of equal gravity. The area MCGN represents the whole quantity of aereal matter which is above C. For CG is the density at C, and CD is the thickness of the stratum between C and D; and therefore CGHD will be as the quantity of matter or air in it; and in like manner of all the others, and of their sums, or the whole area MCGN; and as each ordinate is proportional to the area above it, so each density, and the quantity of air in each stratum, is proportional to the quantity of air above it; and as the whole area MAEN is equal to the rectangle KAEL, so the whole air of variable density above A might be contained in a column KA, if, instead of being compressed by its own weight, it were without weight, and compressed by an external force equal to the pressure of the air at the surface of the earth. In this case, it would be of the uniform density AE, which it has at the surface of the earth, making what we have repeatedly called the homogeneous atmosphere.

Hence we derive this important circumstance, that the height of the homogeneous atmosphere is the subtangent of that curve, the ordinates of which are as the densities of the air at different heights, on the supposition of equal gravity. This curve may with propriety be called the *atmospherical*

Height of the atmosphere.

logarithmic; and as the different logarithmics are all characterised by their subtangents, it is of importance to determine this one.

It may be done by comparing the densities of mercury and air. For a column of air of uniform density, reaching to the top of the homogeneous atmosphere, is in equilibrio with the mercury in the barometer. Now, it is found, by the best experiments, that when mercury and air are of the temperature of 32° of Fahrenheit's thermometer, and the barometer stands at 30 inches, the mercury is nearly 10440 times denser than air. Therefore the height of the homogeneous atmosphere is 10440 times 30 inches, or 26100 feet, or 8700 yards, or 4350 fathoms, or 5 miles wanting 100 yards.

Or it may be found by observations on the barometer. It is found, that when the mercury and air are of the above temperature, and the barometer on the sea-shore stands at 30 inches, if we carry it to a place 884 feet higher it will fall to 29 inches. Now, in all logarithmic curves having equal ordinates, the portions of the axes intercepted between the corresponding pairs of ordinates are proportional to the subtangents. And the subtangents of the curve belonging to our common tables is 0·4342945, and the difference of the logarithms of 30 and 29, (which is the portion of the axis intercepted between the ordinates 30 and 29), or 0·0147233, is to 0·4342945 as 883 is to 26068 feet, or 8686 yards, or 4343 fathoms, or 5 miles wanting 114 yards. This determination is 14 yards less than the other, and it is uncertain which is the more exact. It is extremely difficult to measure the respective densities of mercury and air; and in measuring the elevation which produces a fall of one inch in the barometer, an error of 1-20th of an inch would produce all the difference. We prefer the last, as depending on fewer circumstances.

But all this investigation proceeds on the supposition of equal gravity, whereas we know that the weight of a particle of air decreases as the square of its distance from the centre of the earth increases. In order, therefore, that a superior stratum may produce an equal pressure at the surface of the earth, it must be denser, because a particle of it gravitates less. The density, therefore, at equal elevations, must be greater than on the supposition of equal gravity, and the law of diminution of density must be different.

$$\begin{aligned} \text{Make } \mathrm{OD} : \mathrm{OA} &= \mathrm{OA} : \mathrm{O}d; \\ \mathrm{OC} : \mathrm{OA} &= \mathrm{OA} : \mathrm{O}c; \\ \mathrm{OB} : \mathrm{OA} &= \mathrm{OA} : \mathrm{O}b; \text{ \&c.}; \end{aligned}$$

so that O*d*, O*c*, O*b*, OA, may be reciprocals to OD, OC, OB, OA; and through the points, A, *b*, *c*, *d*, draw the perpendiculars AE, *bf*, *cg*, *dh*, making them proportional to the densities in A, B, C, D: and let us suppose CD to be exceedingly small, so that the density may be supposed uniform through the whole stratum. Thus we have

$$\begin{aligned} & \mathrm{OD} \times \mathrm{O}d = \mathrm{OA}^2, = \mathrm{OC} \times \mathrm{O}c \\ \text{and } & \mathrm{O}c : \mathrm{O}d = \mathrm{OD} : \mathrm{OC}; \\ \text{and } & \mathrm{O}c : \mathrm{O}c - \mathrm{O}d = \mathrm{OD} : \mathrm{OD} - \mathrm{OC}, \\ \text{or } & \mathrm{O}c : cd = \mathrm{OD} : \mathrm{DC}; \\ \text{and } & cd : \mathrm{CD} = \mathrm{O}c : \mathrm{OD}; \end{aligned}$$

or, because OC and OD are ultimately in the ratio of equality, we have

$$cd : \mathrm{CD} = \mathrm{O}c : \mathrm{OC} = \mathrm{OA}^2 : \mathrm{OC}^2,$$

and $cd = \mathrm{CD} \times \frac{\mathrm{OA}^2}{\mathrm{OC}^2}$, and $cd \times cg = \mathrm{CD} \times cg \times \frac{\mathrm{OA}^2}{\mathrm{OC}^2}$; but $\mathrm{CD} \times cg \times \frac{\mathrm{OA}^2}{\mathrm{OC}^2}$ is as the pressure at C arising from the absolute weight of the stratum CD. For this weight is as the bulk, as the density, and as the gravitation of each particle jointly. Now CD expresses the bulk, *cg* the density, and $\frac{\mathrm{OA}^2}{\mathrm{OC}^2}$, the gravitation of each particle. Therefore, $cd \times cg$ is as the pressure on C arising from the weight of the stratum DC; but $cd \times cg$ is evidently the element of the curvilineal area A*mn*E, formed by the curve E*fg h n* and the ordinates AE, *bf*, *cg*, *ah*, &c. *mn*. Therefore the sum of all the elements, such as *c d h g*, that is, the area *c m n g* below *cg*, will be as the *whole* pressure on C, arising from the gravitation of all the air above it; but, by the nature of air, this whole pressure is as the density which it produces, that is, as *cg*. Therefore the curve E*g n* is of such a nature that the area lying below or beyond any ordinate *cg* is proportional to that ordinate. This is the property of the logarithmic curve, and E *g n* is a logarithmic curve.

Height of the atmosphere.

But farther, this curve is the same with EGN. For let B continually approach to A, and ultimately coincide with it. It is evident that the ultimate ratio of BA to A*b*, and of BF to *bf*, is that of equality; and if EFK, E*fk*, be drawn, they will contain equal angles with the ordinate AE, and will cut off equal subtangents AK, A*k*. The curves EGN, E*gn* are therefore the same, but in opposite positions.

Lastly, if OA, O*b*, O*c*, O*d*, &c. be taken in arithmetical progression decreasing, their reciprocals OA, OB, OC, OD, &c. will be in harmonical progression increasing, as is well known; but, from the nature of the logarithmic curve, when OA, O*b*, O*c*, O*d*, &c. are in arithmetical progression, the ordinates AE, *bf*, *cg*, *dh*, &c. are in geometrical progression. Therefore when OA, OB, OC, OD, &c. are in harmonical progression, the densities of the air at A, B, C, D, &c. are in geometrical progression; and thus may the density of the air at all elevations be discovered. Thus, to find the density of the air at K the top of the homogeneous atmosphere, make $\mathrm{OK} : \mathrm{OA} = \mathrm{OA} : \mathrm{O}d$, and draw the ordinate *dh*, *dh* is the density at K.

The celebrated Dr. Halley was the first who observed the relation between the density of the air and the ordinates of the logarithmic curve, or common logarithms. This he did on the supposition of equal gravity; and his discovery is acknowledged by Sir Isaac Newton in his *Principia*, ii. *prop.* 22, *schol.* Halley's dissertation on the subject is in No. 185 of the *Philosophical Transactions.* Newton, with his usual sagacity, extended the same relation to the true state of the case, where gravity is as the square of the distance inversely; and showed that when the distances from the earth's centre are in harmonic progression, the densities are in geometric progression. He shows, indeed, in general, what progression of the distance, on any supposition of gravity, will produce a geometrical progression of the densities, so as to obtain a set of lines OA, O*b*, O*c*, O*d*, &c. which will be logarithms of the densities.[1]

Probable limit to application of Boyle's law.

From these principles a corollary is deducible, viz., that the air has a finite density at an infinite distance from the centre of the earth, which will be represented by the ordinate OP drawn through the centre. But from this corollary it would follow, that our moon must attract and acquire to itself a portion of this atmosphere, bearing an approximate relation to the gravity at its surface. Astronomy pronounces this highly improbable, and thus sets a practical limit to the law of *compression equal to elasticity*, on which our reasoning is founded.

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[1] The subject was afterwards treated in a more familiar manner by Cotes in his *Hydrostatic Lectures*, and in his *Harmonia Mensurarum*; by Dr. Brook Taylor, in his *Methodus Increment.*; by Wolf in his *Aerometria*; by Herman in his *Phoronomia*; and by Horsley in the *Philosophical Transactions*, tom. lxiv.

We have thus given an elementary account of the distinguishing properties of air as a heavy and compressible fluid, and of the general phenomena which are immediate consequences of these properties. This we have done in a set of propositions analogous to those which form the doctrines of hydrostatics. It remains to consider it in another point of view, namely, as moveable and inert. The phenomena consequent on these properties are exhibited in the velocities which air acquires by pressure, in the resistance which bodies meet with to their motion through the air, and in the impression which air in motion gives to bodies exposed to its action.

Doctrine of air acted on by equal and parallel gravity.

We shall first consider the motions of which air is susceptible when the equilibrium of pressure, whether arising from its weight or its elasticity, is removed; and, in the next place, we shall consider its action on solid bodies exposed to its current, and the resistance which it makes to their motion through it. In this consideration we shall avoid the extreme of generality, which renders the discussion too abstract and difficult, and adapt our investigation to the circumstances in which compressible fluids, of which air is taken for the representative, are most commonly found. We shall consider air therefore as it is commonly found in accessible situations, as acted on by equal and parallel gravity; and we shall consider it in the same order in which water is treated in a system of hydraulics.

In that science the leading problem is to determine with what velocity the water will move through a given orifice when impelled by some known pressure; and it has been found, that the best form in which this most difficult and intricate proposition can be put, is to determine the velocity of water flowing through this orifice when impelled by its weight alone. Having determined this, we can reduce to this case every question which can be proposed, for in place of the pressure of any piston or other mover, we can always substitute a perpendicular column of water or air whose weight shall be equal to the given pressure.

The velocity with which air rushes into a void.

The first problem, therefore, is to determine with what velocity air will rush into a void when impelled by its weight alone. This is evidently analogous to the hydraulic problem of water flowing out of a vessel. And here we must be contented with referring our readers to the solutions which have been given of that problem, and the demonstration that it flows with the velocity which a heavy body would acquire by falling from a height equal to the depth of the hole under the surface of the water in the vessel. In whatever way we attempt to demonstrate that proposition, every step, nay, every word, of the demonstration applies equally to the air, or to any fluid whatever. Or, if our readers should wish to see the connexion or analogy of the cases, we only desire them to recollect an undoubted maxim in the science of motion, that "when the moving force and the matter to be moved vary in the same proportion, the velocity will be the same." If therefore there be similar vessels of air, water, oil, or any other fluid, all of the height of a homogeneous atmosphere, they will all run through equal and similar holes with the same velocity; for in whatever proportion the quantity of matter moving through the hole be varied by a variation of density, the pressure which forces it out, by acting in circumstances perfectly similar, varies in the same proportion by the same variation of density. We must therefore assume it as the leading proposition, that "air rushes from the atmosphere into a void with the velocity which a heavy body would acquire by falling from the top of a homogeneous atmosphere."

It is known that air is about 840 times lighter than water, and that the pressure of the atmosphere supports water at the height of 33 feet nearly. The height therefore of a homogeneous atmosphere is nearly 33×840, or 27,720 feet. Moreover, to know the velocity acquired by any fall, recollect that a heavy body by falling one foot acquires the velocity of 8 feet per second; and that the velocities acquired by falling through different heights are as the square roots of the heights. Therefore to find the velocity corresponding to any height, expressed in feet per second, multiply the square root of the height by 8. We have therefore in the present instance $V = 8\sqrt{27,720} = 8 \times 166{\cdot}493 = 1332$ feet per second. This therefore is the velocity with which common air will rush into a void; and this may be taken as a standard number in pneumatics, as 16 and 32 are standard numbers in the general science of mechanics, expressing the action of gravity at the surface of the earth.

It is easy to see that greater precision is not necessary in this matter. The height of a homogeneous atmosphere is a variable thing, depending on the temperature of the air. If this reason seems any objection against the use of the number 1332, we may retain $8\sqrt{H}$ in place of it, where H expresses the height of a homogeneous atmosphere of the given temperature. A variation of the barometer makes no change in the velocity, nor in the height of the homogeneous atmosphere, because it is accompanied by a proportional variation in the density of the air. When it is increased $\frac{1}{10}$, for instance, the density is also increased $\frac{1}{10}$; and thus the expelling force and the matter to be moved are changed in the same proportion, and the velocity remains the same. Observe, we do not here consider the velocity which the air acquires after its issuing into the void by its continual expansion. This may be ascertained by the 39th proposition of Newton's *Principia*, book first. Nay, which appears very paradoxical, if a cylinder of air, communicating in this manner with a void, be compressed by a piston loaded with a weight, which presses it down as the air flows out, and thus keeps it of the same density, the velocity of efflux will still be the same, however great the pressure may chance to be; for the first and immediate effect of the load on the piston is to reduce the air in the cylinder to such a density that its elasticity shall exactly balance the load; and because the elasticity of air is proportional to its density, the density of the air will be increased in the same proportion with the load, that is, with the expelling power, for we are neglecting at present the weight of the included air as too inconsiderable to have any sensible effect. Therefore, since the matter to be moved is increased in the same proportion with the pressure, the velocity will be the same as before.

The velocity with which air rushes into a space containing rarer air.

It is equally easy to determine the velocity with which the air of the atmosphere will rush into a space containing rarer air. Whatever may be the density of this air, its elasticity, which follows the proportion of its density, will balance a proportional part of the pressure of the atmosphere; and it is the excess of this last only which is the moving force. The matter to be moved is the same as before. Let D be the natural density of the air, and δ the density of the air contained in the vessel into which it is supposed to run, and let P be the pressure of the atmosphere, and therefore equal to the force which impels it into a void; and let π be the force with which this rarer air would run into a void. We have $D : \delta = P : \pi$, and $\pi = \frac{P\delta}{D}$. Now the moving force in the present instance is $P - \pi$, or $P - \frac{P\delta}{D}$. Lastly, let V be the velocity of air rushing into a void, and v the velocity with which it will rush into this rarefied air.

It is a theorem in the motion of fluids, that the pressures are as the squares of the velocities of efflux.

Therefore $P : P - \frac{P\delta}{D} = V^2 : v^2$. Hence we derive $v^2 = V^2$

Air in motion.

$\times 1-\frac{\delta}{D}$, and $v\times V=\sqrt{1-\frac{\delta}{D}}\Big|$. We do not here consider the resistance which the air of the atmosphere will meet with from the inertia of that in the vessel which it must displace in its motion.

Here we see that there will always be a current into the vessel while δ is less than D.

We also learn the gradual diminution of the velocity as the vessel fills; for δ continually increases, and therefore $1-\frac{\delta}{D}$ continually diminishes.

It remains to determine the time t expressed in seconds, in which the air of the atmosphere will flow into this vessel from its state of vacuity till the air in the vessel has acquired any proposed density δ.

For this purpose let H, expressed in feet, be the height through which a heavy body must fall in order to acquire the velocity V, expressed also in feet per second. This we shall express more briefly in future, by calling it the height producing the velocity V. Let C represent the capacity of the vessel, expressed in cubic feet, and O the area or section of the orifice, expressed in superficial or square feet; and let the natural density of the air be D.

Since the quantity of aerial matter contained in a vessel depends on the capacity of the vessel and the density of the air jointly, we may express the air which would fill this vessel by the symbol CD when the air is in its ordinary state, and by $C\delta$ when it has the density δ. In order to obtain the rate at which it fills, we must take the fluxion of this quantity $C\delta$. This is $C\dot{\delta}$; for C is a constant quantity, and δ is a variable or flowing quantity.

But we also obtain the rate of influx by our knowledge of the velocity, and the area of the orifice, and the density. The velocity is V, or $8\sqrt{H}$, at the first instant; and when the air in the vessel has acquired the density δ, that is, at the end of the time t, the velocity is $8\sqrt{H}\sqrt{1-\frac{\delta}{D}}$, or $8\sqrt{H}\sqrt{\frac{D-\delta}{D}}$, or $8\sqrt{H}\frac{\sqrt{D-\delta}}{\sqrt{D}}$.

The rate of influx therefore (which may be conceived as measured by the little mass of air which will enter during the time $\dot{t}$ with this velocity) will be $\frac{8\sqrt{HOD}\sqrt{D-\delta}\,\dot{t}}{\sqrt{D}}$, or $8\sqrt{HO}\sqrt{D}\sqrt{D-\delta}\,\dot{t}$, multiplying the velocity by the orifice and the density.

Here then we have two values of the rate of influx. By stating them as equal we have a fluxionary equation, from which we may obtain the fluents, that is, the time t in seconds necessary for bringing the air in the vessel to the density δ, or the density δ which will be produced at the end of any time t. We have the equation $8\sqrt{HO}\sqrt{D}\sqrt{D-\delta}\,\dot{t}=C\dot{\delta}$. Hence we derive $\dot{t}=\frac{C}{8\sqrt{HO}\sqrt{D}}\times\frac{\dot{\delta}}{\sqrt{D-\delta}}$.

Of this the fluent is $t=\frac{C}{4\sqrt{HO}\sqrt{D}}\times\sqrt{D-\delta}+A$, in which A is a conditional constant quantity. The condition which determines it is, that t must be nothing when δ is nothing, that is, when $\sqrt{D-\delta}=\sqrt{D}$; for this is evidently the case at the beginning of the motion. Hence it follows, that the constant quantity is $\sqrt{D}$, and the complete fluent, suited to the case, is

$$\frac{C}{4\sqrt{HO}\sqrt{D}}\times\overline{\sqrt{D}-\sqrt{D-\delta}}.$$

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The motion ceases when the air in the vessel has acquired the density of the external air; that is, when $\delta=D$, or when $t=\frac{C}{4\sqrt{HO}\sqrt{D}}\times\sqrt{D},=\frac{C}{4\sqrt{HO}}$. Therefore the time of completely filling the vessel is $\frac{C}{4\sqrt{HO}}$.

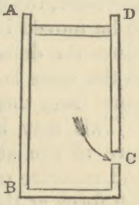
Let us illustrate this by an example in numbers.

Supposing then that air is 840 times lighter than water, and the height of the homogeneous atmosphere 27,720 feet, we have $4\sqrt{H}=666$. Let us further suppose the vessel to contain 8 cubic feet, which is nearly a wine hogshead, and that the hole by which the air of the ordinary density, which we shall make $=1$, enters, is an inch square, or $\frac{1}{144}$ of a square foot. Then the time in seconds of completely filling it will be $\frac{8'}{\frac{1}{144}666}$, or $\frac{1152''}{666}$, or 1.7297″. If the hole is only $\frac{1}{100}$ of a square inch, that is, if its side is $\frac{1}{10}$ of an inch, the time of completely filling the hogshead will be 173″ very nearly, or something less than three minutes.

If we make the experiment with a hole cut in a thin plate, we shall find the time greater nearly in the proportion of 63 to 100, for reasons obvious to all who have studied hydraulics. In like manner we can tell the time necessary for bringing the air in the vessel to $\frac{3}{4}$ths of its ordinary density. The only variable part of our fluent is the coefficient $-\sqrt{D-\delta}$, or $\sqrt{1-\delta}$. Let δ be $=\frac{3}{4}$, then $\sqrt{1-\delta}=\sqrt{\frac{1}{4}}=\frac{1}{2}$, and $\sqrt{1-\delta}=\frac{1}{2}$; and the time is $86\frac{1}{2}''$ very nearly when the hole is $\frac{1}{10}$ of an inch wide.

The velocity of air with the impulse of a weight moving down the vessel.

Fig. 73.



Let us now suppose that the air in the vessel ABCD (fig. 73.) is compressed by a weight acting on the cover AD, which is moveable down the vessel, and is thus expelled into the external air.

The immediate effect of this external pressure is to compress the air and give it another density. The density D of the external air corresponds to its pressure P. Let the additional pressure on the cover of the vessel be p, and the density of the air in the vessel be d. We shall have $P:P+p=D:d$; and therefore $p=P\times\frac{d-D}{D}$. Then, because the pressure which expels the air is the difference between the force which compresses the air in the vessel and the force which compresses the external air, the expelling force is p. And because the quantities of motion are as the forces which similarly produce them, we shall have $P:p\times\frac{d-D}{D}=MV:mv$; where M and m express the quantities of matter expelled, V expresses the velocity with which air rushes into a void, and v expresses the velocity sought. But because the quantities of aerial matter which issue from the same orifice in a moment are as the densities and velocities jointly, we shall have $MV:mv=DVV:dvv=DV^2:dv^2$. Therefore $P:p\frac{d-D}{D}=DV^2:dv$. Hence we deduce

$$V=V\sqrt{\frac{d-D}{d}}\Big|.$$

We may have another expression of the velocity without considering the density. We had $P:P+p=D:d$; therefore $d=\frac{D\times\overline{P+p}}{P}$, and $d-D=\frac{D\times\overline{P+p}}{P}-D,=$

$\frac{D\times\overline{P+p}-DP}{P}$, and $\frac{\dot{d}-D}{d}=\frac{D\times\overline{P+p}-DP}{D\times\overline{P+p}},=\frac{P+p-P}{P+p}=\frac{p}{P+p}$; therefore $v=V\times\sqrt{\frac{p}{P+p}}$, which is a very simple and convenient expression.

Hitherto we have considered the motion of air as produced by its weight only. Let us now consider the effect of its elasticity.

The effect of the air's elasticity considered.

Let ABCD (fig. 73) be a vessel containing air of any density D. This air is in a state of compression; and if the compressing force be removed, it will expand, and its elasticity will diminish along with its density. Its elasticity in any state is measured by the force which keeps it in that state. The force which keeps common air in its ordinary density is the weight of the atmosphere, and is the same with the weight of a column of water 33 feet high. If therefore we suppose that this air, instead of being confined by the top of the vessel, is pressed down by a moveable piston carrying a column of water 33 feet high, its elasticity will balance this pressure as it balances the pressure of the atmosphere; and as it is a fluid, and propagates through every part the pressure exerted on any one part, it will press on any little portion of the vessel by its elasticity in the same manner as when loaded with this column.

The consequence of this reasoning is, that if the small portion of the vessel be removed, and thus a passage be made into a void, the air will begin to flow out with the same velocity with which it would flow when impelled by its weight alone, or with the velocity acquired by falling from the top of a homogeneous atmosphere, or 1332 feet in a second nearly.

But as soon as some air has come out, the density of the remaining air is diminished, and its elasticity is diminished; therefore, the expelling force is diminished. But the matter to be moved is diminished in the very same proportion, because the density and elasticity are found to vary according to the same law; therefore the velocity will continue the same from the beginning to the end of the efflux.

This may be seen in another way. Let P be the pressure of the atmosphere, which being the counter-balance and measure of the initial elasticity, is equal to the expelling force at the first instant. Let D be the initial density, and V the initial velocity. Let d be its density at the end of the time t of efflux, and v the contemporaneous velocity. It is plain that at the end of this time we shall have the expelling force $\pi=\frac{Pd}{D}$; for $D:d=P:\pi\left(=\frac{Pd}{D}\right)$.

These forces are proportional to the quantities of motion which they produce; and the quantities of motion are proportional to the quantities of matter M and m and the velocities V and v jointly: therefore we have $P:\frac{Pd}{D}=MV:mv$. But the quantities of matter which escape through a given orifice are as the densities and velocities jointly; that is, $M:m=DV:dv$: therefore $P:\frac{Pd}{D}=DV^2:dv^2$, and $P\times dv^2=\frac{PdDV^2}{D}=PdV^2$, and $V^2=v^2$, and $V=v$, and the velocity of efflux is constant. Hence follows, what appears very unlikely at first sight, that however much the air in the vessel is condensed, it will always issue into a void with the same velocity.

Quantity of air issuing into a void, and density.

In order to find the quantity of aerial matter which will issue during any time t, and consequently the density of the remaining air at the end of this time, we must get the rate of efflux. In the element of time $\dot{t}$ there issues (by what has been said above) the bulk $8\sqrt{HO}t$ (for the velocity V is constant); and therefore the quantity $8\sqrt{HO}d\dot{t}$. On the other hand, the quantity of air at the beginning was CD, C being the capacity of the vessel; and when the air has acquired the density d, the quantity is Cd; therefore the quantity which has run out in the time $\dot{t}$ must be the fluxion of CD$-$Cd, or $-C\dot{d}$. Therefore we have the equation

$$8\sqrt{HO}d\dot{t}=-C\dot{d}, \text{ and } \dot{t}=\frac{-C\dot{d}}{8\sqrt{HO}d};=\frac{C}{8\sqrt{HO}}\times-\frac{\dot{d}}{d}.$$

The fluent of this is $t=\frac{C}{8\sqrt{HO}}\log.d$. This fluent must be so taken that t may be $=0$ when $d=D$. Therefore the correct fluent will be $t=\frac{C}{8\sqrt{HO}}\log.\frac{D}{d}$, for $\log.\frac{D}{D}=\log.1,=0$. We deduce from this, that it requires an infinite time for the whole air of a vessel to flow out of it into a void. N.B. By log. d, &c. is meant the hyperbolic logarithm of d, &c.

When the vessel emits it into rarer air.

Let us next suppose that the vessel, instead of letting out its air into a void, emits it into air of a less density, which remains constant during the efflux, as we may suppose to be the case when a vessel containing condensed air emits it into the surrounding atmosphere. Let the initial density of the air in the vessel be δ, and that of the atmosphere D. Then it is plain that the expelling force is $P-\frac{PD}{\delta}$, and that after the time t it is $\frac{Pd}{\delta}-\frac{PD}{\delta}$. We have therefore $P-\frac{PD}{\delta}:\frac{Pd}{\delta}-\frac{PD}{\delta}=MV:mv,=\delta V^2:dv^2$. Whence we derive $v=V\sqrt{\frac{\delta\,\overline{d-D}}{d\,\overline{\delta-D}}}$.

From this equation we learn that the motion will be at an end when $d=D$: and if $\delta=D$ there can be no efflux.

Relation between the time and density.

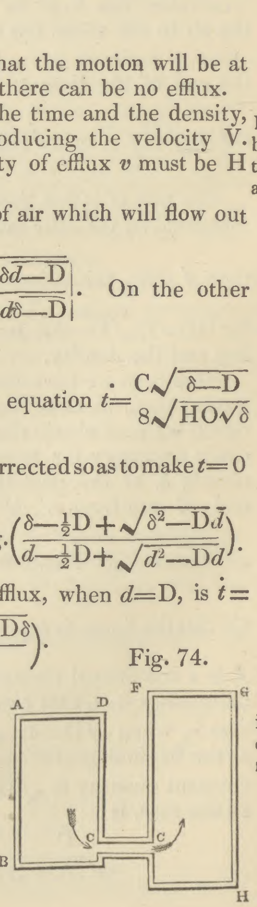
To find the relation between the time and the density, let H, as before, be the height producing the velocity V. The height producing the velocity of efflux v must be $H\times\frac{\delta\overline{d-D}}{d\overline{\delta-D}}$, and the little parcel of air which will flow out in the time t will $=8\sqrt{HO}d\dot{t}\sqrt{\frac{\delta\overline{d-D}}{d\overline{\delta-D}}}$. On the other hand, it is $=-C\dot{d}$.

Hence we deduce the fluxionary equation $\dot{t}=\frac{C\sqrt{\delta-D}}{8\sqrt{HO\sqrt{\delta}}}\times\frac{-\dot{d}}{\sqrt{d^2-Dd}}$. The fluent of this corrected so as to make $t=0$ when $d=\delta$, is $t=\frac{C\sqrt{\delta-D}}{8\sqrt{HO}\sqrt{\delta}}\times\log.\left(\frac{\delta-\frac{1}{2}D+\sqrt{\delta^2-Dd}}{d-\frac{1}{2}D+\sqrt{d^2-Dd}}\right)$. And the time of completing the efflux, when $d=D$, is $\dot{t}=\frac{C\sqrt{\delta-D}}{8\sqrt{HO}\sqrt{\delta}}\times\log.\left(\frac{\delta-\frac{1}{2}D+\sqrt{\delta^2-D\delta}}{\frac{1}{2}D}\right)$.

When issuing from denser into rarer air.

Lastly, let ABCD, CFGH (fig. 74) be two vessels containing airs of different densities, and communicating by the orifice C, there will be a current from the vessel containing the denser air into that containing the rarer; suppose from ABCD into CFGH.

Fig. 74.



Let P be the elastic force of

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the air in ABCD, Q its density, and V its velocity, and D the density of the air in CFGH. And, after the time t, let the density of the air in ABCD be q, its velocity v, and the density of the air in CFGH be δ. The expelling force from ABCD will be $P-\frac{PD}{Q}$ at the first instant, and at the end of the time t it will be $\frac{Pq}{Q}-\frac{P\delta}{Q}$. Therefore we shall have $P-\frac{PD}{Q} : \frac{Pq}{Q}-\frac{P\delta}{Q}=QV^2:qv^2$, which gives $v=V\times\sqrt{\frac{Q(q-\delta)}{q(Q-D)}}$, and the motion will cease when $\delta=q$.

Let A be the capacity of the first vessel, and B that of the second. We have the second equation $AQ+BD=Aq+B\delta$, and therefore $\delta=\frac{A(Q-q)+BD}{qB(Q-D)}$. Substituting this value of δ in the former value of v, we have $v=V\times\sqrt{\frac{Q[B(q-D)-A(Q-q)]}{qB(Q-D)}}$, which gives the relation between the velocity v and the density q.

In order to ascertain the time when the air in ABCD has acquired the density q, it will be convenient to abridge the work by some substitutions. Therefore make $Q(B+A)=M$, $BQD+BQ^2=N$, $BQ-BD=R$ and $\frac{N}{M}=m$. Then, proceeding as before, we obtain the fluxionary equation $8\sqrt{HO}q\frac{\sqrt{Mq-N}}{\sqrt{R}\sqrt{q}}\dot{t}=\overline{A\dot{Q}-q}=-A\dot{q}$, whence $\dot{t}=\frac{A\sqrt{R}}{8\sqrt{HO}\sqrt{M}}\times\frac{q}{\sqrt{q^2-mq}}$ of which the fluent, completed so that $t=0$ when $q=Q$, is $t=\frac{A\sqrt{R}}{8\sqrt{HO}\sqrt{M}}\times\log.\left(\frac{Q-\frac{1}{2}m+\sqrt{(Q^2mQ)}}{q-\frac{1}{2}m+\sqrt{(q^2mq)}}\right)$.

When air is expelled by force.

Some of these questions are of difficult solution, and they are not of frequent use in the more important and usual applications of the doctrines of pneumatics, at least in their present form. The cases of greatest use are when the air is expelled from a vessel by an external force, as when bellows are worked, whether of the ordinary form or consisting of a cylinder fitted with a movement piston. This last case merits a particular consideration; and, fortunately, the investigation is extremely easy.

Let AD (fig. 73) be considered as a piston moving downward with the uniform velocity f, and let the area of the piston be n times the area of the hole of efflux, then the velocity of efflux arising from the motion of the piston be nf. Add this to the velocity V produced by the elasticity of the air in the first question, and the whole velocity will be $V+nf$. It will be the same in the other. The problem is also freed from the consideration of the time of efflux. For this depends now on the velocity of the piston. It is still, however, a very intricate problem to ascertain the relation between the time and the density, even though the piston is moving uniformly; for at the beginning of the motion the air is of common density. As the piston descends, it both expels and compresses the air, and the density of the air in the vessel varies in a very intricate manner, as also its resistance or reaction on the piston. For this reason, a piston which moves uniformly by means of an external force, will never make an uniform blast by successive strokes; it will always be weaker at the beginning of the stroke. The best way for securing an uniform blast is to employ the external force only for lifting up the piston, and then to let the piston descend by its own weight. In this way it will quickly sink down, compressing the air, till its density and corresponding elasticity exactly balance the weight of the piston. After this the piston will descend equably, and the blast will be uniform. These observations and theorems will serve to determine the initial velocity of the air in all important cases of its expulsion. The philosopher will learn the rate of its efflux out of one vessel into another; the chemist will be able to calculate the quantities of the different gases which are employed in the curious experiments of the ingenious but unfortunate Lavoisier on combustion, and will find them extremely different from what he supposed; the engineer will learn how to proportion the motive force of his machine to the quantity of ærial matter which his bellows must supply. But it is not enough, for this purpose, that the air *begin* to issue in the proper quantity; we must see whether it be not affected by the circumstances of its subsequent passage.

Passage of air through pipes, &c.

All the modifications of motion which are observed in water conduits take place also in the passage of air through pipes and holes of all kinds. There is the same diminution of quantity passing through a hole in a thin plate that is observed in water. We know that, abating the small effect of friction, water issues with the velocity acquired by falling from the surface; and yet if we calculate by this velocity and by the area of the orifice, we shall find the quantity of water deficient nearly in the proportion of 63 to 100. This is owing to the water pressing towards the orifice from all sides, which occasions a contraction of the jet. The same thing happens in the efflux of air. Also the motion of water is greatly impeded by all contractions of its passage. These oblige it to accelerate its velocity, and therefore require an increase of pressure to force it through them, and this in proportion to the squares of the velocities. Thus, if a machine working a pump causes it to give a certain number of strokes in a minute, it will deliver a determined quantity of water in that time. Should it happen that the passage of the water is contracted to one half in any part of the machine, a thing which frequently happens at the valves, the water must move through this contraction with twice the velocity that it has in the rest of the passage. This will require four times the force to be exerted on the piston. Nay, if no part of the passage is narrower than the barrel of the pump, but on the contrary a part much wider, and if the conduit be again contracted to the width of the barrel, an additional force must be applied to the piston to drive the water through this passage, which would not have been necessary if the passage had not been widened in any part. It will require a force equal to the weight of a column of water of the height necessary for communicating a velocity, the square of which is equal to the difference of the squares of the velocities of the water in the wide and the narrow part of the conduit.

The same thing takes place in the motion of air, and therefore all contractions and dilatations must be carefully avoided, when we want to preserve the velocity unimpaired.

Air suffers retardation along pipes.

Air also suffers the same retardation in its motion along pipes. By not knowing, or not attending to that, engineers of the first reputation have been prodigiously disappointed in their expectations of the quantity of air which will be delivered by long pipes. Its extreme mobility and lightness hindered them from suspecting that it would suffer any sensible retardation. Dr. Papin, a most ingenious man, proposed this as the most effectual method of transferring the action of a moving power to a great distance. Suppose, for instance, that it was required to raise water out of a mine by a water-machine, and that there was no fall of water nearer than a mile's distance. He employed this water to drive a piston, which should compress the air in a cylinder communicating, by a long pipe, with another cylinder at the mouth of the mine. This second cylinder had a piston in it, whose rod was to give motion to the pumps at the mine. He expected, that as soon as the piston at the water-machine

Air in motion.

had compressed the air sufficiently, it would cause the air in the cylinder at the mine to force up its piston, and thus work the pumps. Dr. Hooke made many objections to the method, when laid before the Royal Society, and it was much debated there. But dynamics was at this time an infant science, and very little understood. Newton had not then taken any part in the business of the society, otherwise the true objections would not have escaped his sagacious mind. Notwithstanding Papin's great reputation as an engineer and mechanic, he could not bring his scheme into use in England; but afterwards, in France and in Germany, where he settled, he got some persons of great fortunes to employ him in this project; and he erected great machines in Auvergne and Westphalia for draining mines. But, so far from being effective machines, they would not even begin to move. He attributed the failure to the quantity of air in the pipe of communication, which must be condensed before it can condense the air in the remote cylinder. This indeed is true, and he should have thought of this earlier. He therefore diminished the size of this pipe, and made his water-machine exhaust instead of condensing, and had no doubt but that the immense velocity with which air rushes into a void would make a rapid and effectual communication of power. But he was equally disappointed here, and the machine at the mine stood still as before.

Nearly a century after this, a very intelligent engineer attempted a much more feasible thing of this kind at an iron-foundery in Wales. He erected a machine at a powerful fall of water, which worked a set of cylinder bellows, the blow-pipe of which was conducted to the distance of a mile and a half, where it was applied to a blast furnace. But notwithstanding every care to make the conducting pipe very air-tight, of great size, and as smooth as possible, it would hardly blow out a candle. The failure was ascribed to the impossibility of making the pipe air-tight. But, what was surprising, above ten minutes elapsed after the action of the pistons in the bellows before the least wind could be perceived at the end of the pipe; whereas the engineer expected an interval of six seconds only.

No very distinct theory can be delivered on this subject; but we may derive considerable assistance in understanding the causes of the obstruction to the motion of water in long pipes, by considering what happens to air. The elasticity of the air, and its great compressibility, have given us the distinctest notions of fluidity in general, shewing us, in a way that can hardly be controverted, that the particles of a fluid are kept at a distance from each other, and from other bodies, by the corpuscular forces.

How fluids are obstructed in moving along canals.

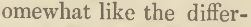
The writers on hydrodynamics have always considered the obstruction to the motion of fluids along canals of any kind, as owing to something like the friction by which the motion of solid bodies on each other is obstructed; but we cannot form to ourselves any distinct notion of resemblance, or even analogy between them. The fact is, however, that a fluid running along a canal has its motion obstructed; and that this obstruction is greatest in the immediate vicinity of the solid canal, and gradually diminishes to the middle of the stream. It appears, therefore, that the parts of fluids can no more move among each other than among solid bodies, without suffering a diminution of their motion. The parts in physical contact with the sides and bottom are retarded by these immoveable bodies. The particles of the next stratum of fluid cannot preserve their initial velocities without overpassing the particles of the first stratum; and it appears from the fact that they are by this means retarded. They retard in the same manner the particles of the third stratum, and so on to the middle stratum or thread of fluid. It appears from the fact, therefore, that this sort of friction is not a consequence of rigidity alone, but that it is equally competent to fluids. Nay, since it is a matter of fact in air, and is even more remarkable there than in any other fluid, as we shall see by the experiments which have been made on the subject; and as our experiments on the compression of air shew us the particles of air ten times nearer to each other in some cases than in others (viz. when we see air a thousand times denser in these cases), and therefore force us to acknowledge that they are not in contact; it is plain that this obstruction has no analogy to friction, which supposes roughness or inequality of surface. No such inequality can be supposed in the surface of an aerial particle; nor would it be of any service in explaining the obstruction, since the particles do not rub on each other, but pass each other at some small and imperceptible distance. We must therefore have recourse to some other mode of explication. We shall apply this to air only in this place; and, since it is proved by the incontrovertible experiments of Canton, Zimmerman, and others, that water, mercury, oil, &c., are also compressible and perfectly elastic, the argument from this principle, which is conclusive in air, must equally explain the similar phenomenon in hydraulics.

Particles of air resist a change from a rectilineal to an undulating motion.

The most highly polished body which we know must be conceived as having an uneven surface when we compare it with the small spaces in which the corpuscular forces are exerted; and a quantity of air moving in a polished pipe may be compared to a quantity of small shot sliding down a channel with undulated sides and bottom. The row of particles immediately contiguous to the sides will therefore have an undulated motion: but this undulation of the contiguous particles of air will not be so great as that of the surface along which they glide; for not only every motion requires force to produce it, but also every change of motion. The particles of air resist this change from a rectilineal to an undulating motion; and, being elastic, that is, repelling each other and other bodies, they keep a little nearer to the surface as they are passing over an eminence, and their path is less incurvated than the surface. The difference between the motion of the particles of air and the particles of a fluid quite unelastic is, in this respect, somewhat like the difference between the motion of a spring-carriage and that of a common carriage. When the common carriage passes along a road not perfectly smooth, the line described by the centre of gravity of the carriage keeps perfectly parallel to that described by the axis of the wheels, rising and falling along with it. Now let a spring body be put on the same wheels and pass along the same road. When the axis rises over an eminence perhaps half an inch, sinks down again into the next hollow, and then rises a second time, and so on, the centre of gravity of the body describes a much straighter line; for upon the rising of the wheels, the body resists the motion, and compresses the springs, and thus remains lower than it would have been had the springs not been interposed. In like manner, it does not sink so low as the axle does when the wheels go into a hollow. And thus the motion of spring-carriages becomes less violently undulated than the road along which they pass. This illustration will, we hope, enable the reader to conceive how the deviation of the particles next to the sides and bottom of the canal from a rectilineal motion is less than that of the canal itself.

It is evident that the same reasoning will prove that the undulation of the next row of particles will be less than that of the first, that the undulation of the third row will be less than that of the second, and so on, as is represented in fig. 75. And thus it appears, that whilst the mass of air has a progressive motion along the pipe or canal, each particle is describing a waving line, of which a line parallel to the direction of the canal is the axis, cutting all these undulations. This axis of each undulated path will be straight or curved as the canal is, and the excursions of the path on each side of its axis will be less and less as the axis of the path is nearer to the axis of the canal.

Fig. 75.



Let us now see what *sensible* effect this will have; for all the motion which we here speak of is imperceptible. It is demonstrated in mechanics, that if a body moving with any velocity be deflected from its rectilineal path by a curved and perfectly smooth channel, to which the rectilineal path is a tangent, it will proceed along this channel with undiminished velocity. Now the path, in the present case, may be considered as perfectly smooth, since the particles do not touch it. It is one of the undulations which we are considering, and we may at present conceive this as without any subordinate inequalities. There should not, therefore, be any diminution of the velocity. Let us grant this of the absolute velocity of the particle; but what we observe is the velocity of the mass, and we judge of it perhaps by the motion of a feather carried along by it. Let us suppose a single atom to be a sensible object, and let us attend to two such particles, one at the side, and the other in the middle: although we cannot perceive the undulations of these particles during their progressive motions, we see the progressive motions themselves. Let us suppose, then, that the middle particle has moved without any undulation whatever, and that it has advanced ten feet. The lateral particle will also have moved ten feet; but this has not been in a straight line. It will not be so far advanced, therefore, in the direction of the canal; it will be left behind, and will appear to us to have been retarded in its motion; and in like manner each thread of particles will apparently be more and more retarded, as it recedes farther from the axis of the canal, or what is usually called the thread of the stream.

The undulatory motion is a real obstruction.

And thus the observed fact is shewn to be a necessary consequence of what we know to be the nature of a compressible or elastic fluid; and that without supposing any diminution in the real velocity of each particle, there will be a diminution of the velocity of the sensible threads of the general stream, and a diminution of the whole quantity of air which passes along it during a given time.

Let us now suppose a parcel of air impelled along a pipe, which is *perfectly* smooth, out of a larger vessel, and issuing from this pipe with a certain velocity. It requires a certain force to change its velocity in the vessel to the greater velocity which it has in the pipe. This is abundantly demonstrated. How long soever we suppose this pipe, there will be no change in the velocity, or in the force to keep it up. But let us suppose that about the middle of this pipe there is a part of it which has suddenly got an undulated surface, however imperceptible. Let us further suppose that the final velocity of the middle thread is the same as before. In this case it is evident that the sum total of the motions of all the particles is greater than before, because the absolute motions of the lateral particles is greater than that of the central particle, which we suppose the same as before. This absolute increase of motion cannot be without an increase of propelling force: the force acting now, therefore, must be greater than the force acting formerly. Therefore, if only the former force had continued to act, the same motion of the central particle could not have been preserved, or the progressive motion of the whole stream must be diminished. And thus we see that this internal insensible undulatory motion becomes a real obstruction to the sensible motion which we observe, and occasions an expense of power.

An additional force necessary for preserving a given progressive motion.

Let us see what will be the consequence of extending this obstructing surface further along the canal. It must evidently be accompanied by an augmentation of the motion produced, if the central velocity be still kept up; for the particles which are now in contact with the sides do not continue to occupy that situation. The middle particles moving faster *forward* get over them, and in their turn come next the side; and as they are really moving equally fast, but not in the direction into which they are now to be forced, force is necessary for changing the direction also; and this is in addition to the force necessary for producing the undulations so minutely treated of. The consequence of this must be, that an additional force will be necessary for preserving a given progressive motion in a longer *obstructing* pipe, and that the motion produced in a pipe of greater length by a given force will be less than in a shorter one, and the efflux will be diminished.

There is another consideration which must have an influence here. Nothing is more irrefragably demonstrated than the necessity of an additional force for producing an efflux through any contraction, even though it should be succeeded by a dilatation of the passage. Now both the inequalities of the sides and the undulations of the motions of each particle are equivalent to a succession of contractions and dilatations; although each of these is next to infinitely small, their number is also next to infinitely great, and therefore the total effect may be sensible.

There are other obstructions, as angular asperities.

We have hitherto supposed that the absolute velocity of the particles was not diminished; this we did, having assumed that the interval of each undulation of the sides was without inequalities. But this was gratuitous; it was also gratuitous that the sides were only undulated. We have no reason for excluding angular asperities. These will produce, and most certainly often produce, real diminutions in the velocity of the contiguous particles; and this must extend to the very axis of the canal, and produce a diminution of the sum total of motion; and in order to preserve the same sensible progressive motion, a greater force must be employed. This is all that can be meant by saying that there is a resistance to the motion of air through long pipes.

There remains another cause of diminution, viz. the want of perfect fluidity, whether arising from the dissemination of solid particles in a real fluid, or from the viscidity of the fluid. We shall not insist on this at present, because it cannot be shown to obtain in air, at least in any case which deserves consideration. It seems of no importance to determine the motion of air hurrying along with it soot or dust. The effect of fogs on a particular modification of the motion of air will be considered under another head. What has been said on this subject is sufficient for our purpose, as explaining the prodigious and unexpected obstruction to the passage of air through long and narrow pipes. We are able to collect an important maxim from it, viz. that all pipes of communication should be made as wide as circumstances will permit; for it is plain that the obstruction depends on the internal surface, and the force to overcome it must be in proportion to the mass of matter which is in motion. The first increases as the diameter of the pipe, and the last as the square. The obstruction must therefore bear a greater proportion to the whole motion in a small pipe than in a large one.

The law of retardation unknown.

It were very desirable to know the law by which the retardation extends from the axis to the sides of the canal, and the proportion which subsists between the lengths of the canal and the forces necessary for overcoming the obstructions when the velocity is given; as also whether the proportion of the obstruction to the whole motion varies with the velocity; but all this is unknown. It does not, however, seem a desperate case in air; we know pretty distinctly the law of action among its particles, viz. that their mutual repulsions are inversely as their distances. This promises to enable us to trace the progress of undulation from the sides of the canal to the axis.

The rate of increase not as the square of the velocities.

We can see that the retardations will not increase so fast as the square of the velocity. Were the fluid incompressible, so that the undulatory path of a particle were invariable, the deflecting forces by which each individual particle is made to describe its undulating path would be precisely such as arise from the path itself and the motion in it; for each particle would be in the situation of a body moving along a fixed path. But in a very compressible fluid, such as air, each particle may be considered as a solitary body, actuated by a projectile and a transverse force, arising from the action of the adjoining particles. Its motion must depend on the adjustment of these forces, in the same manner as the elliptical motion of a planet depends on the adjustment of the force of projection, with a gravitation inversely proportional to the square of the distance from the focus. The transverse force in the present case has its origin in the pressure on the air which is propelling it along the pipe; this, by squeezing the particles together, brings their mutual repulsion into action. Now it is the property of a perfect fluid, that a pressure exerted on any part of it is propagated equally through the whole fluid; therefore the transverse forces which are excited by this pressure are proportional to the pressure itself; and we know that the pressures exerted on the surface of a fluid, so as to expel it through any orifice, or along any canal, are proportional to the squares of the velocities which they produce. Therefore, in every point of the undulatory motion of any particle, the transverse force by which it is deflected into a curve is proportional to the square of its velocity. When this is the case, a body would continue to describe the same curve as before; but, by the very compression, the curvatures are increased, supposing them to remain similar. This would require an increase of the transverse forces; but this is not to be found; therefore the particle will not describe a similar curve, but one which is less incurvated in all its parts; consequently the progressive velocity of the whole, which is the only thing perceivable by us, will not be so much diminished; that is, the obstructions will not increase so fast as they would otherwise do, or as the squares of the velocities.

This reasoning is equally applicable to all fluids, and is abundantly confirmed by experiments in hydraulics, as we shall see when considering the motion of rivers. We have taken this opportunity of delivering our notions on this subject; because, as we have often said, it is in the avowed discrete constitution of air that we see most distinctly the operation of those natural powers which constitute fluidity in general.

Bossut's experiments on pipes and canals.

We would beg leave to mention a form of experiment for discovering the law of retardation with considerable accuracy. Experiments have been made on pipes and canals. M. Bossut, in his *Hydrodynamique*, has given a very beautiful set made on pipes of an inch and two inches in diameter, and 200 feet in length; but although these experiments are very instructive, they do not give us any rule by which we can extend the result to pipes of greater length and different diameters.

Let a smooth cylinder be set upright in a very large vessel or pond, and be moveable round its axis; let it be turned round by means of a wheel and pulley with an uniform motion and determined velocity. It will exert the same force on the contiguous water which would be exerted on it by water turning round it with the same velocity; and as this water would have its motion gradually retarded by the fixed cylinder, so the moving cylinder will gradually communicate motion to the surrounding water. We should observe the water gradually dragged round by it; and the vortex would extend farther and farther from it as the motion is continued, and the velocities of the parts of the vortex will be less and less as we recede from the axis. Now, we apprehend, that when a point of the surface of the cylinder has moved 200 feet, the *motion* of the water at different distances from it will be similar and proportional to, if not precisely the same with, *retardations* of water flowing 200 feet at the same distance from the side of a canal; at any rate, the two are susceptible of an accurate comparison, and the law of retardation may be accurately deduced from observations made on the motions of this vortex.

Wind.

Air in motion is a very familiar object of observation; and it is interesting. In all languages it has got a name; we call it wind; and it is only upon reflection that we consider air as wind in a quiescent state. Many persons hardly know what is meant when air is mentioned; but they cannot refuse that the blast from a bellows is the expulsion of what they contained; and thus they learn that wind is air in motion.

The velocity of win not easily discovered

It is of consequence to know the velocity of wind; but no good and unexceptionable method has been contrived for this purpose. The best seems to be by measuring the space passed over by the shadow of a cloud; but this is extremely fallacious. In the first place, it is certain, that although we suppose that the cloud has the velocity of the air in which it is carried along, this is not an exact measure of the current on the surface of the earth; we may be almost certain that it is greater; for air, like all other fluids, is retarded by the sides and bottom of the channel in which it moves. But, in the next place, it is very gratuitous to suppose, that the velocity of the cloud is the velocity of the stratum of air between the cloud and the earth; we are almost certain that it is not. It was clearly proved by Dr. Hutton of Edinburgh, that clouds are always formed when two parcels of air of different temperatures mix together, each containing a proper quantity of vapour in the state of chemical solution. We know that different strata of air will frequently flow in different directions for a long time. In 1781, whilst a great fleet rendezvoused in Leith Roads during the Dutch war, there was a brisk easterly wind for about five weeks; and, during the last fortnight of this period, there was a brisk westerly current at the height of about three-fourths of a mile. This was distinctly indicated by frequent fleecy clouds at a great distance above a lower stratum of these clouds, which were driving all this time from the eastward. A gentleman who was present at the siege of Quebec in 1759, stated that one day whilst there blew a gale from the west, so hard that the ships at anchor in the river were obliged to strike their topmasts, and it was with the utmost difficulty that some well-manned boats could row against it, carrying some artillery stores to a post above the town, several shells were thrown from the town to destroy the boats; one of the shells burst in the air near the top of its flight, which was about half a mile high. The smoke of this bomb remained in the same spot for above a qaarter of an hour, like a great round ball, and gradually dissipated by diffusion, without removing many yards from its place. When, therefore, two strata of air come from different quarters, and one of them flows over the other, it will be only in the contiguous surfaces that a precipitation of vapour will be made. This will form a thin fleecy cloud; and it will have a velocity and direction which neither belongs to the upper nor to the lower stratum of air which produced it. Should one of these strata come from the east and the other from the west with equal velocities, the cloud formed between them will have no motion at all; should one come from the east, and the other from the north, the cloud will move from the north-east with a greater velocity than either of the strata. So uncertain then is the information given by the clouds either of the velocity or the direction of the wind. A thick smoke from a furnace will give us a much less equivocal measure; and this, combined with the effects of the wind in impelling bodies, or deflecting a loaded plane from the perpendicular, or other effects of this kind, may give us measures of the different currents of wind with a precision sufficient for all practical uses.

The resul of Smeaton's observations.

The celebrated engineer, Mr. John Smeaton, has given, in the 51st volume of the *Philosophical Transactions*, the velocities of wind corresponding to the usual denominations in our language. These are founded on a great number of observations made by himself in the course of his practice in erecting wind-mills. They are contained in the following table:—

Velocity of wind.

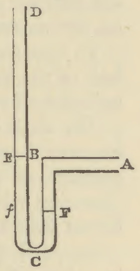
Miles per hour.	Feet per second.	Names.
1	1·47	
2	2·93	Light airs.
3	4·40	
4	5·87	Breeze.
5	7·33	
10	14·67	Brisk gale.
15	22·	
20	29·34	Fresh gale.
25	36·57	
30	44·01	Strong gale.
35	51·34	
40	58·68	Hard gale.
45	66·01	
50	73·35	Storm.
60	88·02	
80	117·36	Hurricane, tearing up trees,
100	146·70	overturning buildings, &c.

Account of Dr. Lind's anemometer.

One of the most ingenious and convenient methods for measuring the velocity of the wind is to employ its pressure in supporting a column of water, in the same way as Mr. Pitot measures the velocity of a current of water. We believe that it was first proposed by Dr. James Lind of Windsor, a gentleman eminent for his great knowledge in all the branches of natural science, and for his ingenuity in every matter of experiment or practical application.

His anemometer consists of a glass tube of the form ABCD (fig. 76), open at both ends, and having the branch AB at right angles to the branch CD. This tube contains a few inches of water or any fluid (the lighter the better); it is held with the part CD upright, and AB horizontal and in the direction of the wind; that is, with the mouth A fronting the wind. The wind acts in the way of pressure on the air in AB, compresses it, and causes it to press on the surface of the liquor; forcing it down to F, whilst it rises to E in the other leg. The velocity of the wind is concluded from the difference E*f* between the heights of the liquor in the legs. As the wind does not generally blow with uniform velocity, the liquor is apt to dance in the tube, and render the observation difficult and uncertain; to remedy this, it is proper to contract very much the communication at C between the two legs. If the tube has half an inch of diameter, and it should not have less, a hole of 1-50th of an inch is large enough; indeed the hole can hardly be too small, nor the tubes too large.

Fig. 76.

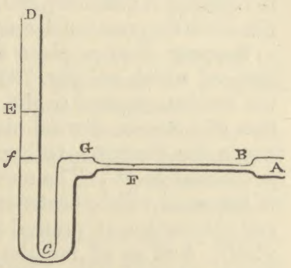


This instrument is extremely ingenious, and will undoubtedly give the proportions of the velocities of different currents with the greatest precision; for in whatever way the pressure of wind is produced by its motion, we are certain that the different pressures are as the squares of the velocities; if, therefore, we can obtain one certain measure of the velocity of the wind, and observe the degree to which the pressure produced by it raises the liquor, we can at all other times observe the pressures and compute the velocities from them, making proper allowances for the temperature and the height of the mercury in the barometer; because the velocity will be in the subduplicate ratio of the density of the air inversely when the pressure is the same.

It is usually concluded, that the velocity of the wind is that which would be acquired by falling from a height which is to E*f* as the weight of water is to that of an equal bulk of air. Thus, supposing air to be 840 times lighter than water, and that E*f* is 9-10ths of an inch, the velocity will be about 63 feet per second, which is that of a very hard gale, approaching to a storm. Hence we see by the bye, that the scale of this instrument is extremely short, and that it would be a great improvement of it to make the leg CD not perpendicular, but very much sloping; or perhaps the following form of the instrument will give it all the perfection of which it is capable. Let the horizontal branch AB (fig. 77) be contracted at B, and continued horizontally for several inches BG of a much smaller bore, and then turned down for two or three inches GC, and then upwards with a wide bore. To use the instrument, hold it with the part DC perpendicular; and (having sheltered the mouth A from the wind) pour in water at D till it advances along GB to the point B, which is made the beginning of the scale; the water in the upright branch standing at *f* in the same horizontal line with BG. Now, turn the mouth A to the wind; the air in AB will be compressed and will force the water along BG to F, and cause it to rise from *f* to E; and the range *f*E will be to the range BF on the scale as the section of the tube BG to that of CD. Thus, if the width of DC be half an inch, and that of BG 1-10th, we shall have 25 inches in the scale for one inch of real pressure E*f*.

Velocity of wind.

Fig. 77.



But it has not been demonstrated in a very satisfactory manner, that the velocity of the wind is that acquired by falling through the height of a column of air whose weight is equal to that of the column of water E*f*. Experiments made with Pitot's tube in currents of water show that several corrections are necessary for conducting the velocity of the current from the elevations in the tube: these corrections may however be made, and safely applied to the present case; and then the instrument will enable us to conclude the velocity of the wind immediately, without any fundamental comparison of the elevation, with a velocity actually determined upon other principles.[1] The chief use which we have for this information is in our employment of wind as an impelling power, by which we can actuate machinery or navigate ships. These are very important applications of pneumatical doctrines, and merit a particular consideration; and this naturally brings us to the last part of our subject, viz. the consideration of the impulse of air on bodies exposed to its action, and the resistance which it opposes to the passage of bodies through it.

This subject important but difficult.

This is a subject of the greatest importance, being the foundation of that art which has done the greatest honour to the ingenuity of man, and the greatest service to human society, by connecting together the most distant inhabitants of this globe, and making a communication of benefits which would otherwise have been impossible; we mean the art of Navigation or Seamanship. Of all the machines which human art has constructed, a ship is not only the greatest and most magnificent, but also the most ingenious and intricate; and the clever seaman possesses a knowledge founded on the most difficult and abstruse doctrines of mechanics. The seaman probably cannot give any account of his own science; and he possesses it rather by a kind of intuition than by any process of reasoning; but the success and efficiency of all the mechanism of this complicated engine, and the propriety of all the manœuvres which the seaman practises, depend on the invariable laws of mechanics; and a thorough knowledge of these would enable an intelligent person not only to understand the machine and the manner of working it, but to improve both.

Unfortunately this is a subject of very great difficulty; and although it has employed the genius of Newton, who has con-

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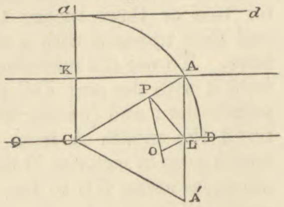
[1] See, on the subject of Anemometry, article METEOROLOGY, paragraphs 81 to 83.

Velocity of wind.

sidered it with great care, and his followers have added more to his labours on this subject than on any other, it still remains in a very imperfect state. A minute discussion of this subject cannot therefore be expected in a work like this; we must content ourselves with such a general statement of the most approved doctrine on the subject as shall enable our readers to conceive it distinctly, and judge with intelligence and confidence of the practical deductions which may be made from it.

Fig. 78.



Suppose then a plane surface, of which aC (fig. 78) is the section, exposed to the action of a stream of wind blowing in the direction QC, perpendicular to aC. The motion of the wind will be obstructed, and the surface aC pressed forward. And as all impulse or pressure is exerted in a direction perpendicular to the surface, and is resisted in the opposite direction, the surface will be impelled in the direction CD, the continuation of QC. And as the mutual actions of bodies depend on their relative motions, the force acting on the surface aC will be the same, if we shall suppose the air at rest, and the surface moving equally swift in the opposite direction. The resistance of the air to the motion of the body will be equal to the impulse of the air in the former case. Thus resistance and impulse are equal and contrary.

Air moving with a double velocity generally impels as the square of that velocity.

If the air be moving twice as fast, its particles will give a double impulse; but in this case a double number of particles will exert their impulse in the same time. The impulse will therefore be fourfold, and in general it will be as the square of the velocity; or if the air and body be both in motion, the impulse and resistance will be proportional to the square of the relative velocity. This is the first proposition on the subject, and it appears very consistent to reason. There will therefore be some analogy between the force of the air's impulse or the resistance of a body, and the weight of a column of air incumbent on the surface; for it is a principle in the action of fluids, that the heights of the columns of fluid are as the squares of the velocities which their pressures produce. Accordingly, the second proposition is, that the absolute impulse of a stream of air, blowing perpendicularly on any surface, is equal to the weight of a column of air which has that surface for its base, and for its height the space through which a body must fall in order to acquire the velocity of the air.

Thirdly, Suppose the surface AC equal to aC no longer to be perpendicular to the stream of air, but inclined to it in the angle ACD, which we shall call the *angle of incidence*; then, by the resolution of forces, it follows, that the action of each particle is diminished in the proportion of radius to the sine of the angle of incidence, or of AC to AL, AL being perpendicular to CD.

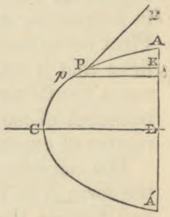
Again: Draw AK parallel to CD. It is plain that no air lying farther from CD than KA is will strike the plane. The quantity of impulse therefore is diminished still farther in the proportion of aC to KC, or of AC to AL. Therefore, on the whole, the absolute impulse is diminished in the proportion of AC^2 to AL^2: hence the proposition, that the impulse and resistance of a given surface are in the proportion of the square of the sine of the angle of incidence.

Fourthly, This impulse is in the direction PL, perpendicular to the impelled surface, and the surface tends to move in this direction: but suppose it moveable only in some other direction PO that we wish to employ this impulse, its action is therefore oblique; and if we wish to know the intensity of the impulse in this direction, it must be diminished still farther in the proportion of radius to the cosine of the angle LPO or sine of CPO. Hence the general proposition: *The effective impulse is as the surface, as the square of the velocity of the wind, as the square of the sine of the angle of incidence, and as the sine of the obliquity jointly*, which we may express by the symbol $R = S \cdot V^{2} \cdot \textit{sin.}^{2}\, I \cdot \textit{sin.}\, O$; and as the impulse depends on the density of the impelling fluid, we may take in every circumstance by the equation $R = S \cdot D \cdot V^{2} \cdot \textit{sin.}^{2}\, I \cdot \textit{sin.}\, O$. If the impulse be estimated in the direction of the stream, the angle of obliquity ACD is the same with the angle of incidence, and the impulse in this direction is as the surface, as the square of the velocity, and as the cube of the angle of incidence jointly.

It evidently follows from these premises, that if ACA′ be a wedge, of which the base AA′ is perpendicular to the wind, and the angle ACA′ bisected by its direction, the direct or perpendicular impulse on the base is to the oblique impulse on the sides as radius to the square of the sine of half the angle ACA′.

The same must be affirmed of a pyramid or cone ACA′, of which the axis is in the direction of the wind.

Fig. 79.



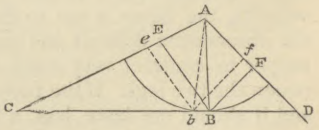
If ACA′ (fig. 79,) represent the section of a solid, produced by the revolution of a curve line APC round the axis CD, which lies in the direction of the wind, the impulse on this body may be compared with the direct impulse on this base, or the resistance to the motion of this body through the air may be compared with the direct resistance of its base, by resolving its surface into elementary planes Pp, which are coincident with a tangent plane PR, and comparing the impulse on P p with the direct impulse on the corresponding part K k of the base.

In this way it follows that the impulse on a sphere is one half of the impulse on its great circle, or on the base of a cylinder of equal diameter.

We shall conclude this sketch of the doctrine with a very important proposition to determine the most advantageous position of a plane surface, when required to move in one direction while it is impelled by the wind blowing in a different direction. Thus,

Inference from this doctrine.

Fig. 80.



Let AB (fig. 80) be the sail of a ship, CA the direction in which the wind blows, and AD the line of the ship's course. It is required to place the yard AC in such a position that the impulse of the wind upon the sail may have the greatest effect possible in impelling the ship along AD.

Let AB, Ab, be two positions of the sail very near the best position, but on opposite sides of it. Draw BE, $b\,e$, perpendicular to CA, and BF, $b\,f$, perpendicular to AD, calling AB radius; it is evident that BE, BF, are the sines of impulse and obliquity, and that the effective impulse is $BE^2 \times BF$, or $b\,e^2 \times b\,f$. This must be a maximum.

Let the points B, b, continually approach and ultimately coincide; the chord b B will ultimately coincide with a straight line CBD touching the circle in B; the triangles CBE, C b e are similar, as also the triangles DBF, D b f: therefore $BE^2 : b\,e^2 = BC^2 : bC^2$, and $BF : b\,f = BD : b\,D$; and $BE^2 \times BF : b\,e^2 \times b\,f = CB^2 \times BD : Cb^2 \times bD$. Therefore when AB is in the best position, so that $BE^2 \times BF$ is greater than $b\,e^2 \times b\,f$, we shall have $CB \times BD$ greater than $Cb^2 \times bD$, or $CB^2 \times BD$ is also a maximum. This we know to be the case when $CB = 2BD$: therefore the sail must be so placed that the tangent of the angle of incidence shall be double of the tangent of the angle of the sail and keel.

In a common windmill the angle CAD is necessarily a right angle; for the sail moves in a circle to which the wind is perpendicular: therefore the best angle of the sail and axle will be 54° 44′ nearly.

Such is the theory of the resistance and impulse of the air. It is extremely simple and of easy application. In all physical theories there are assumptions which depend on other principles, and those on the judgment of the naturalist; so that it is always proper to confront the theory with experiment. There are even circumstances in the present case which have not been attended to in the theory. When a stream of air is obstructed by a solid body, or when a solid body moves along in air, the air is condensed before it and rarefied behind. There is therefore a pressure on the anterior parts arising from this want of equilibrium in the elasticity of the air. This must be superadded to the force arising from the impetus or inertia of the air. We cannot tell with precision what may be the amount of this condensation; it depends on the velocity with which any condensation diffuses itself. Also, if the motion be so rapid that the pressure of the atmosphere cannot make the air immediately occupy the place quitted by the body, it will sustain this pressure on its fore part to be added to the other forces.

The principal experiments on this subject

Experiments on this subjects are by no means numerous; at least such experiments as can be depended on for the foundation of any practical application. The first that have this character are those published by Mr. Robins in 1742, in his *Treatise on Gunnery*. They were repeated with some additions by the Chevalier Borda, and some account of them published in the *Memoirs of the Academy of Sciences in* 1763. In the *Philosophical Transactions of the Royal Society of London*, vol. lxxiii., there are some experiments of the same kind on a larger scale by Mr. Edgeworth. These were all made in the way described in our account of Mr. Robins's improvements in gunnery. Bodies were made to move with determined velocities, and the resistances were measured by weights. In all these experiments the resistances were found very exactly in the proportion of the squares of the velocities; but they were found considerably greater than the weight of the column of air, whose height would produce the velocity in a falling body. Mr. Robins's experiments on a square of 16 inches, describing 25.2 feet per second, indicate the resistance to be to this weight nearly as 4 to 3. Borda's experiments on the same surface state the disproportion still greater.

The resistances are found not to be in the proportion of the surfaces, but increase considerably faster. Surfaces of 9, 16, 36, and 81 inches, moving with one velocity, had resistances in the proportion of 9, $17\frac{1}{2}$, $42\frac{3}{4}$, and $104\frac{3}{4}$.

Now as this deviation from the proportion of the surfaces increases with great regularity, it is most probable that it continues to increase in surfaces of still greater extent; and these are the most generally to be met with in practice in the action of wind on ships and mills.

Borda's experiments on 81 inches show that the impulse of wind moving one foot per second is about $\frac{1}{100}$ of a pound on a square foot. Therefore to find the impulse on a foot corresponding to any velocity, divide the square of the velocity by 500, and we obtain the impulse in pounds. Mr. Rouse of Leicestershire made many experiments, which are mentioned with great approbation by Mr. Smeaton. His great sagacity and experience in the erection of windmills, oblige us to pay a considerable deference to his judgment. These experiments confirm our opinion, that the impulses increase faster than the surfaces. The following table was calculated from Mr. Rouse's observations, and may be considered as pretty near the truth:

Velocity in feet.	Impulse on a foot in pounds.	Velocity in feet.	Impulse on a foot in pounds.
0	0,000	30	2,059
10	0,229	40	3,660
20	0,915	50	5,718
60	8,234	110	27,675
70	11,207	120	32,926
80	14,638	130	38,654
90	18,526	140	44,830
100	22,872	150	51,462

If we multiply the square of the velocity in feet by 16, the product will be the impulse or resistance on a square foot in grains, according to Mr. Rouse's numbers.

The greatest deviation from the theory occurs in the oblique impulses. Mr. Robins compared the resistance of a wedge, whose angle was 90°, with the resistance of its base; and instead of finding it less in the proportion of $\sqrt{2}$ to 1, as determined by the theory, he found it greater in the proportion of 55 to 68 nearly; and when he formed the body into a pyramid, of which the sides had the same surface and the same inclination as the sides of the wedge, the resistance of the base and face were now as 55 to 39 nearly; so that here the same surface with the same inclination had its resistance reduced from 68 to 39 by being put into this form. Similar deviations occur in the experiments of the Chevalier Borda; and it may be collected from both, that the resistances diminish more nearly in the proportion of the sines of incidence than in the proportion of the squares of those sines.

The irregularity in the resistance of curved surfaces is as great as in plane surfaces. In general, the theory gives the oblique impulses on plane surfaces much too small, and the impulses on curved surfaces too great. The resistance of a sphere does not exceed the fourth part of the resistance of its great circle, instead of being its half; but the anomaly is such as to leave hardly any room for calculation. It would be very desirable to have the experiments on this subject repeated in a greater variety of cases, and on larger surfaces, so that the errors of the experiments may be of less consequence. Till this matter is reduced to some rule, the art of working ships must remain very imperfect, as must also the construction of windmills.

The resistance of air in the motion of projectiles.

The case in which we are most interested in the knowledge of the resistance of the air is the motion of bullets and shells. Writers on artillery have long been sensible of the great effect of the air's resistance. It seems to have been this consideration that chiefly engaged Sir Isaac Newton to consider the motion of bodies in a resisting medium. A proposition or two would have sufficed for showing the incompatibility of the planetary motions with the supposition that the celestial spaces were filled with a fluid matter; but he has with great solicitude considered the motion of a body projected on the surface of the earth, and its deviation from the parabolic track assigned by Galileo. He has bestowed more pains on this problem than any other in his whole work; and his investigation has pointed out almost all the improvements which have been made in the application of mathematical knowledge to the study of nature. Nowhere does his sagacity and fertility of resource appear in so strong a light as in the second book of the *Principia*, which is almost wholly occupied by this problem. The celebrated mathematician John Bernoulli engaged in it as the finest opportunity of displaying his superiority. A mistake committed by Newton in his attempt to a solution was matter of triumph to him; and the whole of his performance, though a piece of elegant and elaborate geometry, is greatly hurt by his continually bringing this mistake, which is a mere trifle, into view. The difficulty of the subject is so great, that subsequent mathematicians seem to have kept aloof from it; and it has been entirely overlooked by the many voluminous writers who have treated professedly on military projectiles. They have supposed that the resistance of air was not so great as to render their theories erroneous; but as this will be found discussed under the article Gunnery, nothing more shall be said of it here.

There is another motion of which air and other elastic fluids are susceptible, viz. an internal vibration of their particles, or undulation, by which any extended portion of air is distributed into alternate parcels of condensed and rarefied air, which are continually changing their condition without changing their places. By this change the condensation which is produced in one part of the air is gradually transferred along the mass of air to the greatest distances in all directions. It is of importance to have some distinct conception of this motion. It is found to be by this means that distant bodies produce in us the sensation of sound. Sir Isaac Newton treated this subject with his accustomed ingenuity, and has given us a theory of it in the end of the second book of his *Principia*. This theory has been objected to with respect to the conduct of the argument, and other explanations have been given by the most eminent mathematicians. Though they appear to differ from Newton's, their results are precisely the same; but, on a close examination, they differ no more than John Bernoulli's theorem of centripetal forces differs from Newton's, viz. the one being expressed by geometry and the other by literal analysis. The celebrated Lagrange reduces Newton's investigation to a tautological proposition or identical equation; but Dr M. Young of Trinity College, Dublin, has by a different turn of expression, freed Newton's method from this objection.

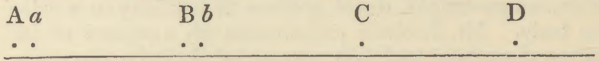
This has been used to explain a variety of natural phenomena.

But since Newton published this theory of aerial undulations, and of their propagation along the air, and since the theory has been so corrected and improved as to be received by the most accurate philosophers as a branch of natural philosophy susceptible of rigid demonstration, it has been freely resorted to by many writers on other parts of natural science, who did not profess to be mathematicians, but made use of it for explaining phenomena in their own line on the authority of the mathematicians themselves. Learning from them that this vibration, and the *quaquaversum* propagation of the pulses, were the necessary properties of an elastic fluid, and that the rapidity of this propagation had a certain assignable proportion to the elasticity and density of the fluid, they freely made use of these concessions, and have introduced elastic vibrating fluids into many facts, where others would suspect no such thing, and have attempted to explain by their means many abstruse phenomena of nature. Æthers are everywhere introduced, endued with great elasticity and tenuity. Vibrations and pulses are supposed in this æther, and these are offered as explanations. The doctrines of animal spirits and nervous fluids, and the whole mechanical system of Hartley, by which the operations of the soul are said to be explained, have their foundation in this theory of aerial undulations. If these fancied fluids, and their internal vibrations, really operate in the phenomena ascribed to them, any explanation that can be given of the phenomena from this principle must be nothing else then showing that the legitimate consequences of these undulations are similar to the phenomena; or, if we are no more able to see this last step than in the case of sound, (which we know to be *one* consequence of the aerial undulations, although we cannot tell how), we must be able to point out, as in the case of sound, certain constant relations between the general laws of these undulations and the general laws of the phenomena. It is only in this way that we think ourselves entitled to say that the aerial undulations are causes, though not the only causes, of sound; and it is because there is no such relation, but, on the contrary, a total dissimilarity, to be observed between the laws of elastic undulations and the laws of the propagation of light, that we assert with confidence that ethereal undulations are not the causes of vision.

Explanations of this kind suppose, therefore, in the first place, that the philosopher who proposes them understands precisely the nature of these undulations; in the next place, that he makes his reader sensible of those circumstances of them which are concerned in the effect to be explained; and, in the third place, that he makes the reader understand how this circumstance of the vibrating fluid is connected with the phenomenon, either by showing it to be its mechanical cause, as when the philosopher explains the resounding of a musical chord to a flute or pipe which gave the same tone; or by showing that this circumstance of the undulation always accompanies the phenomenon, as when the philosopher shows that 233 vibrations of air in a second, in whatever manner or by whatever cause they are produced, always are followed by the sensation of the tone C in the middle of the harpsichord.

How elastic differ from unelastic fluids.

We propose now to give some account of the motion of elastic fluids; and the first thing incumbent on us is to show how these fluids differ from the unelastic in the propagation of any agitation of their parts. When a long tube is filled with water, and any one part of it pushed out of its place, the whole is instantly moved like a solid mass. But this is not the case with air. If a door be suddenly shut, the window at the farther end of a long and close room will rattle; but some time will elapse between the shutting of the door and the motion of the window. If some light dust be lying on a braced drum, and another be violently beat at a little distance from it, an attentive observer will see the dust dance up from the parchment; but this will be at the instant he hears the sound of the stroke on the other drum, and a sensible time after the stroke. Many such familiar facts show that the agitation is gradually communicated along the air; and therefore that when one particle is agitated by any sensible motion, a finite time, however small, must elapse before the adjoining particle is agitated in the same manner. This would not be the case in water if water be perfectly incompressible. We think that this may be made intelligible with very little trouble.

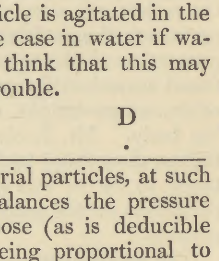


Let A, B, C, D, &c. be a row of aerial particles, at such distances that their elasticity just balances the pressure of the atmosphere; and let us suppose (as is deducible from the observed density of air being proportional to the compressing force) that the elasticity of the particles, by which they keep each other at a distance, is as their distances inversely. Let us farther suppose that the particle A has been carried, with an uniform motion, to *a* by some external force. It is evident that B cannot remain in its present state; for being now nearer to *a* than to C, it is propelled towards C by the excess of the elasticity of A above the natural elasticity of C. Let E be the natural elasticity of the particles, or the force corresponding to the distance BC or BA, and let F be the force which impels B towards C, and let *f* be the force exerted by A when at *a*. We have

$$\mathrm{E} : f = \mathrm{B}a : \mathrm{BC} = \mathrm{B}a,\ \mathrm{BA};$$
$$\text{and } \mathrm{E} : f - \mathrm{E} = \mathrm{B}a : \mathrm{BA} - \mathrm{B}a = \mathrm{B}a : \mathrm{A}a;$$
$$\text{or } \mathrm{E} : \mathrm{F} = \mathrm{B}a : \mathrm{A}a.$$

Now, in fig. 81, let ABC be the line joining three particles, to which draw FG, PH parallel, and IAF, HBG perpendicular. Take IF or HG to represent the elasticity corresponding to the distance AB. Let the particle A be supposed to have been carried with an uniform motion to *a* by some external force, and draw R*a*M perpendicular to RG; and make FI : RM = B*a* : BA. We shall then have FI : PM = B*a* : A*a*; and PM will represent the force

Fig. 81.



with which the particle B is urged towards C. Suppose this construction to be made for every point of the line AB, and that a point M is thus determined for each of them, mathematicians know that all these points M lie in the curve of a hyperbola, of which FG and GH are the asymptotes. It is also known by the elements of mechanics, that since the motion of A along AB is uniform, A*a* or IP may be taken to represent the time of describing A*a*; and that the area IPM represents the whole velocity which B has acquired in its motion towards C when A has come to *a*, the force urging B being always as the portion PM of the ordinate.

Take GX of any length in HG produced, and let GX represent the velocity which the uniform action of the natural elasticity IF could communicate to the particle B during the time that A would uniformly describe AB. Make GX to GY as the rectangle IFGH to the hyperbolic space IFRM, and draw YS cutting MR produced in S, and draw FX cutting MR in T. It is known to the mathematicians that the point S is in a curve line FS*s*, called the *logarithmic curve;* of which the leading property is, that any line RS parallel to GX is to GX as the rectangle IFGH is to the hyperbolic space IFRM, and that FX touches the curve in F.

This being the case, it is plain, that because RT increases in the same proportion with FR, or with the rectangle IFRP, and RS increases in the proportion of the space IFRM, TS increases in the proportion of the space IPM. Therefore TS is proportional to the velocity of B when A has reached *a*, and RT is proportional to the velocity which the uniform action of the natural elasticity would communicate to B in the same time. Then since FT is as the time, and TS is as the velocity, the area FTS will be as the space described by B, urged by the variable force PM; while A, urged by the external force, describes A*a;* and the triangle FRT will represent the space which the uniform action of the natural elasticity would cause B to describe in the same time.

And thus it is plain that these three motions can be compared together: the uniform motion of the agitated particle A, the uniformly accelerated motion which the natural elasticity would communicate to B by its constant action, and the motion produced in B by the agitation of A. But this comparison, requiring the quadrature of the hyperbola and logarithmic curve, would lead us into most intricate and tedious computations. Of these we need only give the result, and make some other comparisons which are palpable.

Let A*a* be supposed indefinitely small in comparison of AB. The space described by A is therefore indefinitely small; but in this case we know that the ratio of the space FRT to the rectangle IFRP is indefinitely small. There is therefore no comparison between the agitation of A by the external force, and the agitation which natural elasticity would produce on a single particle in the same time, the last being incomparably smaller than the first. And this space FRT is incomparably greater than FTS; and therefore the space which B would describe by the uniform action of the natural elasticity is incomparably greater than what it would describe in consequence of the agitation of A.

From this reasoning we see evidently that A must be sensibly moved, or a finite or measurable time must elapse before B acquires a measurable motion. In like manner, B must move during a measurable time before C acquires a measurable motion, &c.; and therefore the agitation of A is communicated to the distant particles in gradual succession.

By a further comparison of these spaces we learn the time in which each succeeding particle acquires the very agitation of A. If the particles B and C only are considered, and the motion of C neglected, it will be found that B has acquired the motion of A a little before it has described one-third of the space described by A; but if the motion of C be considered, the acceleration of B must be increased by the retreat of C, and B must describe a greater space in proportion to that described by A. By computation it appears, that when both B and C have acquired the velocity of A, B has described nearly one-half of A's motion, and C more nearly one-third. Extending this to D, we shall find that D has described still more nearly one-fourth of A's motion. And from the nature of the computation it appears that this approximation goes on rapidly; therefore, supposing it accurate from the very first particle, it follows from the equable motion of A, that each succeeding particle moves through an equal space in acquiring the motion of A.

The conclusion which we must draw from all this is, that when the agitation of A has been fully communicated to a particle at a *sensible* distance, the intervening particles, all moving forward with a common velocity, are equally compressed as to sense, except a very few of the first particles; and that this communication, or this propagation of the original agitation, goes on with an uniform velocity.

These computations need not be attended to by such as do not wish for an accurate knowledge of the precise agitation of each particle. It is enough for such readers to see clearly that time *must* escape between the agitation of A and that of a distant particle; and this is abundantly manifest from the incomparability (excuse the term) of the nascent rectangle IFRP with the nascent triangle FRT, and the incomparability of FRT with FTS.

Newton's demonstration on this subject.

What has now been shown of the communication of any sensible motion A *a* must hold equally with respect to any change of this motion. Therefore if a tremulous motion of a body, such as a spring or bell, should agitate the adjoining particle A by pushing it forward in the direction AB, and then allowing it to come back again in the direction BA, an agitation similar to this will take place in all the particles of the row one after the other. Now if this body vibrate according to the law of motion of a pendulum vibrating in a cycloid, the neighbouring particle of air *will of necessity* vibrate in the same manner; and then Newton's demonstration in the article Acoustics needs no apology. Its only deficiency was, that it *seemed* to prove that this *would be* the way in which every particle would of necessity vibrate; which is not true, for the successive parcels of air will be differently agitated according to the original agitation. Newton only wants to prove the uniform propagation of the agitations, and he selects that form which renders the proof easiest. He proves, in the most unexceptionable manner, that if the particles of a pulse of air are really moving like a cycloidal pendulum, the forces acting on each particle, in consequence of the compression and dilatation of the different parts of the pulse, are precisely such as are necessary for continuing this motion, and therefore no other forces are required. Then since each particle in a certain part of its path, is moving in a certain direction, and with a certain velocity, and urged by a determined force, it *must* move in that very manner. The objection started by John Bernoulli against Newton's demonstration of the elliptical motion of a body urged by a force in the inverse duplicate ratio of the distance from the focus, is precisely the same with the objection against Newton's demonstration of the progress of aerial undulations, and is equally futile.

It must, however, be observed, that Newton's demonstration proceeds on the supposition that the linear agitations of a particle are incomparably smaller than the extent of an undulation. This is not strictly the case in any instance, and in many it is far from being true. In a pretty strong twang of a harpsichord wire, the agitation of a particle may be near the 50th part of the extent of the undulation. This must disturb the regularity of the motion, and cause the agitations in the remote undulations to differ from those in the first pulse. In the explosion of a cannon, the breaking of an exhausted bottle, and many instances which may be given, the agitations are still greater. The commentators on Newton's *Principia*, Le Sueur and Jacquier, have shown, and Euler more clearly, that when the original agitations are very violent, the particles of air will acquire a subordinate vibration compounded with the regular cycloidal vibration, and the progress of the pulses will be somewhat more rapid; but the intricacy of the calculus is so great, that they have not been able to determine with any tolerable precision what the change of velocity will be.

Confirmed by experiments on sounds.

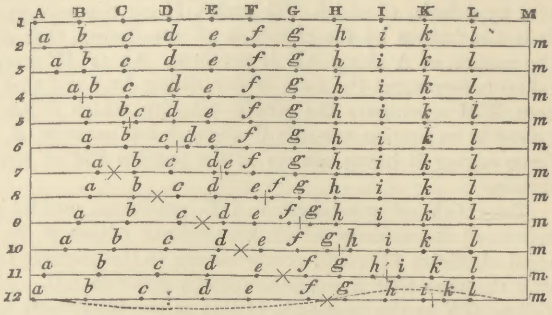
All this, however, is fully confirmed by experiment on sounds. The sound of a cannon at 10 or 20 miles distance does not in the least resemble its sound when near. In this case it is a loud instantaneous crack, to which we can assign no musical pitch. At a distance, it is a grave sound, of which we can tell the note; and it begins softly, swells to its greatest loudness, and then dies away growling. The same may be said of a clap of thunder, which we know to be a loud snap of still less duration. It is highly probable that the appreciable tones which those distant sounds afford are produced by the continuance of these subordinate vibrations which are added together and fortified in the successive pulses, though not perceptible in the first, in a way somewhat resembling the resonance of a musical chord. Newton's explanation gathers evidence therefore from this circumstance. And we must further observe, that all elastic bodies tremble or vibrate almost precisely as a pendulum swinging in a cycloid, unless their vibrations are uncommonly violent; in which case they are quickly reduced to a moderate quantity by the resistance of the air. The only very loud sounds which we can produce in this way are from great bells; and in these the utmost extent of the vibration is very small in comparison with the breadth of the pulse. The velocity of these sounds has not been compared with that of cannon, or perhaps it would be found less, and an objection against Newton's determination removed. He gives 969 feet per second, (experiment 1142.)

The agitation in the successive pulses probably assumes a cycloidal form.

But it is also very probable, that in the propagation through the air, the agitation gradually and rapidly approaches to this regular cycloidal form in the successive pulses, in the same way as we observe that whatever is the form of agitation in the middle of a smooth pond of water, the spreading circles are always of one gentle form without asperities. In like manner, into whatever form we throw a stretched cord by the twang which we give it, it almost immediately makes smooth undulations, keeping itself in the shape of an elongated trochoid. Of this last we can demonstrate the necessity, because the case is simple. In the wave, the investigation is next to impossible; but we see the fact. We may therefore presume it in air. And accordingly we know that any noise, however abrupt and jarring near at hand, is smooth at a distance. Nothing is more rough and harsh than the scream of a heron; but at half a mile's distance it is soft. The ruffle of a drum is also smooth at a distance.

Fig. 82, shows the successive situations of the particles of a row. Each line of the figure shows the same particles marked with the same letters; the first particle *a* being supposed to be removed successively from its quiescent situation and back to it again. The mark × is put on that part of each line where the agitated particles are at their natural distances, and the air is of the natural density. The mark | is put where the air is most of all compressed, and : where it is most of all dilated; the curve line drawn through the lowest line of the figure is intended to represent the density in every point, by drawing ordinates to it from the straight line. The ordinates below the line indicate a rarity, and those above the line a density, greater than common. It appears that when *a* has come back to its natural situation, the part of greatest density is between the particles *i* and *k*, and the greatest rarity between *c* and *d*.

Fig. 82.

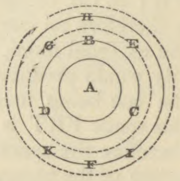


We have only to add, that the velocity of this propagation depends on the elasticity and density of the fluid. If these vary in the same proportion, that is, if the fluid has its elasticity proportional to its density, the velocity will remain the same. If the elasticity or density alone be changed, the velocity of the undulations will change in the direct subduplicate ratio of the elasticity and the inverse subduplicate ratio of the density; or should the elasticity be quadrupled, the quantity of motion produced by it in any given time will be quadrupled. This will be the case if the velocity be doubled; for there would then be double the number of particles doubly agitated. Should the density be quadrupled, the elasticity remaining the same, the quantity of motion must remain the same. This will be the case if the velocity be reduced to one half; for this will propagate half the agitation to half the distance, which will communicate it to twice the number of particles, and the quantity of motion will remain the same. The same may be said of other proportions, and therefore $V=\frac{\sqrt{E}}{\sqrt{D}}$. Therefore a change in the barometer will not affect the velocity of the undulations in air; but they will be accelerated by heat, which diminishes its density, or increases its elasticity. The velocity of the pulses in inflammable air must be at least thrice as great, because its density is but one-tenth of that of air when the elasticity of both are the same.

Further consideration of aerial pulses.

Let us now attend a little to the propagation of aerial pulses as they really happen; for this hypothesis of a single row of particles is nowhere to be observed. Suppose a sphere A, fig. 83, filled with condensed air, and that the vessel which contains it is suddenly annihilated. The air must expand to its natural dimensions, suppose BCD. But it cannot do this without pressing aside the surrounding air. We have seen that in any single row of particles this cannot be at once diffused to a distance, but must produce a condensation in the air adjoining; which will be gradually propagated to a distance. Therefore this sphere BCD of the common density will form round it a shell, bounded by EFG, of condensed air. Suppose that at this instant the inner air BCD becomes solid. The shell of condensed air can expand only outwards. Let it expand till it is of the common density, occupying the shell HIK. This expansion must, in like manner, produce a shell of condensed air without it; and at this instant let HIK become solid. The surrounding shell of condensed air can expand only outward, condensing another shell without it. It is plain that this must go on continually, and the central agitation will be gradually propagated to a distance in all directions. But, in this process, it is not the same numerical particles that go to a distance. Those of the original

Fig. 83.



sphere go no further than BCD, those of the next shall go no further than HIK, &c. Further, the expansion outwards of any particle will be more moderate as the diffusion advances; for the whole motion of each shell cannot exceed the original quantity of motion; and the number of particles in each successive shell increases as the surface, that is, as the square of the distance from the centre; therefore the agitation of the particles will decrease in the same ratio, or will be in the inverse duplicate ratio of the distance from the centre. Each successive shell, therefore, contains the same quantity of motion, and the successive agitations of the particles of any row out from the centre will not be equal to the original agitation, as happens in the solitary row. But this does not affect the velocity of the propagation, because all agitations are propagated equally fast.

We supposed the air A to become solid as soon as it acquired the common density; but this was to facilitate the conception of the diffusion. It does not stop at this bulk; for while it was denser it had a tendency to expand. Therefore each particle has attained this distance with an accelerated motion. It will, therefore, continue this motion like a pendulum that has passed the perpendicular, till it is brought to rest by the air without it; and it is now rarer than common air, and collapses again by the greater elasticity of the air without it. This outward air, therefore, in regaining its natural density, must expand both ways. It expands towards the centre, following the collapsing of the air within it; and it expands outwards, condensing the air beyond it. By expanding inwards, it will again condense the air within it, and this will again expand; a similar motion happens in all the outward shells; and thus there is propagated a succession of condensed and rarefied shells of air, which gradually swell to the greatest distance.

Application of the fact of dropping a pebble into water.

It may be demonstrated, that when the central air has for the second time acquired the natural density, it will be at rest, and be disturbed no more; and that this will happen to all the shells in succession. But the demonstration is much too intricate for this place; and we must be contented with pointing out a fact perfectly analogous. When we drop a small pebble into water, we see it produce a series of circular waves, which go along the surface of smooth water to a great distance, becoming more and more gentle as they recede from the centre; and the middle, where the agitation was first produced, remains perfectly smooth, and this smoothness extends continually; that is, each wave when brought to a level remains at rest. Now these waves are produced and propagated by the depression and elevation made at the centre. The elevation tends to diffuse itself; and the force with which each particle of water is actuated is a force acting directly up and down, and is proportional to the elevation or depression of the particle. This hydrostatical pressure operates precisely in the same way as the condensation and rarefaction of the air; and the mathematical investigation of the propagation of the circular undulations on smooth water is similar in every step to that of the propagation of the spherical waves in still air. For this we appeal to Newton's *Principia*, or to Euler's *Opuscula*, where he gives a very beautiful investigation of the velocity of the aerial pulses; and to some memoirs of Lagrange in the collections of the academies of Berlin and Turin. These two last authors have made the investigation as simple as seems possible, and have freed it from every objection which can be stated against the geometrical one of their greater teacher Newton.

The waves of water are useful in explaining those of air.

Having said this much respecting the similarity between the waves on water and the aerial undulations, we shall have recourse to them, as affording us a very sensible object to represent many affections of the other which it would be extremely difficult to explain. We neither see nor feel the aerial undulations; and they behoved, therefore, to be described very abstractedly and imperfectly. In the watery wave there is no permanent progressive motion of the water from the centre. Throw a small bit of cork on the surface, and it will be observed to popple up and down without the least motion outwards. In like manner, the particles of air are only agitated a very little outwards and inwards, which motion is communicated to the particles beyond them, whilst they themselves come to rest, unless agitated afresh; and this agitation of the particles is inconceivably small. Even the explosion of a cannon at no great distance will but gently agitate a feather, giving it a single impulse outwards, and immediately after another inwards or towards the cannon. When a harpsichord wire is forcibly twanged at a few feet distance, the agitation of the air is next to insensible. It is not, however, nothing; and it differs from that in a watery wave by being *really* outwards and inwards. In consequence of this, when the condensed shell reaches an elastic body, it impels it slightly. If its elasticity be such as to make it acquire the opposite shape at the instant that the next agitation and condensed shell of air touches it, its agitation will be doubled, and a third agitation will increase it, and so on, till it acquire the agitation competent to that of the shell of air which reaches it, and it is thrown into sensible vibration, and gives a sound extremely faint indeed, because the agitation which it acquires is that corresponding to a shell of air considerably removed from the original string. Hence it happens that a musical chord, pipe, or bell, will cause another to resound, whose vibrations are isochronous with its own; or if the vibrations of the one coincides with every second, or third, or fourth, &c. of the other; just as we can put a very heavy pendulum into sensible motion by giving it a gentle puff with the breath at every vibration, or at every second, third, or fourth, &c. A drum struck in the neighbourhood of another drum will agitate it very sensibly; for here the stroke depresses a very considerable surface, and produces an agitation of a considerable mass of air; it will even agitate the surface of stagnant water. The explosion of a cannon will even break a neighbouring window. The shell of condensed air which comes against the glass has a great surface and a great agitation; the best security in this case is to throw up the sash; this admits the condensed air into the room, which acts on the inside of the window, balancing part of the external impulse.

Waves of air and of water in some respects similar

It is demonstrated in every elementary treatise of natural philosophy, that when a wave on water meets any plane obstacle, it is reflected by it from a centre equally removed behind the obstacle; that waves radiating from the focus of a parabola are reflected in waves perpendicular to its axis; that waves radiating from one focus of an ellipse are made to converge to the other focus, &c. All this may be affirmed of the aerial undulations; that when part of a wave gets through a hole in the obstacle, it becomes the centre of a new series of a waves; that waves bend round the extremities of an obstacle; all this happens in the aerial undulations. And lastly, that when the surface of water is thrown into regular undulations by one agitation, another agitation in another place will produce other regular waves, which will cross the former without disturbing them in the smallest degree. The same thing happens in air; and experiments may be made on water which will illustrate in the most perfect manner many other affections of the aerial pulses, which we should otherwise conceive very imperfectly. We would recommend to our curious readers to make some of these experiments in a large vessel of milk. Take a long and narrow plate of lead, which, when set on the bottom of the vessel, will reach above the surface of the milk; bend this plate into a parabola, elliptical, or other curve. Make the undulations by dropping milk on the focus from a small pipe, which will cause the agitations to succeed with rapidity, and then all that we have said will be most distinctly seen, and the experiment will be

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very amusing and instructive, especially to the musical reader.

We shall now proceed to explain a number of natural appearances, depending on the pressure and the elasticity of the air; appearances not sufficiently general, or too complicated for the purposes of argument, whilst we were employed in the investigation of these properties, but too important to be passed over in silence.

The pressure of the air occasions the cohesion of two surfaces, &c.

It is owing to the pressure of the atmosphere that two surfaces which accurately fit each other cohere with such force. This is a fact familiarly known to the glass-grinders, polishers of marble, &c. A large lens or speculum, ground on its tool till it becomes very smooth, requires more than any man's strength to separate it directly from the tool. If the surface is only a square inch, it will require fifteen pounds to separate them perpendicularly, though a very moderate force will make them slide along each other. But this cohesion is not observed unless the surfaces are wetted or smeared with oil or grease; otherwise the air gets between them, and they separate without any trouble. That this cohesion is owing to the atmospheric pressure, is evident from the ease with which the plates may be separated in an exhausted receiver. To the same cause we must ascribe the very strong adhesion of snails, periwinkles, limpets, and other univalve shells, to the rocks. The animal forms the rim of its shell, so as to fit the shape of the rock to which it intends to cling. It then fills its shell, if not already filled by its own body, with water. In this condition it is evident that we must act with a force equal to fifteen pounds for every square inch of touching surface before we can detach it. This may be illustrated by filling a drinking-glass to the brim with water, and having covered it with a piece of thin wet leather, invert it on a table, and then try to pull it straight up; which will require a considerable force. But if we expose a snail adhering to a stone in the exhausted receiver, we shall see it drop off by its own weight. In the same manner do the remora, the polypus, the lamprey, and many other animals, adhere with such firmness. Boys frequently amuse themselves by pulling out large stones from the pavement by means of a circle of stiff wetted leather fastened to a string. It is owing to the same cause that the bivalve shell fishes keep themselves so firmly shut. We think the muscular force of an oyster prodigious, because it requires such force to open it; but if we grind off a bit of the convex shell, so as to make a hole in it, though without hurting the fish in the smallest degree, it opens with great ease, as it does also *in vacuo*.

Other effects of the pressure of the air.

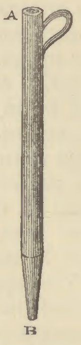
The pressure of the air, operating in this way, contributes much to the cohesion of bodies, where we do not suspect its influence. The tenacity of our mortars and cements would frequently be ineffectual without this assistance. It is owing to the pressure of the atmosphere that a cask will not run by the cock unless a hole be opened in some other part of the cask. If the cask is not quite full, some liquor indeed will run out, but it will stop as soon as the diminished elasticity of the air above the liquor is in equilibrio, together with the liquor, with the atmospheric pressure. In like manner, a teapot must have a small hole in its lid to ensure its pouring out the tea. If indeed the hole in the cask is of large dimensions, it will run without any other, because air will get in at the upper side of the hole while the liquor runs out by the lower part of it. On the same principle depends the performance of an instrument used by the spirit-dealers for taking out a sample of their spirits. It consists of a long tinplate tube AB (fig. 84,) open a-top at A, and ending in a small hole at B. The end B is dipped into the spirits, which rises into the tube; then the thumb is clapt on the mouth A, and the whole is lifted out of the cask. The spirit remains in it till the thumb be taken off; it is then allowed to run into a glass for examination.

Effects of the pressure of the air.

Why frosts instantly occasion a scarcity of water.

It seems principally owing to the pressure of the air that frosts immediately occasion a scantiness of water in our fountains and wells. This is erroneously accounted for, by supposing that the water freezes in the bowels of the earth. But this is a great mistake. The most intense frost of a Siberian winter would not freeze the ground two feet deep; but a very moderate frost will consolidate the whole surface of a country, and make it impervious to the air; especially if the frost has been preceded by rain, which has soaked the surface. When this happens, the water which was filtering through the ground is all arrested and kept suspended in its capillary tubes by the pressure of the air, in the very same manner as the spirits are kept suspended in the instrument just now described by the thumb's shutting the hole A. A thaw melts the superficial ice, and allows the water to run in the same manner as the spirits run when the thumb is removed.

Fig. 84.

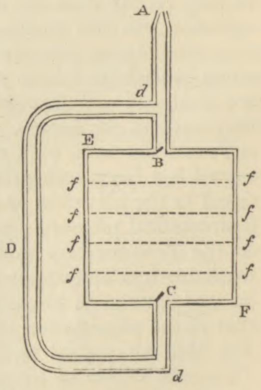


The necessity of common air to animal life.

Common air is necessary for supporting the lives of most animals. If a small animal, such as a mouse or bird, be put under the receiver of an air-pump, and the air be exhausted, the animal will quickly be thrown into convulsions and fall down dead; if the air be immediately readmitted, the animal will sometimes revive, especially if the rarefaction has been briskly made, and has not been very great. We do not know that any breathing animal can bear the air to be reduced to one-fourth of its ordinary density, nor even one-third; nor have we good evidence that an animal will ever recover if the rarefaction is pushed very far, although continued for a very short time.

But the mere presence of the air is by no means sufficient for preserving the life of the animal; for it is found, that an animal shut up in a vessel of air cannot live in it for any length of time. If a man be shut up in a box, containing a wine hogshead of air, he cannot live in it much above an hour, and long before this he will find his breathing very unsatisfactory and uneasy. A gallon of air will support him about a minute. A box EF (fig. 85,) may be made, having a pipe AB inserted into its top, and fitted with a very light valve at B, opening upwards. This pipe sends off a lateral branch *d*D *d*C, which enters the box at the bottom, and is also fitted with a light valve at C opening upwards. If a person breathe through the pipe, keeping his nostrils shut, it is evident that the air which he expires will not enter the box by the hole B, nor return through the pipe CD*d*; and by this contrivance he will gradually employ the whole air of the box. With this apparatus experiments can be made without any risk or inconveniency, and the quantity of air necessary for a given time of easy breathing may be accurately ascertained.

Fig. 85.



How the air of our atmosphere produces this effect is not a question for mechanical philosophy to determine. While a certain amount of atmospheric pressure and elasticity is necessary to balance the mechanical impulse of the blood, and to maintain a sufficient supply of air in the lungs; these play but a subordinate part to the subtle agency more immediately concerned in maintaining the animal functions. Quito in Peru, and the country round Gondar in Abyssinia, are so far elevated above the surface of the ocean, that the pressure and the elasticity of the air are one-third less

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than in the low countries; yet these are populous and healthy places. And, on the other hand, we know, that when an animal has breathed in any quantity of air for a certain time without renewal, it will not only be suffocated, but another animal put into this air will die immediately. And we do not find either the pressure or elasticity of the air remarkably diminished; it is indeed diminished, but by a very small quantity. Restoring the former pressure and elasticity has not the smallest tendency to prevent the death of the animal; for an animal will live no longer under a receiver that has its mouth inverted on water, than in one set upon the pump-plate covered with leather. Now when the receiver is set on water, the pressure of the atmosphere acts completely on the included air, and preserves it in the same state of elasticity.

The nature of air that has been inspired, altered.

In short, it is known that the air which has already served to maintain the animal functions has its chemical and alimentary properties completely changed, and is no longer fit for this purpose. So much of any mass of air as has really been thus employed is changed into what is called *fixed air* by Dr. Black, or *carbonic acid* by the chemists of the school of Lavoisier. Any person may be convinced of this by breathing or blowing through a pipe immersed in lime water. Every expiration will produce white clouds on the water, till all the lime which it contains is precipitated in the form of pure chalk. In this case we know that the lime has combined with the fixed air.

Hales's experiments.

The celebrated Dr. Stephen Hales made many experiments, with a view to clear the air from the noxious vapour which he supposed to be emitted from the lungs. He made use of the apparatus which we have been just now mentioning; and he put several diaphragms *ff*, *ff*, &c. of thin woollen stuff into the box, and moistened them with various liquids. He found nothing so efficacious as a solution of potash. We now understand this perfectly. If the solution is not already saturated with fixed air, it will take it up as fast as it is produced, and this will purify the air: a solution of caustic alkali therefore will have this effect till it is rendered quite mild.

How it comes to be changed.

These experiments have been repeated, and varied in many circumstances, in order to ascertain whether this fixed air was really emitted by the lungs, or whether the inspired air was in part changed into fixed air by its combination with some other substance. This is a question which comes properly in our way, and which the doctrines of pneumatics enable us to answer. If the fixed air be emitted in substance from the lungs, it does not appear how a renewal of the air into which it is emitted is necessary, for this does not hinder the subsequent emission; and the bulk of the air would be increased by breathing in it, viz. by the bulk of all the fixed air emitted; but, on the contrary, it is a little diminished. We must therefore adopt the other opinion; and the discoveries in modern chemistry enable us to give a pretty accurate account of the whole process. Fixed air is acknowledged to be a compound, of which one ingredient is found to constitute nearly one-fourth of the whole atmospheric fluid, we mean vital air or the oxygen of Lavoisier. When this is combined with phlogiston, according to the doctrine of Stahl, or with carbon, according to Lavoisier, the result is fixed air or carbonic acid. The change therefore which breathing makes on the air is the solution of this matter by vital air; and the use of air in breathing is the carrying off this noxious principle in the way of solution. When therefore the air is already so far saturated as not to dissolve this substance as fast as it is secreted, or must be secreted in the lungs, the animal suffers the pain of suffocation, or is otherwise mortally affected. Suffocation is not the only consequence; for we can remain for a number of seconds without breathing, and then we begin to feel the true pain of suffocation; but those who have been instantaneously struck down by an inspiration of fixed air, and afterwards recovered to life, complained of no such pain, and seemed to have suffered chiefly by a nervous affection. It is said, but we will not vouch for the truth of it, that a person may safely take a full inspiration of fixed air, if the passages of the nose be shut; and that unless these nerves are stimulated by the fixed air, it is not instantaneously mortal. But these are questions out of our present line of inquiry. They belong to physiology, and are treated of in other places of this work. Our business is to explain in what manner the pressure and elasticity of the air, combined with the structure and mechanism of the body, operate in producing this necessary secretion and removal of the matter discharged from the lungs in the act of breathing.

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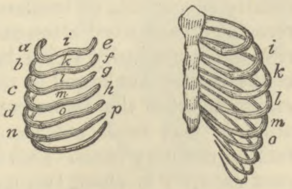
It is well ascertained, that the secretion is made from the mass of blood during its passage through the lungs. The blood delivered into the lungs is of a dark blackish colour, and is there changed into a florid red. In the lungs it is exposed to the action of the air in a prodigiously extended surface; for the lungs consist of an inconceivable number of small vessels or bladders, communicating with each other and with the windpipe. These are filled with air in every inspiration. These vessels are everywhere in contact with minute blood-vessels. The blood does not *in toto* come into immediate contact with the air; and it would seem that it is only the thin serous part of it which is acted on by the air at the mouths of the vessels or pores, where it stands by capillary attraction. Dr. Priestley found, that venous blood inclosed in thin bladders and other membranes was rendered florid by keeping the bladders in contact with abundance of pure vital air. We know also, that breath is moist or damp, and must have acquired this moisture in the lungs. It is immaterial whether this secretion of water or lymph, as the anatomists call it, be furnished by mere exudation through simple pores, or by a vascular and organic secretion; in either case, some ingredient of the blood comes in contact with air in the lungs, and there unites with it. This is farther confirmed, by observing, that all breathing animals are warmer than the surrounding medium, and that by every process in which fixed air is formed from vital air, heat is produced. Hence the formation of this gas by the union of atmospheric oxygen with carbon in the blood is generally assigned as the source of animal heat. We touch on these things in a very transitory way in this place, only to prove that, for the support of animal life, there must be a very extensive application of the air to the blood, and that this is made in the lungs.

The question under consideration here is, How is this brought about by the weight and elasticity of the air? The answer is, it is done in two ways; by the action of the muscles of the ribs, and by the action of the diaphragm and other muscles of the abdomen. The thorax or chest is a great cavity, completely filled by the lungs. The sides of this cavity are formed by the ribs. These are crooked or arched, and each is moveable round its two ends, one of them being inserted into the vertebra of the back, and the other into the sternum or breast-bone. The rib turns in a manner resembling the handle of a drawer. The inspection of fig. 86 will illustrate this matter a little. Suppose the curves *a c e*, *b k f*, *c l g*, &c. to represent the ribs moveable round the extremities. Each succeeding rib is more bent than the one above it, and this curvature is both in the vertical and horizontal direction. Suppose each so broad as to project a little over its inferior like the tiles of a roof. It is evident, that if we take the lower one by its middle, and draw it out a little, moving it round the line *np*, it will bring out the next *dmh* along with it. Also, because the dis-

Fig. 86.



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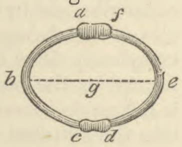
tance of the middle point o from the axis of motion np is greater than the distance of m from the axis dh, and because o will therefore describe a portion of a larger circle than m does, the rib nop will slide up a little under the rib dmh, or the rib dmh will overlap nop a little more than before; the distance om will therefore be diminished. The same must happen to all the superior ribs; but the change of distance will be less and less as we go upwards. Now, instead of this great breadth of the ribs overlapping each other, suppose each inferior rib connected with the one above it by threads or fibres susceptible of contraction at the will of man. The articulations e, a, of the first or upper rib with the spine and sternum are so broad and firm, that this rib can have little or no motion round the line ae; this rib therefore is as a fixture for the ends of all the contracting fibres: therefore, whenever the fibres which connect the second rib with the first rib contract, the second must rise a little, and also go outward, and will carry the lower ribs along with it; the third rib will still rise farther by the contraction of the muscles which connect it with the second, and so on; and thus the whole ribs are raised and thrown outward (and a little forward, because the articulation of each with the spine is considerably higher than that with the sternum), and the capacity of the thorax is enlarged by the contraction of its muscular covering. The direction of the muscular fibres is very oblique to the direction of the circular motion which it produces; from which circumstance it follows, that a very minute contraction of the muscles produces all the motion which is necessary. This indeed is not great; the whole motion of the lowest ribs is less than an inch in the most violent inspiration, and the whole contraction of the muscles of the twelve ribs does not exceed the eighth part of an inch, even supposing the intercostal muscles at right angles to the ribs; and being oblique, the contraction is still less. It would seem, that the intensity of the contractive power of a muscular fibre is easily obtained, but that the space through which it can be exerted is very limited; for in most cases nature places the muscles in situations of great mechanical disadvantage in this respect, in order to procure other conveniences.

But this is not the whole effect of the contraction of the intercostal muscles; since the compound action of the two sets of muscles, which cross each other from rib to rib like the letter X, is nearly at right angles to the rib, but is oblique to its plane, it tends to push the ribs closer on their articulations, and thus to press out the two pillars on which they are articulated. Thus, supposing af (fig. 87) to represent the section of one of the vertebræ of the spine, and $c\,d$ a section of the sternum, and $a\,b\,c$, $f\,e\,d$, two opposite ribs, with a lax thread $b\,e$ connecting them. If this thread be pulled upwards by the middle g till it is tight, it will tend to pull the points b and e nearer to each other, and to press the vertebra af and the sternum $c\,d$ outwards. The spine being the chief pillar of the body, may be considered as immoveable in the present instance. The sternum is sufficiently susceptible of motion for the present purpose. It remains almost fixed a-top at its articulation with the first rib, but it gradually yields below; and thus the capacity of the thorax is enlarged in this direction also. The whole enlargement of the diameters of the thorax during inspiration is very small, not exceeding the fiftieth part of an inch in ordinary cases. This is easily calculated. Its quiescent capacity is about two cubic feet, and we never draw in more than fifteen inches. Two spheres, one of which holds two cubic feet and the other two feet and fifteen inches, will not differ in diameter above the fiftieth part of an inch.

Fig. 87.



The other method of enlarging the capacity of the thorax is very different. It is separated from the abdomen by a strong muscular partition called the diaphragm, which is attached to firm parts all around. In its quiescent or relaxed state it is considerably convex upwards, that is, towards the thorax, rising up into its cavity like the bottom of an ordinary quart bottle, only not so regular in its shape. Many of its fibres tend from its middle to the circumference, where they are inserted into firm parts of the body. Now suppose these fibres to contract. This must draw down its middle, or make it flatter than before, and thus enlarge the capacity of the thorax.

Physiologists are not well agreed as to the share which each of these actions has in the operation of enlarging the thorax. Many refuse all share of it to the intercostal muscles, and say that it is performed by the diaphragm alone. But the fact is, that the ribs are really observed to rise even while the person is asleep; and this cannot possibly be produced by the diaphragm, as these anatomists assert. Such an opinion shows either ignorance or neglect of the laws of pneumatics. If the capacity of the thorax were enlarged only by drawing down the diaphragm, the pressure of the air would compress the ribs, and make them descend. And the simple laws of mechanics make it as evident as any proposition in geometry, that the contraction of the intercostal muscles must produce an elevation of the ribs and enlargement of the thorax; and it is one of the most beautiful contrivances of nature. It depends much on the will of the animal what share each of these actions shall have. In general, the greatest part is done by the diaphragm; and any person can breathe in such a manner that his rib shall remain motionless; and, on the contrary, he can breathe almost entirely by raising his chest. In the first method of breathing, the belly rises during inspiration, because the contraction of the diaphragm compresses the upper part of the bowels, and therefore squeezes them outwards; so that an ignorant person would be apt to think that the breathing was performed by the belly, and that the belly is inflated with the air. The strait lacing of the women impedes the motion of the ribs, and changes the natural habit of breathing, or brings on an unnatural habit. When the mind is depressed, it is observed that the breathing is more performed by the muscles of the thorax; and a deep sigh is always made in this way.

These observations on the manner in which the capacity of the chest can be enlarged were necessary, before we can acquire a just notion of the way in which the mechanical properties of air operate in applying it to the mass of blood during its passage through the lungs. Suppose the thorax quite empty, and communicating with the external air by means of the trachea or windpipe, it would then resemble a pair of bellows. Raising the boards corresponds to the raising of the ribs; and we might imitate the action of the diaphragm by forcibly pulling outwards the folded leather which unites them. Thus their capacity is enlarged, and the air rushes in at the nozzle by its weight in the same manner as water would do. The thorax differs from bellows only in this respect, that it is filled by the lungs, which is a vast collection of little bladders, like the holes in a piece of fermented bread, all communicating with the trachea, and many of them with each other. When the chest is enlarged, the air rushes into them all in the same manner as into the single cavity of an empty thorax. It cannot be said with propriety that they are inflated; all that is done is the allowing the air to come in. At the same time, as their membranous covering must have some thickness, however small, and some elasticity, it is not unlikely that, when compressed by expiration, they tend a little to recover their former shape, and thus aid the voluntary action of the muscles. It is in this manner that a small bladder of caoutchouc swells again after compression, and fills itself with air or water. But this cannot happen except in the most minute vesicles; those of sensible bulk have not elasticity enough for this purpose. The lungs of birds, however, have some very large bladders, which have a very considerable elasticity, and recover their shape and size with great force after compression, and thus fill themselves with air. The respiration of these animals is considerably different from that of land animals, and their muscles act chiefly in expiration. This will be explained by and by as a curious variety in the pneumatic instrument.

Air taken in, not by our own action, but by external pressure.

This account of the manner in which the lungs are filled with air does not seem agreeable to the notions we entertain of it. We seem to suck in the air; but although it be true that we act, and exert force, in order to get air into our lungs, it is not by our action, but by external pressure, that it does come in. If we apply our mouth to the top of a bottle filled with water, we find that no draught, as we call it, of our chest will suck in any of the water, but if we suck in the very same manner at the end of a pipe immersed in water, it follows immediately. Our interest in the thing makes us connect in imagination our own action with the effect, without thinking on the many steps which may intervene in the train of natural operations; and we consider the action as the immediate cause of the reception of the air into the lungs. It is as if we opened the door, and took in by the hand a person who was really pushed in by the crowd without. If an incision be made into the side of the thorax, so that the air can get in by that way, when the animal acts in the usual manner, the air will really come in by this hole, and fill the space between the lungs and the thorax; but no air is sucked into the lungs by this process, and the animal is as completely suffocated as if the windpipe were shut up. And, on the other hand, if a hole be made into the lungs without communicating with the thorax, the animal will breathe through this hole, though the windpipe be stopped. This is successfully performed in cases of patients whose trachea is shut up by accident or by inflammation; only it is necessary that this perforation be made into a part of the lungs where it may meet with some of the great pulmonary passages; for if made into some remote part of a lobe, the air cannot find its way into the rest of the lungs through such narrow passages, obstructed too by blood, &c.

Nature of expiration.

We have now explained, on pneumatical principles, the process of inspiration. The expiration is chiefly performed by the natural tone of the parts. In the act of inspiration the ribs were raised and drawn outwards in opposition to the elasticity of the solids themselves; for although the ribs are articulated at their extremities, the articulations are by no means such as to give a free and easy motion like the joints of the limbs. This is particularly the case in the articulations with the sternum, which are by no means fitted for motion. It would seem that the motion really produced here is chiefly by the yielding of the cartilaginous parts and the bending of the rib; when therefore the muscles which produced this effect are allowed to relax, the ribs again collapse. Perhaps this is assisted a little by the action of the long muscles which come down across the ribs without being inserted into them. These may draw them together a little, as we compress a loose bundle by a string. In like manner, when the diaphragm was drawn down, it compressed the abdomen in opposition to the elasticity of all the viscera contained in it, and to the elasticity and tone of integuments and muscles which surround it. When therefore the diaphragm is relaxed, these parts push it up again into its natural situation, and in doing this expel the air from the lungs.

It requires no effort.

If this be a just account of the matter, expiration should be performed without any effort. This accordingly is the case. We feel that, after having made an ordinary easy inspiration, it requires the continuance of the effort to keep the thorax in this enlarged state, and that all that is necessary for expiration is to cease to act. No person feels any difficulty in emptying the lungs; but weak people often feel a difficulty of inspiration, and compare it to the feeling of a weight on their breast; and expiration is the last motion of the thorax in a dying person. But nature has also given us a mechanism by which we can expire, namely, the abdominal muscles; and when we have finished an ordinary and easy expiration, we can still expel a considerable bulk of air—nearly half the contents of the lungs—by contracting the abdominal muscles. These, by compressing the body, force up its moveable contents against the diaphragm, and cause it to rise further into the thorax, acting in the same manner as when we expel the fæces *per anum.* When a person breathes out as much air as he can in this manner, he may observe that his ribs do not collapse during the whole operation.

A certain quantity of air necessary to keep the lungs of a natural size.

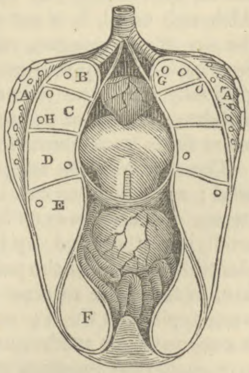
There seems then to be a certain natural unconstrained state of the vesicles of the lungs, and a certain quantity of air necessary for keeping them of this size. It is probable that this state of the lungs gives the freest motion to the blood. Were they more compressed, the blood-vessels would be compressed by the adjoining vesicles; were they more lax, the vessels would be more crooked, and by this means obstructed. The frequent inspirations gradually change this air by mixing fresh air with it, and at every expiration carrying off some of it. In catarrhs and inflammations, especially when attended with suppuration, the small passages into the remote vessels are obstructed, and thus the renewal of air in them will be prevented. The painful feeling which this occasions, causes us to expel the air with violence, shutting the windpipe, till we have exerted strongly with the abdominal muscles, and made a strong compression on the lower part of the thorax. We then open the passage suddenly, and expel the air and obstructing matter by violent coughing.

Process of breathing in birds.

We have said, that birds exhibit a curious variety in the process of breathing. The muscles of their wings being so very great, required a very extensive insertion, and this is one use of the great breast bone. Another use of it is, to form a firm partition to hinder the action of these muscles from compressing the thorax in the act of flying; therefore the form of their chest does not admit of alternate enlargement and contraction to that degree as in land animals. Moreover, the muscles of their abdomen are also very small; and it would seem that they are not sufficient for producing the compression on the bowels which is necessary for carrying on the process of concoction and digestion. Instead of aiding the lungs, they receive help from them.

In the ostrich, the lungs consist of a fleshy part A, A, (fig. 88) composed of vesicles like those of land animals, and, like theirs, serving to expose the blood to the action of the air. Besides these, they have on each side, four large bags, B, C, D, E, each of which has an orifice G, communicating with the trachea; but the second, C, has an orifice, H, by which it communicates with another bag F, situated below the rest in the abdomen. Now, when the lungs are compressed by the action of the diaphragm, the air in C is partly expelled by the trachea through the orifice G, and partly driven through the orifice H into the bag F, which is then allowed to receive it, because the same action which compresses the lungs enlarges the abdomen. When the thorax is enlarged, the bag C is partly supplied with fresh air through the trachea, and partly from the bag F. As the lungs of other animals resemble a common bellows, the

Fig. 88.



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lungs of birds resemble the smith's bellows with a partition; and anatomists have discovered passages from this part of the lungs into their hollow bones and quills. We do not know all the uses of this contrivance; and only can observe, that this alternate action must assist the muscles of the abdomen in promoting the motion of the food along the alimentary canal, &c. We can distinctly observe in birds that their belly dilates when the chest collapses, and *vice versa*, contrary to what we see in the land animals. Another use of this double passage may be to produce a circulation of air in the lungs, by which a compensation is made for the smaller surface of action on the blood; for the number of small vesicles, of equal capacity with these large bags, give a much more extensive surface.

If we try to raise mercury in a pipe by the action of the chest alone, we cannot raise it above two or three inches; and the attempt is both painful and hazardous. It is painful chiefly in the breast, and it provokes coughing. Probably the fluids ooze through the pores of the vesicles by the pressure of the surrounding parts. On the other hand, we can by expiration support mercury about five or six inches high; but this also is very painful, and apt to produce extravasation of blood. This seems to be done entirely by the abdominal muscles.

The operation of sucking.

The operation properly termed *sucking*, is totally different from breathing, and resembles exceedingly the action of a common pump. Suppose a pipe held in the mouth, and its lower end immersed in water. We fill the mouth with the tongue, bringing it forward, and applying it closely to the teeth and to the palate; we then draw it back, or bend it downwards from the palate behind, thus leaving a void. The pressure of the air on the cheeks immediately depresses them, and applies them close to the gums and teeth; and its pressure on the water in the vessel causes it to rise through the pipe into the empty part of the mouth, which it quickly fills. We then push forward the tip of the tongue, below the water, to the teeth, and apply it to them all round, the water being above the tongue, which is kept much depressed. We then apply the tongue to the palate, beginning at the tip, and gradually going backward in this application. By this means the water is gradually forced backward by an operation similar to that of the gullet in swallowing. This is done by contracting the gullet above, and relaxing it below, just as we would empty a gut of its contents, by drawing our closed hand along it. By this operation the mouth is again completely occupied by the tongue, and we are ready for repeating the operation. Thus the mouth and tongue resemble the barrel and piston of a pump; and the application of the tip of the tongue to the teeth, performs the office of the valve at the bottom of the barrel, preventing the return of the water into the pipe. Although usual, it is not absolutely necessary, to withdraw the tip of the tongue, making a void before the tongue. Sucking may be performed by merely separating the tongue gradually from the palate, beginning at the root. If we withdraw the tip of the tongue a very minute quantity, the water flows back above the tongue.

The action of the tongue in this operation is very powerful; some persons can raise mercury 25 inches; but this strong exertion is very fatiguing, and the soft parts are prodigiously swelled by it. It causes the blood to ooze plentifully through the pores of the tongue, fauces, and palate, in the same manner as if a cupping-glass and syringe were applied to them; and, when the inside of the mouth is excoriated or tender, as is frequent with infants, even a very moderate exertion of this kind is accompanied with extravasation of blood. When children suck the nurse's breast, the milk follows their exertion by the pressure of the air on the breast; and a weak child, or one that withholds its exertions on account of pain from the above mentioned cause, may be assisted by a gentle pressure of the hand on the breast. The infant pupil of nature, without any knowledge of pneumatics, frequently helps itself by pressing its face to the yielding breast.

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In the whole of this operation the breathing is performed through the nostrils; and it is a prodigious distress to an infant when this passage is obstructed by mucus. We beg to be forgiven for observing by the way, that this obstruction may be almost certainly removed for a little while, by rubbing the child's nose with any liquid of quick evaporation, or even with water.

Of drinking.

The operation in drinking is not very different from that in sucking. We have indeed little occasion here to suck, but we must do it a little. Dogs, and some other animals, cannot drink, but only lap the water into their mouths with their tongues, and then swallow it. The gallinaceous birds seem to drink very imperfectly. They seem merely to dip their head into the water, up to the eyes, till their mouth is filled with water, and then holding up the head, it gets into the gullet by its weight, and is then swallowed. The elephant drinks in a very complicated manner. He dips his trunk into the water, and fills it by making a void in his mouth. This he does in the contrary way to man. After having depressed his tongue, he begins the application of it to the palate at the root, and by extending the application forward, he expels the air by the mouth which came into it from the trunk. The process here is not very unlike that of the condensing syringe without a piston valve, in which the external air, corresponding to the air in the trunk, enters by the hole in the side, and is expelled through the hole in the end of the barrel; by this operation the trunk is filled with water; then he lifts his trunk out of the water, and bringing it to his mouth, pours the contents into it, and swallows it. On considering this operation, it appears that, by the same process by which the air of the trunk is taken into the mouth, the water could also be taken in, to be afterwards swallowed; but we do not find, upon inquiry, that this is done by the elephant; we have always observed him to drink in the manner now described. In either way it is a double operation, and cannot be carried on any way but by alternately sucking and swallowing, and while one operation is going on, the other is interrupted; whereas man can do both at the same time. Nature seems to delight in exhibiting to rational observers her inexhaustible variety of resource; for many insects which drink with a trunk, drink without interruption; yet we do not call in question the truth of the aphorism, *Natura maxime simplex et semper sibi consona*, nor doubt but that, if the *whole* of her purpose were seen, we should find that her process is the simplest possible; for Nature, or Nature's God, is wise above our wisest thoughts, and simplicity is certainly the choice of wisdom; but, alas! it is generally but a small and the most obvious part of her purpose that we can observe or appreciate. We seldom see this simplicity of nature stated to us, except by some system-maker, who has found a principle which somehow tallies with a considerable variety of phenomena, and then cries out, *Frustra sit per plura quod fieri potest per pauciora*.

Mode of keeping up a continued blast with a blow-pipe.

There is an operation similar to that of the elephant, which many find a great difficulty in acquiring; namely, keeping up a continued blast with a blow-pipe. We would desire our chemical reader to attend minutely to the gradual action of his tongue in sucking, and he will find it such as we have described. Let him attend particularly to the way in which the tip of the tongue performs the office of a valve, preventing the turn of the water into the pipe; and the same position of the tongue would hinder air from coming into the mouth. Next let him observe, that in swallowing what water he has now got lodged above his tongue, he continues the tip of the tongue applied to the teeth; now let him shut his mouth, keeping his lips firm together, the tip of the tongue at the

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teeth, and the whole tongue forcibly kept at a distance from the palate; bring up the tongue to the palate, and allow the tip to separate a little from the teeth, this will expel the air into the space between the fauces and cheeks, and will blow up the cheeks a little; then, acting with the tip of the tongue as a valve, hinder this air from getting back, and depressing the tongue again, more air from the nostrils will get into the mouth, which may be expelled into the space without the teeth as before, and the cheeks will be more inflated. Continue this operation, and the lips will no longer be able to retain it, and it will ooze through as long as the operation is continued. When this has become familiar and easy, take the blow-pipe, and there will be no difficulty in maintaining a blast as uniform as a smith's bellows, breathing all the while through the nostrils. The only difficulty is the holding the pipe. This fatigues the lips; but it may be removed by giving the pipe a convenient shape, a pretty flat oval, and wrapping it round with leather or thread.

Nature of the land and sea-breeze in warm countries.

Another phenomenon depending on the principles already established, is the land and sea-breeze in the warm countries. We have seen that air expands exceedingly by heat; therefore heated air, being lighter than an equal bulk of cold air, must rise in it. If we lay a hot stone in the sunshine in a room, we shall observe the shadow of the stone surrounded with a fluttering shadow of different degrees of brightness, and that this flutter rises rapidly in a column above the stone. If we hold an extinguished candle near the stone, we shall see the smoke move towards the stone, and then ascend from it. Now, suppose an island receiving the first rays of the sun in a perfectly calm morning; the ground will soon be warmed, and will warm the contiguous air. If the island be mountainous, this effect will be more remarkable; because the inclined sides of the hills will receive the light more directly. The midland air will therefore be most warmed. The heated air will rise, and that in the middle will rise fastest; and thus a current of air upwards will begin, which must be supplied by air coming in from all sides, to be heated and to rise in its turn; so that the morning sea-breeze is produced, and continues all day. This current will frequently be reversed during the night, by the air cooling and gliding down the sides of the hills, and we shall have the land-breeze.

Circulation of air in mines.

It is owing to the same cause that we have a circulation of air in mines which have the mouths of their shafts of unequal heights. The temperature under ground is pretty constant through the whole year, while that of the atmosphere is extremely variable. Now, suppose a mine having a long horizontal drift, communicating between two pits or shafts, and that one of these shafts terminates in a valley, while the other opens on the brow of a hill perhaps 100 feet higher. Let us further suppose it summer, and the air heated to 65°, while the temperature of the earth is but 45°; this last will be also the temperature of the air in the shafts and the drift. Now, since air expands nearly 24 parts in 10,000 by one degree of heat, we shall have an odds of pressure at the bottom of the two shafts equal to nearly the 20th part of the weight of a column of air 100 feet high (100 feet being supposed the difference of the heights of the shafts.) This will be about six ounces on every square foot of the section of the shaft. If this pressure could be continued, it would produce a prodigious current of air down the long shafts, along the drift, and up the short shaft. The weight of air acting through 100 feet would communicate to it the velocity of 80 feet per second: divide this by $\sqrt{20}$, that is, by 4·5, and we shall have 18 feet per second for the velocity: this is the velocity of what is called a brisk gale. This pressure would be continued, if the warm air which enters the long shaft were cooled and condensed as fast as it comes in; but this is not the case. It is however cooled and condensed, and a current is produced sufficient to make an abundant circulation of air along the whole passage; and care is taken to dispose the shafts and conduct the passages in such a manner that no part of the mine is out of the circle. When any new lateral drift is made, the renewal of air at its extremity becomes more imperfect as it advances: and when it is carried a certain length, the air stagnates and becomes suffocating, till either a communication can be made with the rest of the mine, or a shaft be made at the end of this drift.

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As this current depends entirely on the difference of temperature between the air below and that above, it must cease when this difference ceases. Accordingly, in the spring and autumn, the miners complain much of stagnation; but in summer they never want a current from the deep pits to the shallow, nor in the winter a current from the shallow pits to the deep ones. It frequently happens also, that in mineral countries the chemical changes which are going on in different parts of the earth occasion differences of temperature sufficient to produce a sensible current.

The nature of what is called the draught in chimneys.

And this naturally leads us to consider a very important effect of the expansion and consequent ascent of air by heat, namely, the drawing, as it is called, of chimneys. The air which has contributed to the burning of fuel must be intensely heated, and will rise in the atmosphere. This will also be the case with much of the surrounding air which has come very near the fire, although not in contact with it. If this heated air be made to rise in a pipe, it will be kept together, and therefore will not soon cool and collapse: thus we shall obtain a long column of light air, which will rise with a force so much the greater as the column is longer or more heated. Therefore the taller we make the chimney, or the hotter we make the fire, the more rapid will be the current, or the draught or suction, as it is injudiciously called, will be so much the greater. The ascensional force is the difference between the weight of the column of heated air in the funnel and a column of the surrounding atmosphere of equal height. We increase the draught, therefore, by increasing the perpendicular height of the chimney. Its length in a horizontal direction gives no increase, but, on the contrary, diminishes the draught by cooling the air before it gets into the effective part of the funnel. We increase the draught also by obliging all the air which enters the chimney to come very near the fuel; therefore a low mantle-piece will produce this effect; also filling up all the spaces on each side of the grate. When much air gets in above the fire, by having a lofty mantle-piece, the general mass of air in the chimney cannot be much heated. Hence it must happen that the greatest draught will be produced by bringing down the mantle-piece to the very fuel; but this converts a fire-place into a furnace, and by thus sending the whole air through the fuel, causes it to burn with great rapidity, producing a prodigious heat; and this producing an increase of ascensional force, the current becomes furiously rapid, and the heat and consumption of fuel immense. If the fire-place be a cube of a foot and a half, and the front closed by a door, so that all the air must enter through the bottom of the grate, a chimney of fifteen or twenty feet high, and sufficiently wide to give passage to all the expanded air which can pass through the fire, will produce a current which will roar like thunder, and a heat sufficient to run the whole inside into a lump of glass.

All that is necessary, however, in a chamber fire-place, is a current sufficiently great for carrying up the smoke and vitiated air of the fuel. And as we want also the enlivening light and flutter of the fire, we give the chimney-piece both a much greater height and width than what is merely necessary for carrying up the smoke, only wishing to have the current sufficiently determinate and steady for counteracting any occasional tendency which it may sometimes have to come into the room. By allowing a greater quantity of air to get into the chimney, heated only to a mode-

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rate degree, we produce a more rapid renewal of the air of the room: did we oblige it to come so much nearer the fire as to produce the same renewal of the air in consequence of a more rapid current, we should produce an inconvenient heat. But in this country, where pit-coal is in general so very cheap, we carry this indulgence to an extreme; or rather we have not studied how to get all the desired advantages with economy. A much smaller renewal of air than we commonly produce is abundantly wholesome and pleasant, and we may have all the pleasure of the light and flame of the fuel at much less expense, by contracting greatly the passage into the vent. The best way of doing this is by contracting the brick-work on each side behind the mantle-piece, and reducing it to a narrow parallelogram, having the back of the vent for one of its long sides. Make an iron plate to fit this hole, of the same length, but broader, so that it may lie sloping, its lower edge being in contact with the foreside of the hole, and its upper edge leaning on the back of the vent. In this position it shuts the hole entirely. Now let the plate have a hinge along the front or lower edge, and fold up like the lid of a chest. We shall thus be able to enlarge the passage at pleasure. In a fire-place fit for a room of 24 feet by 18, if this plate be about 18 inches long from side to side, and folded back within an inch or an inch and a half of the wall, it will allow passage for as much air as will keep up a very cheerful fire; and by raising or lowering this register, the fire may be made to burn more or less rapidly. A free passage of half an inch will be sufficient in weather that is not immoderately cold. The principle on which this construction produces its effect is, that the air which is in the front of the fire, and much warmed by it, is not allowed to get into the chimney, where it would be immediately hurried up the vent, but rises up to the ceiling and is diffused over the whole room. This double motion of the air may be distinctly observed by opening a little of the door and holding a candle in the way. If the candle be held near the floor, the flame will be blown into the room; but if held near the top of the door, the flame will be blown outward.

Description of a stove-grate or chapelle.

But the most perfect method of warming an apartment in the temperate climates, where we can indulge in the cheerfulness and sweet air produced by an open fire, is what we call a stove-grate, and our neighbours on the Continent call a chapelle, from its resemblance to the chapels or oratories in the great churches.

In the great chimney-piece, which, in this case, may be made even larger than ordinary, is set a smaller one fitted up in the same style of ornament, but of a size no greater than is sufficient for holding the fuel. The sides and back of it are made of iron (cast iron is preferable to hammered iron, because it does not so readily calcine), and are kept at a small distance from the sides and back of the main chimney-piece, and are continued down to the hearth, so that the ash-pit is also separated. The pipe or chimney of the stove grate is carried up behind the ornaments of the mantle-piece till it rises above the mantle-piece of the main chimney-piece, and is fitted with a register or damper-plate turning round a traverse axis. The best form of this register is that which we have recommended for an ordinary fire-place, having its axis or joint close at the front; so that when it is open or turned up, the burnt air and smoke striking it obliquely, are directed with certainty into the vent, without any risk of reverberating and coming out into the room. All the rest of the vent is shut up by iron-plates or brick-work out of sight.

The effect of this construction is very obvious. The fuel, being in immediate contact with the back and sides of the grate, heats them to a great degree, and they heat the air contiguous to them. This heated air cannot get up the vent, because the passages above these spaces are shut up. It therefore comes out into the room; some of it goes into the real fire-place and is carried up the vent, and the rest rises to the ceiling and is diffused over the room.

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Effect of its construction.

It is surprising to a person who does not consider it with skill, how powerfully this grate warms a room. Less than one-fourth of the fuel consumed in an ordinary fire-place is sufficient; and this with the same cheerful blazing hearth and salutary renewal of air. It even requires attention to keep the room cool enough. The heat communicated to those parts in contact with the fuel is needlessly great; and it will be a considerable improvement to line this part with very thick plates of cast-iron, or with tiles made of fire-clay which will not crack with the heat. These, being very bad conductors, will make the heat, ultimately communicated to the air, very moderate. If, with all these precautions, the heat should be found too great, it may be brought under perfect management by opening passages into the vent from the lateral spaces. These may be valves or trap-doors moved by rods concealed behind the ornaments.

Thus we have a fire-place under the most complete regulation, where we can always have a cheerful fire without being for a quarter of an hour incommoded by the heat; and we can as quickly raise our fire, when too low, by hanging on a plate of iron on the front, which shall reach as low as the grate. This in five minutes will blow up the fire into a glow; and the plate may be sent out of the room, or set behind the stove-grate out of sight.

The propriety of inclosing the ash-pit is not so obvious; but if this be not done, the light ashes, not finding a ready passage up the chimney, will come out into the room along with the heated air.

Mode of warming apartments by stoves.

Under this head we shall next give a general account and description of the method of warming apartments by stoves. A stove in general is a fire-place shut up on all sides, having only a passage for admitting the air to support the fire, and a tube for carrying off the vitiated air and smoke; and the air of the room is warmed by coming into contact with the outside of the stove and flue. The general principle of construction, therefore, is very simple. The air must be made to come into as close contact as possible with the fire, or even to pass through it, and this in such quantities as just to consume a quantity of fuel sufficient for producing the heat required; and the stove must be so constructed, that both the burning fuel and the air which has been heated by it shall be applied to as extensive a surface as possible of furnace, all in contact with the air of the room; and the heated air within the stove must not be allowed to get into the funnel which is to carry it off till it is too much cooled to produce any considerable heat on the outside of the stove.

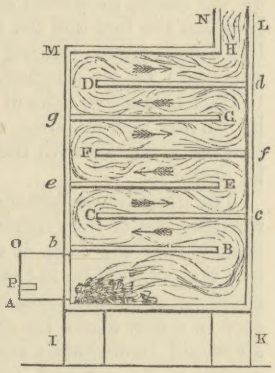
In this temperate climate no great ingenuity is necessary for warming an ordinary apartment; and stoves are made rather to please the eye as furniture than as economical substitutes for an open fire of equal calorific power. But our neighbours on the Continent, and especially towards the north, where the cold of winter is intense and fuel very dear, have bestowed much attention on their construction, and have combined ingenious economy with every elegance of form. Nothing can be handsomer than the stoves of Fayencerie that are to be seen in French Flanders, or the Russian stoves at St. Petersburg, finished in stucco. Our readers will not, therefore, be displeased with a description of them. In this place, however, we shall only consider a stove in general as a subject of pneumatical discussion, and refer our readers to the article STOVE for stoves as articles of domestic accommodation.

General form of a stove.

The general form, therefore, of a stove, and of which all others are only modifications adapted to circumstances of utility or taste, is as follows:—MIKL (fig. 79.) is a quadrangular box of any size in the directions MILK. The inside width from front to back is pretty constant, never less than 10 inches, and rarely extending to 20;

the included space is divided by a great many partitions. The lowest chamber B is the receptacle for the fuel, which lies on the bottom of the stove without any grate; this fire-place has a door AO turning on hinges, and in this door is a very small wicket P: the roof of the fire-place extends to within a very few inches of the farther end, leaving a narrow passage B for the flame. The next partition c C is about eight inches higher, and reaches almost to the other end, leaving a narrow passage for the flame at C. The partitions are repeated above, at the distance of eight inches, leaving passages at the ends, alternately disposed as in the figure; the last of them H communicates with the room vent. This communication may be regulated by a plate of iron, which can be slid across it by means of a rod or handle which comes through the side. The more usual way of shutting up this passage is by a sort of pan or bowl of earthen ware, which is inverted over it with its brim resting in sand contained in a groove formed all round the hole. This damper is introduced by a door in the front, which is then shut. The whole is set on low pillars, so that its bottom may be a few inches from the floor of the room. It is usually placed in a corner, and the apartments are so disposed that their chimneys can be joined in stacks as with us.

Fig. 79.



Some straw or wood shavings are first burnt on the hearth at its farther end. This warms the air in the stove, and creates a determined current. The fuel is then laid on the hearth close by the door, and pretty much piled up. It is now kindled; and the current being already directed to the vent, there is no danger of any smoke coming out into the room. Effectually to prevent this, the door is shut, and the wicket P opened. The air supplied by this, being directed to the middle or bottom of the fuel, quickly kindles it, and the operation goes on.

Aim and effects of this construction.

The aim of this construction is very obvious. The flame and heated air are retained as long as possible within the body of the stove by means of the long passages; and the narrowness of these passages obliges the flame to come in contact with every particle of soot, so as to consume it completely, and thus convert the whole combustible matter of the fuel into heat. For want of this, a very considerable portion of our fuel is wasted by our open fires, even under the very best management. The soot which sticks to our vents is very inflammable, and a pound weight of it will give as much if not more heat than a pound of coal. And what sticks to our vents is very inconsiderable in comparison with what escapes unconsumed at the chimney top. In fires of green wood, peat, and some kinds of pit-coal, nearly one-fifth of the fuel is lost in this way; but in these stoves there is hardly ever any mark of soot to be seen; and even this small quantity is produced only after lighting the fires. The volatile inflammable matters are expelled from parts much heated indeed, but not so hot as to burn; and some of it charred or half-burnt cannot be any further consumed, being enveloped in flame and air already vitiated and unfit for combustion. But when the stove is well heated, and the current brisk, no part of the soot escapes the action of the air.

The hot air retained in this manner in the body of the stove is applied to its sides in a very extended surface. To increase this still more, the stove is made narrower from front to back in its upper part; a certain breadth is necessary below, that there may be room for fuel. If this breadth were preserved all the way up, much heat would be lost, because the heat communicated to the partitions of the stove does no good. By diminishing their breadth, the proportion of useful surface is increased. The whole body of the stove may be considered as a long pipe folded up, and its effect would be the greatest possible if it really were so; that is, if each partition cC, dD, &c. were split into two, and a free passage allowed between them for the air of the room. Something like this will be observed afterwards in some German stoves.

It is with the same view of making an extensive application of a hot surface to the air, that the stove is not built in the wall, not even in contact with it, nor with the floor; for by its detached situation, the air in contact with the back, and with the bottom, where it is hottest, is warmed, and contributes at least one-half of the whole effect; for the great heat of the bottom makes its effect on the air of the room at least equal to that of the two ends. Sometimes a stove makes part of the wall between two small rooms, and is found sufficient.

It must be remarked, on the whole, that the effect of a stove depends much on keeping in the room the air already heated by it. This is so remarkably the case, that a small open fire in the same room will be so far from increasing its heat, that it will greatly diminish it; it will even draw the warm air from a suite of adjoining apartments. This is distinctly observed in the houses of the English merchants in St. Petersburg; their habits of life in Britain make them uneasy without an open fire in their sitting rooms; and this obliges them to heat all their stoves twice a-day, and their houses are cooler than those of the Russians, who heat them only once. In many German houses, especially of the lower class, the fire-place of the stove does not open into the room, but into the yard or a lobby, where all the fires are lighted and tended; by this means is avoided the expense of warm air which must have been carried off by the stove; but it is evident, that this must be very unpleasant, and cannot be wholesome. We must breathe the same quantity of stagnant air loaded with all the vapours and exhalations which must be produced in every inhabited place. Going into one of these houses from the open air, is like putting one's head into a stew-pan or under a pie-crust, and quickly nauseates us who are accustomed to fresh air and cleanliness. In these countries it is a matter almost of necessity, to fumigate the rooms with frankincense and other gums burnt. The censer in ancient worship was in all probability an utensil introduced by necessity for sweetening or rendering tolerable the air of a crowded place; and it is a constant practice in the Russian houses for a servant to go round the room after dinner, waving a censer with some gums burning on bits of charcoal.

Of hot walls in gardening, &c.

The account now given of stoves for heating rooms, and of the circumstances which must be attended to in their construction, will equally apply to hot walls in gardening, whether within or without doors. The only new circumstance which this employment of a flue introduces, is the attention which must be paid to the equability of the heat, and the gradation which must be observed in different parts of the building. The heat in the flue gradually diminishes as it recedes from the fire-place, because it is continually giving out heat to the flue. It must therefore be so conducted through the building by frequent returns, that in every part there may be a mixture of warmer and cooler branches of the flue, and the final chimney should be close by the fire-place. It would, however, be improper to run the flue from the end of the floor up to the ceiling, where the second horizontal pipe would be placed, and then return it downward again and make the third horizontal flue adjoining to the first, &c. This would make the middle of the wall the coldest. If it is the flue of a greenhouse, this would be highly improper, because the upper part of the wall can be very little employed; and in this case it is better to allow the flue to proceed gradually up the wall in its different returns, by which the lowest part would be the warmest, and the heated air will ascend among the pots and plants; but in a hot wall, where the trees are to receive heat by contact, some approximation to the above method may be useful. In the hypocausta and fudaria of the Greeks and Romans, the flue was conducted chiefly under the floors.

Malt-kilns a species of stove.

Malt-kilns are a species of stove which merit our attention. Many attempts have been made to improve them on the principle of flue stoves; but they have been unsucessful, because heat is not what is chiefly wanted in malting; it is a copious current of very dry air to carry off the moisture.

Of the current of air in melting furnaces.

All that is to be attended to in the different kinds of melting furnaces is, that the current of air be sufficiently rapid, and that it be applied in as extensive a surface as possible to the substance to be melted. The more rapid the current it is the hotter, because it is consuming more fuel; and therefore its effect increases in a higher proportion than its rapidity. It is doubly effectual if twice as hot; and if it then be twice as rapid, there is twice the quantity of doubly hot air applied to the subject; it would therefore be four times more powerful. This is procured by raising the chimney of the furnace to a greater height. The close application of it to the subject can hardly be laid down in general terms, because it depends on the precise circumstances of each case.

Current in reverberatory furnaces.

In reverberatory furnaces, such as refining furnaces for gold, silver, and copper, the flame is made to play over the surface of the melted metal. This is produced entirely by the form of the furnace, by making the arch of the furnace as low as the circumstances of the manipulation will allow. See Furnace. Experience has pointed out in general the chief circumstances of their construction, viz. that the fuel should be at one end on a grate, through which the air enters to maintain the fire; and that the metal should be placed on a level floor between the fuel and the tall chimney which produces the current. But there is no kind of furnace more variable in its effect, and almost every place has a small peculiarity of construction, on which its preeminence is rested. This has occasioned many whimsical varieties in their form. This uncertainty seems to depend much on a circumstance rather foreign to our present purpose; but as we do not observe it taken notice of by mineralogical writers, we beg leave to mention it here. It is not heat alone that is wanted in the refining of silver by lead, for instance. We must make a continual application to its surface of air, which has not contributed to the combustion of the fuel. Any quantity of the hottest air, already saturated with the fuel, may play on the surface of the metal for ever, and keep it in the state of most perfect fusion, but without refining it in the least. Now, in the ordinary construction of a furnace, this is much the case. If the whole air has come in by the grate, and passed through the middle of the fuel, it can hardly be otherwise than nearly saturated with it; and if air be also admitted by the door, which is generally done or something equivalent, the pure air lies above the vitiated air, and during the passage along the horizontal part of the furnace, and along the surface of the metal, it still keeps above it, at least there is nothing to promote their mixture. Thus the metal does not come into contact with air fit to act on the base metal and calcine it, and the operation of refining goes on slowly. Trifling circumstances in the form of the arch or canal may tend to promote the jumbling of the airs together, and thus render the operation more expeditious; and as these are but ill understood, or perhaps this circumstance not attended to, no wonder that we see these considered as so many nostrums of great importance. It were therefore worth while to try the effect of changes in the form of the roof directed to this very circumstance. Perhaps some little prominence down from the arch of the reverberatory would have this effect, by suddenly throwing the current into confusion. If the additional length of passage do not cool the air too much, we should think that if there were interposed between the fuel and the refining floor a passsage twisted like a cork-screw, making just half a turn, it would be most effectual; for we imagine, that the two airs, keeping each to their respective sides of the passage, would by this means be turned upside down, and that the pure stratum would now be in contact with the metal, and the vitiated air would be above it.

Current in the glass-house furnaces.

The glass-house furnace exhibits the chief variety in the management of the current of heated air. In this it is necessary that the hole at which the workman dips his pipe into the pot shall be as hot as any part of the furnace. This could never be the case, if the furnace had a chimney situated in a part above the dipping-hole; for in this case cold air would immediately rush in at the hole, play over the surface of the pot, and go up the chimney. To prevent this the hole itself is made the chimney; but as this would be too short, and would produce very little current and very little heat, the whole surface is set under a tall dome. Thus the heated air from the real furnace is confined in this dome, and constitutes a high column of very light air, which will therefore rise with great force up the dome, and escape at the top. The dome is therefore the chimney, and will produce a draught or current proportioned to its height. Some are raised above a hundred feet. When all the doors of this house are shut, and thus no supply given except through the fire, the current and heat become prodigious. This, however, cannot be done, because the workmen are in this chimney, and must have respirable air. But notwithstanding this supply by the house-doors, the draught of the real furnace is vastly increased by the dome, and a heat produced sufficient for the work, and which could not have been produced without the dome.

Cotterel's improvement for melting iron from the ore.

This has been applied with great ingenuity and effect to a furnace for melting iron from the ore, and an iron finery, both without a blast. The common blast iron furnace is well known. It is a tall cone with the apex undermost. The ore and fluxes are thrown into this cone mixed intimately with the fuel till it is full, and the blast of most powerful bellows is directed into the bottom of this cone through a hole in the side. The air is thrown in with such force, that it makes its way through the mass of matter, kindles the fuel in its passage, and fluxes the materials, which then drop down into a receptacle below the blast-hole, and thus the passage for the air is kept unobstructed. It was thought impossible to produce or maintain this current without bellows; but Mr. Cotterel, an ingenious founder, tried the effect of a tall dome placed over the mouth of the furnace, and though it was not half the height of many glass-house domes it had the desired effect.

Currents of air applied to free mines, &c. of noxious air.

The last application which we shall make of the currents produced by heating the air is to the freeing mines, ships, prisons, &c. from the damp and noxious vapours which frequently infest them. As a drift or work is carried on in the mine, let a trunk of deal boards, about six or eight inches square, be laid along the bottom of the drift, communicating with a trunk carried up in the corner of one of the shafts. Let the top of this last trunk open into the ash-pit of a small furnace, having a tall chimney. Let fire be kindled in the furnace; and when it is well heated, shut the fire-place and ash-pit doors. There being no other supply for the current produced in the chimney of this furnace, the air will flow into it from the trunk, and will bring along with it all the offensive vapours. This is the most effectual method yet found out. In the same manner may trunks be conducted into the ash-pit of a furnace from the cells of a prison or the wards of an hospital.

In the account which we have been giving of the management of air in furnaces and common fires, we have frequently mentioned the immediate application of air to the burning fuel as necessary for its combustion. This is a general fact.

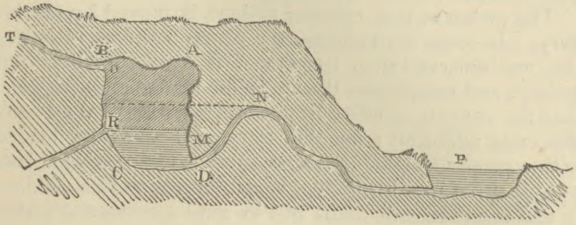
Air necessary for the combustion of fuel.

In order that any inflammable body may be readily inflamed, and its combustible matter consumed and ashes produced, it is not enough that the body be made hot. A piece of charcoal inclosed in a box of iron may be kept red hot for ever, without wasting its substance in the smallest degree. It is further necessary that it be in contact with a particular species of air, which constitutes nearly one-fourth of the air of the atmosphere, viz. the vital air or oxygen of Lavoisier. It was called empyreal air by Scheele, who first observed its indispensable use in maintaining fire; and it appears, that, in contributing to the combustion of an inflammable body, this air combines with some of its ingredients, and becomes fixed air, suffering the same change as by the breathing of animals. Combustion may therefore be considered as a union of the inflammable body with oxygen. This doctrine was first promulgated by the celebrated Dr. Hooke in his *Micrographia*, published in 1660, and afterwards improved in his *Treatise on Lamps*. It is now completely established, and considered as a new discovery. It is for this reason, that in fire-places of all kinds we have directed the construction, so as to produce a close application of the air to the fuel. It is quite needless at this day to enter into the discussions which formerly occupied philosophers about the manner in which the pressure and elasticity of the air promoted combustion. Many experiments were made in the seventeenth century by the first members of the Royal Society, to discover the office of air in combustion. It was thought that the flame was extinguished in rare air for want of a pressure to keep it together; but this did not explain its extinction when the air was not renewed. These experiments were long retained in courses of experimental philosophy, as they were judiciously styled; but they neither gave information, nor tended to the illustration of any pneumatical doctrine: they are of course omitted in this place. In short, it is now fully established, that it is not a mechanical but a chemical phenomenon. We can only inform the chemist, that a candle will consume faster in the low countries than in the elevated regions of Quito and Gondar, because the air is nearly one half denser below, and will act proportionally faster in decomposing the candle.

Curious effect of the pressure of the air.

We shall conclude this part of our subject with the explanation of a curious phenomenon observed in many places. Certain springs or fountains are observed to have periods of repletion and scantiness, or seem to ebb and flow at regular intervals; and some of these periods are of a complicated nature. Thus a well will have several returns of high and low water, the difference of which gradually increases to a maximum, and then diminishes, just as we observe in the ocean. A very ingenious and probable explanation of this has been given in No. 424 of the *Philosophical Transactions*, by Mr. Atwell.

Fig. 90.



Let ABCD (fig. 90,) represent a cavern, into which water is brought by the subterraneous passage OT. Let it have an outlet MNP, of a crooked form, with its highest part N considerably raised above the bottom of the cavern, and thence sloping downwards into lower ground, and terminating in an open well at P. Let the dimensions of this canal be such that it will discharge much more water than is supplied by TO. All this is very natural, and may be very common. The effect of this arrangement will be a remitting spring at P; for when the cavern is filled higher than the point N, the canal MNP will act as a syphon; and, by the conditions assumed, it will discharge the water faster than TO supplies it; it will therefore run it dry, and then the spring at P will cease to furnish water. After some time the cavern will again be filled up to the height N, and the flow at P will recommence.

If, besides this supply, the well P also receive water from a constant force, we shall have a reciprocating spring. The situation and dimensions of this syphon canal, and the supply of the feeder, may be such, that the efflux at P will be constant. If the supply increase in a certain degree, a reciprocation will be produced at P with very short intervals; if the supply diminishes considerably, we shall have another kind of reciprocation with great intervals and great differences of water.

If the cavern have another simple outlet R, new varieties will be produced in the spring P, and R will afford a copious spring. Let the mouth of R, by which the water enters into it from the cavern, be lower than N, and let the supply of the feeding spring be no greater than R can discharge, we shall have a constant spring from R, and P will give no water. But suppose that the main feeder increases in winter or in rainy seasons, but not so much as will supply both P and R, the cavern will fill till the water gets over N, and R will be running all the while; but soon after P has begun to flow, and the water in the cavern sinks below R, the stream from R will stop. The cavern will be emptied by the syphon canal MNP, and then P will stop. The cavern will then begin to fill, and when near full R will give a little water, and soon after P will run and R stop as before, &c. Desaguliers shows (vol. ii. p. 177, &c.) in what manner a prodigious variety of periodical ebbs and flows may be produced by underground canals, which are extremely simple and probable.

Account of some pneumatic engines.

We shall conclude this article with the descriptions of some pneumatical machines or engines which have not been particularly noticed under their names in the former volumes of this work.

Bellows are of most extensive and important use; and it will be of service to describe such as are of uncommon construction and power, sufficient for the great operations in metallurgy.

It is not the impulsive force of the blast that is wanted in most cases, but merely the copious supply of air, to produce the rapid combustion of inflammable matter; and the service would be better performed in general if this could be done with moderate velocities, and an extended surface. What are called air-furnaces, where a considerable surface of inflammable matter is acted on at once by the current which the mere heat of the expended air has produced, are found more operative in proportion to the air expended than blast furnaces animated by bellows; and we doubt not but that the method proposed by Mr. Cotterel, which we have already mentioned, of increasing this current in a melting furnace by means of a dome, will in time supersede the blast furnaces. There is indeed a great impulsive force required in some cases; as for blowing off the scoriæ from the surface of silver or copper in refining furnaces, or for keeping a clear passage for the air in the great iron furnace.

In general, however, we cannot procure this abundant supply of air any other way than by giving it a great velocity by means of a great pressure, so that the general construction of bellows is pretty much the same in all kinds.

The air is admitted into a very large cavity, and then expelled from it through a small hole.

The furnaces at the mines having been greatly enlarged, it was necessary to enlarge the bellows also; and the leathern bellows becoming exceedingly expensive, wooden ones were substituted in Germany about the beginning of the seventeenth century, and from them became general throughout Europe. They consist of a wooden box ABCPFE, fig. 91, which has its top and two sides flat or straight, and the end BAE formed into an arched or cylindrical surface, of which the line FP at the other end is the axis. This box is open below, and receives within it the shallow box KHGNML, fig. 92, which exactly fills it. The line FP of the one coincides with FM of the other, and along this line is a set of hinges on which the upper box turns as it rises and sinks. The lower box is made fast to a frame fixed in the ground. A pipe OQ proceeds from the end of it, and terminates at the furnace, where it ends in a small pipe called the *tewer* or *tuyere*. This lower box is open above, and has in its bottom two large valves V, V, fig. 93, opening inwards. The conducting pipe is sometimes furnished with a valve opening outwards, to prevent burning coals from being sucked into the bellows when the upper box is drawn up. The joint along PF is made tight by thin leather nailed along it. The sides and ends of the fixed box are made to fit the sides and curved end of the upper box, so that this last can be raised and lowered round the point FP without sensible friction, and yet without suffering much air to escape; but as this would not be sufficiently air-tight by reason of the shrinking and warping of the wood, a farther contrivance is adopted. A slender lath of wood, divided into several joints, and covered on the outer edge with very soft leather, is laid along the upper edges of the sides and ends of the lower box. This lath is so broad, that when its inner edge is even with the inside of the box, its outer edge projects about an inch. It is kept in this position by a number of steel wires, which are driven into the bottom of the box, and stand up touching the sides, as represented in fig. 94, where *a b c* are the wires, and *e* the lath, projecting over the outside of the box. By this contrivance the laths are pressed close to the sides and curved end of the moveable box, and the spring wires yield to all their inequalities. A bar of wood RS, fig. 91, is fixed to the upper board, by which it is either raised by machinery, to sink again by its own weight, having an additional load laid on it, or it is forced downward by a crank or wiper of the machinery, and afterwards raised.

Fig. 91.

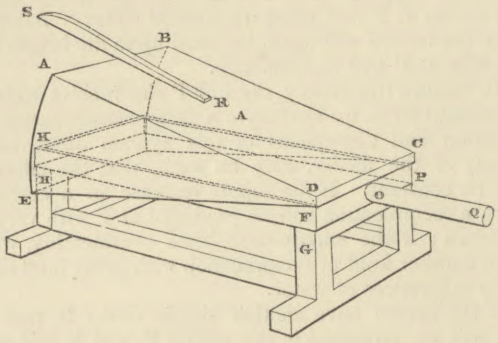


Fig. 92.

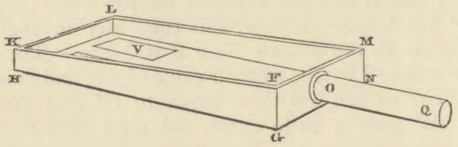


Fig. 93.

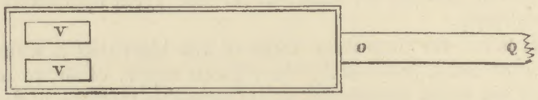
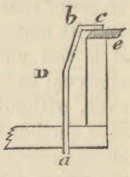


Fig. 94.



The operation here is precisely similar to that of blowing with a chamber-bellows. When the board is lifted up, the air enters by the valves V, V, fig. 93, and is expelled at the pipe OQ by depressing the boards. There is therefore no occasion to insist on this point.

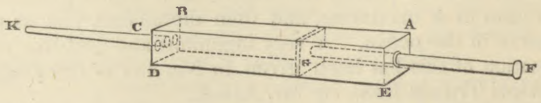
These bellows are made of a very great size, AD being 16 feet, AB five feet, and the circular end AE also five feet. The rise, however, is but about 3 or $3\frac{1}{2}$ feet. They expel at each stroke about 90 cubic feet of air, and they make about 8 strokes per minute.

Such are the bellows in general use on the continent. We have adopted a different form in this kingdom, which seems much preferable. We use an iron or wooden cylinder, with a piston sliding along it. This may be made with much greater accuracy than the wooden boxes, at less expense, if of wood, because it may be of cooper's work, held together by hoops; but the great advantage of this form is its being more easily made air-tight. The piston is surrounded with a broad strap of thick and soft leather, and it has around its edge a deep groove, in which is lodged a quantity of wool. This is called the packing or stuffing, and keeps the leather very closely applied to the inner surface of the cylinder. Iron cylinders may be very neatly bored and smoothed, so that the piston, even when very tight, will slide along it very smoothly. To promote this, a quantity of black lead is ground very fine with water, and a little of this is smeared on the inside of the cylinder from time to time.

The cylinder has a large valve, or sometimes two, in the bottom, by which the atmospheric air enters when the piston is drawn up. When the piston is thrust down, this air is expelled along a pipe of great diameter, which terminates in the furnace with a small orifice.

This is the simplest form of bellows which can be conceived. It differs in nothing but size from the bellows used by the rudest nations. The Chinese smiths have a bellows very similar, being a square pipe of wood ABCDE, fig. 95, with a square board G which exactly fits it, moved by the handle FG. At the farther end is the blast pipe CK, and on each side of it a valve in the end of the square pipe, opening inwards. The piston is sufficiently tight for their purposes without any leathering.

Fig. 95.

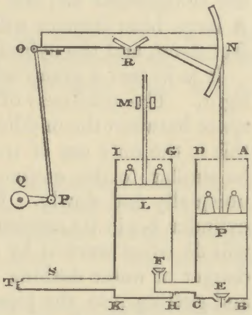


The piston of this cylinder bellows is moved by machinery. In some blast engines the piston is simply raised by the machine, and then let go, and it descends by its own weight, and compresses the air below it to such a degree, that the velocity of efflux becomes constant, and the piston descends uniformly; for this purpose it must be loaded with a proper weight. This produces a very uniform blast, except at the very beginning, whilst the piston falls suddenly and compresses the air; but in most engines the piston rod is forced down the cylinder with a determined motion, by means of a beam, crank, or other contrivance. This gives a more unequal blast, because the motion of the piston is necessarily slow in the beginning and end of the stroke, and quicker in the middle.

But in all it is plain that the blast must be desultory. It ceases while the piston is rising; for this reason it is usual to have two cylinders, as it was formerly usual to have two bellows which worked alternately. Sometimes three or four are used, as at the Carron iron-works. This makes a blast abundantly uniform.

But an uniform blast may be made with a single cylinder, by making it deliver its air into another cylinder, which has a piston exactly fitted to its bore, and loaded with a sufficient weight. The blowing cylinder ABCD, fig. 96, has its piston P worked by a rod NP, connected by double chains with the arched head of the working beam NO, moving round a gudgeon at R. The other end O of this beam is connected by the rod OP, with the crank PQ of a wheel machine; or it may be connected with a piston of a steam-engine, &c. &c. The blowing cylinder has a valve or valves E in its bottom, opening inwards. There proceeds from it a large pipe CF, which enters the regulating cylinder GHKI, and has a valve at top to prevent the air from getting back into the blowing cylinder. It is evident that the air forced into this cylinder must raise its piston L, and that it must afterwards descend, while the other piston is rising. It must descend uniformly, and make a perfectly equable blast.

Fig. 96.



Observe, that if the piston L be at the bottom when the machine begins to work, it will be at the bottom at the end of every stroke if the *tuyere* T emits as much air as the cylinder ABCD furnishes; nay, it will lie a while at the bottom, for, while it was rising, air was issuing through T. This would make an interrupted blast. To prevent this, the orifice T must be lessened; but then there will be a surplus of air at the end of each stroke, and the piston L will rise continually, and at last get to the top, and allow air to escape. It is just possible to adjust circumstances, so that neither shall happen. This is done easier by putting a stop in the way of the piston, and putting a valve on the piston, or on the conducting pipe KST, loaded with a weight a little superior to the intended elasticity of the air in the cylinder. Therefore, when the piston is prevented by the stop from rising, the snifting valve, as it is called, is forced open, the superfluous air escapes, and the blast preserves its uniformity.

It may be of use to give the dimensions of a machine of this kind, which worked for many years at a very great furnace, and given satisfaction.

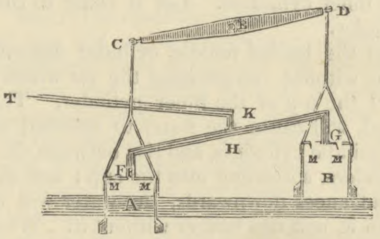
The diameter of the blowing cylinder is 5 feet, and the length of the stroke is 6. Its piston is loaded with $3\frac{1}{2}$ tons. It is worked by a steam-engine whose clyinder is 3 feet 4 inches wide, with a six-feet stroke. The regulating cylinder is 8 feet wide, and its piston is loaded with $8\frac{1}{2}$ tons, making about 2.63 pounds on the square inch; and it is very nearly in equilibrio with the load on the piston of the blowing cylinder. The conducting pipe KST is 12 inches in diameter, and the orifice of the tuyere was $\frac{5}{8}$ths of an inch when the engine was erected, but it has gradually enlarged by reason of the intense heat to which it is exposed. The snifting valve is loaded with 3 pounds on the square inch.

When the engine worked briskly, it made 18 strokes per minute, and there was always much air discharged by the snifting valve. When the engine made 15 strokes per minute, the snifting valve opened but seldom, so that things were nearly adjusted to this supply. Each stroke of the blowing cylinder sent in 118 cubic feet of common air. The ordinary pressure of the air being supposed $14\frac{3}{4}$ pounds on an inch, the density of the air in the regulating cylinder must be $\frac{14.75+2.63}{14.75}$, $=1.1783$, the natural density being 1.

This machine gives an opportunity of comparing the expense of air with the theory. It must, at the rate of 15 strokes, expel 30 cubic feet of air in a second through a hole of $1\frac{5}{8}$ inches in diameter. This gives a velocity of near 2000 feet per second, and of more than 1600 feet for the condensed air. This is vastly greater than the theory can give, or is indeed possible; for air does not rush into a void with so great velocity. It shows with great evidence, that a vast quantity of air must escape round the two pistons. Their united circumferences amount to above 40 feet, and they move in a dry cylinder. It is impossible to prevent a very great loss. Accordingly, a candle held near the edge of the piston L has its flame very much disturbed. This case, therefore, gives no hold for a calculation; and it suggests the propriety of attempting to diminish this great waste.

This has been very ingeniously done, in part at least, at some other furnaces. At a certain foundery, near Glasgow, the blowing cylinder, also worked by a steam-engine, delivers its air into a chest without a bottom, which is immersed in a large cistern of water, and supported at a small height from the bottom of the cistern, and has a pipe from its top leading to the tuyere. The water stands about five feet above the lower brim of the regulating air-chest, and by its pressure gives the most perfect uniformity of blast, without allowing a particle of air to get off by any other passage besides the tuyere. This is a very effectual regulator, and must produce a great saving of power, because a smaller blowing cylinder will thus supply the blast. We must observe, that the loss round the piston of the blowing cylinder remains undiminished.

Fig. 97.



A blowing machine was erected many years ago at Chastillon in France on a principle considerably different, and which must be perfectly air-tight throughout. Two cylinders A, B, (fig. 97) loaded with great weights, were suspended at the ends of the lever CD, moving round the gudgeon E. From the top F, G of each there was a large flexible pipe which united in H, from whence a pipe KT led to the tuyere T. There were valves at F and G opening outwards, or into the flexible pipes; and other valves M, M, adjoining to them in the top of each cylinder, opening inwards, but kept shut by a slight spring. Motion was given to the lever by a machine. The operation of this blowing machine is evident. When the cylinder A was pulled down, or allowed to descend, the water, entering at its bottom, compressed the air, and forced it along the passage FHKT. In the mean time, the cylinder B was rising, and the air entered by the valve M. We see that the blast will be very unequal, increasing as the cylinder is immersed deeper. It is needless to describe this machine more particularly, because we shall give an account of one which we think per-

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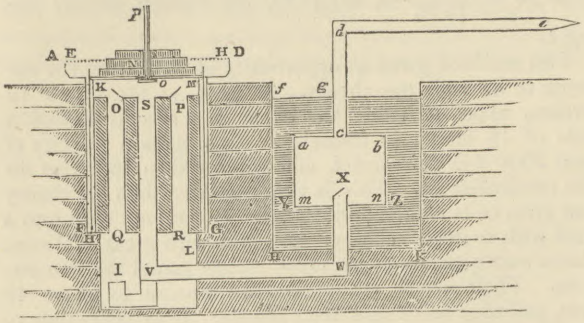
fect in its kind, and which leaves hardly any thing to be desired in a machine of this sort.

ABCD (fig. 98) is an iron cylinder, truly bored within, and evasated a-top like a cup. EFGH is another, truly turned both without and within, and a small matter less than the inner diameter of the first cylinder. This cylinder is close above and hangs from the end of a lever moved by a machine. It is also loaded with weights at N. KILM is a third cylinder, whose outside diameter is somewhat less than the inside diameter of the second. This inner cylinder is fixed to the same bottom with the outer cylinder. The middle cylinder is loose, and can move up and down between the outer and inner cylinders without rubbing on either of them. The inner cylinder is perforated from top to bottom by three pipes OQ, SV, PR. The pipes OQ, PR have valves at their upper ends O, P, and communicate with the external air below. The pipe SV has a horizontal part VW, which again turns upwards, and has a valve at top X. This upright part WX is in the middle of a cistern of water *fhkg*. Into this cistern is fixed an air-chest *a* YZ *b*, open below, and having at top a pipe *cde* terminating in the tuyere at the furnace.

Fig. 98.



When the machine is at rest, the valves X, O, P, are shut by their own weights, and the air-chest is full of water. When things are in this state, the middle cylinder EFGH is drawn up by the machinery till its lower brims F and G are equal with the top KM of the inner cylinder. Now pour in water or oil between the outer and middle cylinders; and it will run down and fill the space between the outer and inner cylinders. Let it come to the top of the inner cylinder.

Now, let the loaded middle cylinder descend. It cannot do this without compressing the air which is between its top and the top of the inner cylinder. This air being compressed, will cause the water to descend between the inner and middle cylinders, and rise between the middle and outer cylinders, spreading into the cup; and as the middle cylinder advances downwards, the water will descend farther within it, and rise farther without it. When it has got so far down, and the air has been so much compressed, that the difference between the surface of the water on the inside and outside of this cylinder is greater than the depth of water between X and the surface of the water *fg*, air will go out by the pipe SVW, and will lodge in the air-chest, and will remain there if *c* be shut, which we shall suppose for the present. Pushing down the middle cylinder till the partition touch the top of the inner cylinder, all the air which was formerly between them will be forced into the air-chest, and will drive out water from it. Draw up the middle cylinder, and the external air will open the valves O, P, and again fill the space between the middle and inner cylinders; for the valve X will shut, and prevent the regress of the condensed air. By pushing down the middle cylinder a second time, more air will be forced into the air-chest, and it will at last escape by getting out between its brims Y, Z, and the bottom of the cistern; or if we open the passage *c*, it will pass along the conduit *c d e* to the tuyere, and form a blast.

The operation of this machine is similar to Mr. Haskins's quicksilver pump, described by Desaguliers.[1] The force which condenses the air is the load on the middle cylinder. The use of the water between the inner and outer cylinders, is to prevent this air from escaping; and the inner cylinder thus performs the office of a piston, having no friction. It is necessary that the length of the outer and middle cylinders be greater than the depth of the regulator-cistern, that there may be a sufficient height for the water to rise between the middle and outer cylinders, to balance the compressed air, and oblige it to go into the air-chest. A large blast-furnace will require the regulator-cistern five feet deep, and the cylinders about six or seven feet long.

It is in fact a pump without friction, and is perfectly air-tight. The quickness of its operation depends on the small space between the middle cylinder and the two others; and this is the only use of these two. Without these it would be similar to the engine at Chastillon, and operate more unequally and slowly. Its only imperfection is, that if the cylinder begin its motion of ascent or descent rapidly, as it will do when worked by a steam engine, there will be some danger of water dashing over the top of the inner cylinder, and getting into the pipe SV; but should this happen, an issue can easily be contrived for it at V, covered with a loaded valve *v*. This will never happen if the cylinder is moved by a crank. One blowing cylinder only is represented here, but two may be used.

We do not hesitate in recommending this form of bellows as the most perfect of any, and fit for all uses where standing bellows are required. They will be cheaper than any other sort for common purposes. For a common smith's forge they may be made with square wooden boxes instead of cylinders. They are also easily repaired. They are perfectly tight; and they may be made with a blast almost perfectly uniform, by making the cistern in which the air-chest stands, of considerable dimensions. When this is the case, the height of water, which regulates the blast, will vary very little.

This may suffice for an account of blast machines. The leading parts of their construction have been described as far only as was necessary for understanding their operation, and enabling an engineer to erect them in the most commodious manner. Views of complete machines might have amused, but they would not have added to our reader's information.

But the account is imperfect unless we show how their parts may be so proportioned that they shall perform what is expected from them. The engineer should know what size of bellows, and what load on the board or piston, and what size of tuyere, will give the blast which the service requires, and what force must be employed to give them the necessary degree of motion. We shall accomplish these purposes by considering the efflux of the compressed air through the tuyere. The propositions formerly delivered will enable us to ascertain this.

That we may proportion everything to the power employed, we must recollect, that if the piston of a cylinder employed for expelling air, be pressed down with any force p, it must be considered as superadded to the atmospheric pressure P on the same piston, in order that we may compare the velocity v of efflux with the known velocity V with which air rushes into a void. By what has been formerly delivered, it appears that this velocity $v = V \times \sqrt{\frac{p}{P+p}}$, where P is the pressure of the atmosphere on the piston, and p the additional load laid on it. This velocity is expressed in feet per second; and, when multiplied by the area of the orifice (also expressed in square feet) it will give us the cubical feet of condensed air expelled in a second; but the bellows are always to be filled again with common air, and therefore we want to know the quantity of common air which will be expelled; for it is this which determines the number of strokes which must be made in a minute, in order that the proper supply may be obtained. Therefore recollect that the quantity expelled from a given orifice with a given velocity, is in the proportion of the density; and that when D is the density of common air produced by the pressure P, the density d produced by the pressure $P+p$, is $D \times \frac{P+p}{P}$; or if D be made 1, we have $d = \frac{P+p}{P}$.

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[1] *Experimental Philosophy*, vol. ii. p. 491; and *Philosophical Transactions*, 1728, vol. xxxii. p. 5.

Therefore, calling the area of the orifice expressed in square feet O, and the quantity of common air, or the cubic feet expelled in a second Q, we have $Q = V \times O \times \sqrt{\frac{p}{P+p}} \times \frac{P+q}{P}$.

It will be sufficiently exact for all practical purposes, to suppose P to be 15 pounds on every square inch of the piston; and p is then conveniently expressed by the pounds of additional load on every square inch. We may also take $V = 1332$ feet.

As the orifice through which the air is expelled is generally very small, never exceeding three inches in diameter, it will be more convenient to express it in square inches; which being the $\frac{1}{144}$th of a square foot, we shall have the cubic feet of common air expelled in a second, or $Q = \frac{1332}{144} O \sqrt{\frac{p}{P+p}} \times \frac{P+p}{P}, = O \times 9{\cdot}25 \times \sqrt{\frac{p}{P+p}} \times \frac{P+p}{P}$; and this seems to be as simple an expression as we can obtain.

This will perhaps be illustrated by taking an example in numbers. Let the area of the piston be four square feet, and the area of the round hole through which the air is expelled, be two inches, its diameter being 1.6, and let the load on the piston be 1728 pounds; this is three pounds on every square inch. We have $P=15$, $p=3$, $P+p=18$, and $O=2$; therefore we will have $Q = 2 \times 9.25 \times \sqrt{\frac{3}{18}} \times \frac{18}{15}, = 9.053$ cubic feet of common air expelled in a second. This will however be diminished at least one-third by the contraction of the jet; and therefore the supply will not exceed six cubic feet per second. Supposing therefore that this blowing machine is a cylinder or prism of this dimension in its section, the piston so loaded would, after having compressed the air, descend about 15 inches in a second. It would first sink one-fifth of the whole length of the cylinder pretty suddenly, till it had reduced the air to the density $\frac{18}{15}$, and would then descend uniformly at the above rate, expelling six cubic feet of common air in a second.

The computation is made much in the same way for bellows of the common form, with this additional circumstance, that as the loaded board moves round a hinge at one end, the pressure of the load must be calculated accordingly. The computation, however, becomes a little intricate, when the form of the loaded board is not rectangular. It is almost useless when the bellows have flexible sides, either like smith's bellows or like organ bellows, because the change of figure during their motion makes continual variation on the compressing powers. It is therefore chiefly with respect to the great wooden bellows, of which the upper board slides down between the sides, that the above calculation is of service.

The propriety, however, of this piece of information is evident: we do not know precisely the quantity of air necessary for animating a furnace; but this calculation tells us what force must be employed for expelling the air that may be thought necessary. If we have fixed on the strength of the blast, and the diameter of the cylinder, we learn the weight with which the piston must be loaded; the length of the cylinder determines its capacity, the above calculation tells the expense per second; hence we have the time of the piston's coming to the bottom. This gives us the number of strokes per minute. The load must be lifted up by the machine this number of times, making the time of ascent precisely equal to that of descent; otherwise the machine will either catch and stop the descent of the piston, or allow it to lie inactive for a while of each stroke. These circumstances determine the labour to be performed by the machine, and it must be constructed accordingly. Thus the engineer will not be affronted by its failure, nor will he expend needless power and cost.

In machines which force the piston or bellows board with a certain determined motion, different from what arises from their own weight, the computation is extremely intricate. When a piston moves by a crank, its motion at the beginning and end of each stroke is slow, and the compression and efflux is continually changing. We can however approximate to a statement of the force required.

Every time the piston is drawn up, a certain space of the cylinder is filled again with air of the common density; and this is expelled during the descent of the piston. A certain number of cubic feet of common air is therefore expelled with a velocity which perhaps continually varies; but there is a medium velocity with which it might have been uniformly expelled, and a pressure corresponding to this velocity. To find this, divide the area of the piston by the area of the blast-hole (or rather by this area multiplied by 0·613, in order to take in the effect of the contracted jet), and multiply the length of the stroke performed in a second by the quotient arising from this division; the product is the medium velocity of the air (of the natural density). Then find by calculation the height through which a heavy body must fall in order to acquire this velocity; this is the height of a column of homogeneous air which would expel it with this velocity. The weight of this column is the least force that can be exerted by the engine: but this force is too small to overcome the resistance in the middle of the stroke, and it is too great even for the end of the stroke, and much too great for the beginning of it. But if the machine is turned by a very heavy water-wheel, this will act as a regulator, accumulating in itself the superfluous force during the too favourable positions of the crank, and exerting it by its *vis insita* during the time of greatest effort. A force not greatly exceeding the weight of this column of air will therefore suffice. On the other hand, if the strength of the blast be determined, which is the general state of the problem, this determines the degree of condensation of the air, and the load on the square inch of the piston, or the mean force which the machine must exert on it. A table, which will be given presently, determines the cubic feet of common air expelled in a second, corresponding to this load. This combined with the proposed dimensions of the cylinder, will give the descent of the piston or the length of the stroke.

These general observations apply to all forms of bellows; and without a knowledge of them no person can erect a machine for working them without total uncertainty or servile imitation. In order, therefore, that they may be useful to such as are not accustomed to the management of even these simple formulæ, we insert the following short table of the velocity and quantity of air discharged from a cylinder whose piston is loaded with the pounds contained in the first column on every square inch. The second column contains the velocity with which the *condensed air*

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rushes out through any *small* hole; and the third column is the cubic feet discharged from a hole whose area is a square inch; column fourth contains the mean velocity of air of the common density; and column fifth is the cubic feet of common air discharged; the sixth column is the height in inches at which the force of the blast would support a column of water if a pipe were inserted into the side of the cylinder. This is an extremely proper addition to such machines, showing at all times the power of the machines, and teaching us what intensity of blast is employed for different purposes. The table is computed from the supposition that the ordinary pressure of the air is 15 pounds on a square inch. This is somewhat too great, and therefore the velocities are a little too small; but the quantities discharged will be found about one-third too great, without affecting the velocities, on account of the convergency of the stream.

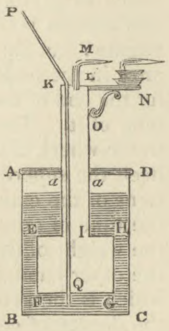
I	II	III	IV	V	VI
½	239	1·66	249	1·72	14
1	333	2·32	355	2·47	27
1½	404	2·79	437	3·05	40
2	457	3·17	518	3·60	54
2½	500	3·48	584	4·2	68
3	544	3·76	653	4·53	82
3½	582	4·03	715	4·98	95
4	611	4·24	774	5·38	109
4½	642	4·46	822	5·75	122
5	666	4·67	888	6·17	136
5½	693	4·84	950	6·49	150
6	711	5·06	997	6·92	163

This table extends far beyond the limits of ordinary use, very few blast-furnaces having a force exceeding 60 inches of water.

We shall conclude this account of blowing machines with a description of a small one for a blow-pipe. ABCD, (fig. 99) is a vessel containing water, about two feet deep. EFGH is the air-box of the blower open below, and having a pipe ILK rising up from it to a convenient height; an arm ON which grasps this pipe carries the lamp N: the blow-pipe LM comes from the top of the upright pipe. PKQ is the feeding-pipe reaching near to the bottom of the vessel.

Water being poured into the vessel below, and its cover being put on, which fits the upright pipe, and touches two studs *a*, *a*, projecting from it, blow in a quantity of air by the feeding pipe PQ; this expels the water from the air-box, and occasions a pressure which produces the blast through the blow-pipe M.

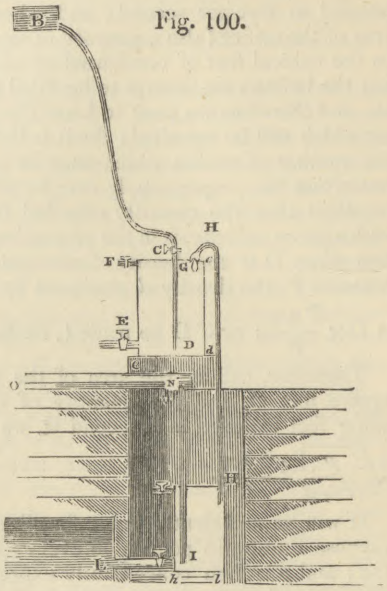
Fig. 99.



In a preceding part of this article, we mentioned an application which has been made of Hero's fountain, at Chemnitz in Hungary, for raising water from the bottom of a mine. We shall now give an account of this very ingenious contrivance.

In fig. 100, B represents the source of water elevated above the mouth of the pit 136 feet. From this there is led a pipe BCD, four inches diameter. This pipe enters the top of a copper cylinder *c d e*, 8½ feet high, five feet diameter, and two inches thick, and it reaches to within four inches of the bottom; it has a cock at C. This cylinder has a cock at F, and a very large one at E. From the top CF proceeds a pipe GHH′ two inches in diameter, which goes down the pit 96 feet, and is inserted into the top of another brass cylinder *fghi*, which is 6½ feet high, four feet diameter, and two inches thick, containing 83 cubic feet, which is very nearly one-half of the capacity of the other, viz. of 170 cubic feet. There is another pipe NI of four inches diameter, which rises from within four inches of the bottom of this lower cylinder, is soldered into its top, and rises to the trough NO, which carries off the water from the mouth of the pit. This lower cylinder communicates at the bottom with the water L which collects in the drains of the mine. A large cock K serves to admit or exclude this water; another cock M, at the top of this cylinder, communicates with the external air.

Fig. 100.



Now, suppose the cock C shut, and all the rest open; the upper cylinder will contain air, and the lower cylinder will be filled with water, because it is sunk so deep that its top is below the usual surface of the mine-waters. Now, shut the cocks F, E, M, K, and open the cock C. The water of the source B must run in by the orifice D, and rise in the upper cylinder, compressing the air above it and along the pipe GHH′, and thus acting on the surface of the water in the lower cylinder. It will therefore cause it to rise gradually in the pipe IN, where it will always be of such a height that its weight balances the elasticity of the compressed air. Suppose no issue given to the air from the upper cylinder, it would be compressed into one-fifth of its bulk by the column of 136 feet high; for a column of 34 feet nearly balances the ordinary elasticity of the air. Therefore, when there is an issue given to it through the pipe GHH′, it will drive the compressed air along this pipe, and it will expel water from the lower cylinder. When the upper cylinder is full of water, there will be 34 cubic feet of water expelled from the lower cylinder. If the pipe IN had been more than 136 feet long, the water would have risen 136 feet, being then in equilibrio with the water in the feeding pipe BCD, by the intervention of the elastic air; but no more water would have been expelled from the lower cylinder than what fills this pipe. But the pipe being only 96 feet high, the water will be thrown out at N with a very great velocity. If it were not for the great obstructions which water and air must meet with in their passage along pipes, it would issue at N with a velocity of more than 50 feet per second. It issues much more slowly, and at last the upper cylinder is full of water, and the water would enter the pipe GH and enter the lower cylinder, and without displacing the air in it, would rise through the discharging pipe IN, and run off to waste. To prevent this there hangs in the pipe HG a cork ball or double cone, by a brass wire which is guided by holes in two cross pieces in the pipe HG. When the upper cylinder is filled with water, this cork plugs up the orifice G, and no water is wasted; the influx at D now stops. But the lower cylinder contains compressed air, which would balance water in a discharging pipe 136 feet high, whereas IN is only 96. Therefore the water will continue to flow at N till the air has so far expanded as to balance only 96 feet of water, that is, till it occupies one-fourth of its ordinary bulk, that is, one-fourth of the capacity of the upper cylinder, or 42½ cubic feet. Therefore 42½ cubic feet will be expelled, and

Pneumatic engines.

the efflux at N will cease; and the lower cylinder is about one-half full of water. When the attending workman observes this, he shuts the cock C. He might have done this before, had he known when the orifice G was stopped; but no loss ensues from the delay. At the same time the attendant opens the cock E, the water issues with great violence, being pressed by the condensed air from the lower cylinder. It therefore issues with the sum of its own weight and of this compression. These gradually decrease together, by the efflux of the water and the expansion of the air; but this efflux stops before all the water has flowed out; for there is 42½ feet of the lower cylinder occupied by air. This quantity of water remains, therefore, in the upper cylinder nearly; the workman knows this, because the discharged water is received first of all into a vessel containing three-fourths of the capacity of the upper cylinder. Whenever this is filled, the attendant opens the cock E by a long rod which goes down the shaft; this allows the water of the mine to fill the lower cylinder, allows the air to get into the upper cylinder, and this allows the remaining water to run out of it. And thus every thing is brought into its first condition; and when the attendant sees no more water come out at E, he shuts the cock E and M, and opens the cock C, and the operation is repeated.

There is a very surprising appearance in the working of this engine. When the efflux at N has stopped, if the cock F be opened, the water and air rush out together with prodigious violence, and the drops of water are changed into hail or lumps of ice. It is a sight usually shown to strangers, who are desired to hold their hats to receive the blast of air: the ice comes out with such violence as frequently to pierce the hat like a pistol bullet. This rapid congelation is a remarkable instance of the general fact, that air by suddenly expanding, generates cold, its capacity for heat being increased. Thus the peasant cools his broth by blowing over the spoon, even from warm lungs; a stream of air from a pipe is always cooling.

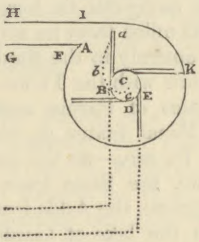
The above account of the procedure in working this engine shows that the efflux both at N and E becomes very slow near the end. It is found convenient therefore not to wait for the complete discharges, but to turn the cocks when about 30 cubic feet of water have been discharged at N: more work is done in this way. A gentleman of great accuracy and knowledge of these subjects took the trouble, at our desire, of noticing particularly the performance of the machine. He observed that each stroke, as it may be called, took up about three minutes and one-eighth; and that 32 cubic feet of water were discharged at N, and 66 were expended at E. The expense, therefore, is 66 feet of water falling 136 feet, and the performance is 32 raised 96, and they are in the proportion of 66×136 to 32×96, or of 1 to 0·3422, or nearly as 3 to 1. This is superior to the performance of the most perfect undershot mill, even when all friction and irregular obstructions are neglected, and is not much inferior to any overshot pump-mill that has yet been erected. When we reflect on the great obstructions which water meets with in its passage through long pipes, we may be assured that, by doubling the size of the feeder and discharger, the performance of the machine will be greatly improved; we do not hesitate to say, that it would be increased one-third: it is true that it will expend more water, but this will not be nearly in the same proportion, for most of the deficiency of the machine arises from the needless velocity of the first efflux at N. The discharging pipe ought to be 110 feet high, and not give sensibly less water. Then it must be considered how inferior in original expense this simple machine must be to a mill of any kind which would raise 10 cubic feet 96 feet high in a minute, and how small the repairs on it need be, when compared with a mill. And, lastly, let it be noticed, that such a machine can be used where no mill whatever can be put in motion. A small stream of water, which would not move any kind of wheel, will here raise one-third of its own quantity to the same height, working as fast as it is supplied.

For all these reasons, we think that the Hungarian machine eminently deserves the attention of mathematicians and engineers, to bring it to its utmost perfection, and into general use. There are situations where this kind of machine may be very useful. Thus, where the tide rises 17 feet, it may be used for compressing air to seven-eighths of its bulk; and a pipe leading from a very large vessel inverted in it, may be used for raising the water from a vessel of one-eighth of its capacity 17 feet high; or if this vessel has only one-tenth of the capacity of the large one set in the tide-way, two pipes may be led from it, one into the small vessel and the other into an equal vessel 16 feet higher, which receives the water from the first. Thus one-sixteenth of the water may be raised 34 feet, and a smaller quantity to a still greater height, and this with a kind of power that can hardly be applied in any other way. Machines of this kind are described by Schottus, Sturmius, Leupold, and other old writers; and they should not be forgotten, because opportunities may offer of making them highly useful. A gentleman's house in the country may thus be supplied with water by a machine that will cost little, and hardly go out of repair.

The last pneumatical engine which we shall speak of at present is the common fanners, used for winnowing grain, and for drawing air out of a room; and we have but few observations to make on them.

The wings of the fanners are enclosed in a cylinder or drum, whose circular sides have a large opening BDE, (fig. 101), round the centre, to admit the air. By turning the wings rapidly round, the air is hurried round along with them, and thus acquires a centrifugal tendency, by which it presses strongly on the outer rim of the drum: this is gradually detached from the circle as at KI, and terminated in a trunk IHGF, which goes off in a tangential direction; the air therefore is driven along this passage.

Fig. 101.



If the wings were disposed in planes passing through the axis C, the compression of the air by the anterior surface would give it some tendency to escape in every direction, and would obstruct in some degree the arrival of more air through the side holes. They are therefore reclined a little backward, as represented in the figure. It may be shown that their best form would be that of a hyperbolic spiral *a b c*; but the straight form approaches sufficiently near to the most perfect shape.

Much labour is lost, however, in carrying the air round those parts of the drum where it cannot escape. The fanners would either draw or discharge almost twice as much air if an opening were made all round one side. This could be gradually contracted, where required for winnowing, by a surrounding cone, and thus directed against the falling grain; as has been verified by actual trial. When used for drawing air out of a room for ventilation, it would be much better to remove the outer side of the drum entirely, and let the air fly freely off on all sides; but the flat sides are necessary, in order to prevent the air from arriving at the fanners any other way but through the central holes, to which trunks should be fitted leading to the apartment which is to be ventilated.

(J. R.)

PO, the largest river in Italy, called by the ancients *Padus* or *Eridanus*, rises on the E. side of Monte Viso, one of the highest summits of the Alps, between Italy and France; N. Lat. 44. 40., E. Long. 7. At first a mere mountain torrent, it flows eastward down the deep Val d'Oro; and being augmented by other streams like itself, turns to the left, and sweeps round the northern edge of the Monferrato hills. After describing nearly a semicircle, it emerges at Valenza into the broad plain of Lombardy, through which it flows eastward to the Adriatic, fed by the rivers that flow on the one side from the Alps and on the other from the Apennines. Its great volume, supplied from the everlasting snows of the Alps, renders the country liable to those destructive floods which have furnished the Latin poets with some of their finest comparisons. From Piacenza downwards, the river is confined by artificial embankments of very ancient origin; but these do not always prevent the danger. The constant deposits of soil tend to raise the bed of the stream above the surrounding country, so that at Ferrara the Po is on a level with the tops of the houses. For the last 200 miles of its course the breadth of the river varies from 400 to 600 yards, and the depth from 2 to 6 fathoms. Near its mouth it divides itself into two arms, each falling into the sea by several mouths, one belonging to each arm being accessible to small ships. Formerly the Po followed a different course to the sea, south of Ferrara, and its old channel is now filled partly by canals from the main river, and partly by the Reno from the Apennines. Considerable changes seem to have taken place on the coast-line, from the gradual deposit of sand and mud by the river; and indeed the whole lower part of the Lombard plain seems to have been gradually formed in this way. But these processes must have been accomplished for the most part ages before the historic period. The whole length of the Po is estimated at 420 miles; and it is navigable for barges and river steamers to a distance of 60 miles from its source. The upper part of its course lies entirely in the Sardinian territories; but after its confluence with the Ticino it separates Austrian Italy from the duchies of Parma and Modena on the north, and from the Papal States on the south. The principal affluents of the Po are,—on the north, the Dora Baltea from Mont Blanc, the Sesia from Monte Rosa, the Ticino from lake Maggiore, the Adda from the lake of Como, and the Mincio from the lake of Garda; and on the south, the Tanaro in Piedmont, the Trebbia and Taro in Parma, and the Secchia in Modena. The Po abounds in fish of various kinds, especially shad, salmon, and sturgeon. It imparts great fertility to the adjacent country. The free navigation of the Po is secured by a treaty concluded between Austria, Parma, and Modena in July 1850.

POCHETTI. See BARBATELLI.

POCKLINGTON, a town of England, in the E. Riding of Yorkshire, 12 miles E.S.E. of York, and 212 N. by W. of London. It stands in a flat region, near the western edge of the Yorkshire wolds, and is a pretty, well-built town, with a convenient market-place. Near the centre stands the plain old church, in the form of a cross, with a fine tower rising from its W. end. The town has churches for Dissenters, several schools, a literary institute, and a temperance hall. There are no manufactures here, the people being mostly engaged in farming; but some trade is carried on in cattle, corn, flour, timber, coal, &c. Pop. (1851) 2546.

POCOCK, **EDWARD**, a learned English divine, and the first oriental scholar of his time, was the eldest son of Edward Pocock, and born in November 1604, at Oxford, where he was also educated. In 1628 he was admitted probationer-fellow of his college; and about the same time he had prepared an edition of the second Epistle of St Peter, the second and third of St John, and the Epistle of St Jude, in Syriac and Greek, with a Latin translation and notes. In 1629 he was ordained priest, and appointed chaplain to the English merchants at Aleppo, where he arrived in October 1630, and continued for five or six years, during which he distinguished himself by his zeal and fortitude, particularly whilst the plague raged there in 1634. At length returning to England, he was in 1639 appointed reader of the Arabic Lectures founded by Archbishop Laud. Three years afterwards he went to Constantinople, where he prosecuted his studies of the eastern tongues, and procured many valuable manuscripts. After a residence of nearly four years in that city, he embarked in 1640; and taking Paris in his way, visited Gabriel Sionita, the famous Maronite, and also Hugo Grotius. In 1643 he was presented to the rectory of Childrey in Berkshire; and about three years afterwards married the daughter of Mr Thomas Burdett. About the middle of 1647 he obtained the restitution of the salary of his Arabic Lecture, which had been detained from him about three years. In 1648 Charles I., being then a prisoner in the Isle of Wight, nominated Pocock to the professorship of Hebrew, and the canonry of Christ Church annexed to it; but in 1650 he was ejected from his canonry for refusing to take the engagement, and soon afterwards a vote passed for depriving him of his Hebrew and Arabic professorships. But several governors of houses, and others, having presented a petition in his favour, he was suffered to enjoy both these places. He had some years before published his *Specimen Historiæ Arabum*, a very learned work, and now appeared his *Porta Mosis;* and soon afterwards the English polyglot edition of the Bible, to which he had largely contributed, and also Eutychius' *Annals*, with a Latin version, gave evidence of his industry and learning. At the Restoration he was reinstated in the canonry of Christ Church, and also received the degree of Doctor of Divinity. He then published his Arabic version of Grotius' *Treatise of the Truth of the Christian Religion;* and an Arabic poem entitled *Carmen Abu-Ismaelis Tograi*, with a Latin translation and notes. Soon afterwards he published Gregory Abulfaragius' *Historia Dynastiarum;* but this work did not meet with much encouragement from the public, a circumstance which his biographer accounts for in a manner not very creditable to the reign of Charles II. as compared with the Protectorate, when solid learning was appreciated and rewarded. The fact seems to be, that the love of Arabic learning was now growing cold; and Pocock himself, in his correspondence with Greaves, appears to be not only sensible that such was the case, but very much hurt by the decline of sound literary taste. The same circumstance also may in some measure account for this distinguished scholar not having obtained higher preferment at the period of the Restoration, when such numbers of vacant dignities were conferred on far inferior men. Perhaps he was almost the only instance of a clergyman, then at the highest pitch of eminence for learning and every other merit proper to his profession, who lived throughout the reign of Charles II. without the least regard from the court, except the favour sometimes done him of being called upon to translate Arabic letters from the princes of the Levant, or the credentials of ambassadors coming from thence; a service for which we do not find that he obtained any recompense besides fair words and hollow compliments. But his modesty equalled his merit; and after presenting Abulfaragius to the king, he ceased to obtrude his claims on the attention of royalty. In 1674 he published an Arabic version of the principal parts of the Liturgy of the Church of England; and a few years afterwards appeared his *Commentary on the Prophecies of Micah, Malachi, Hosea, and Joel.* This truly great man died in 1691, after having been for many years confessedly the first orientalist in Europe; and he was no less worthy of admiration for his uncommon modesty and humility, and all the virtues which can adorn a Christian. His theological works were republished at London in 1740, in 2 vols. folio, by Leonard Twells, M.A., with some account of his life and writings.

Pocock's son Edward published the works of Ibn Tofayl, the same which Ockley afterwards translated into English. He translated also the work of Abn-l-latif on Egypt, published for the first time at Oxford in 1800. Another of Pocock's sons translated into English the *De Termino Vitæ* of Manasses Ben Israel, London, 1699.

POCOCKE, RICHARD, distantly related to the preceding, was the son of Mr Richard Pococke, head master of the free school at Southampton, where he was born in the year 1704. He received his school learning under his father, and his academical education at Corpus Christi College, Oxford, where he took his various degrees. He commenced his travels in the East in 1737, and returned in 1742. In 1743 he published his *Observations on Egypt*, under the general title of *A Description of the East and some other Countries*. In 1744 he was made precentor of Waterford; and in 1745 he printed the second volume of his Travels, under the title of *Observations on Palestine, or the Holy Land, Syria, Mesopotamia, Cyprus, and Candia*, which he dedicated to the Earl of Chesterfield, then lord-lieutenant of Ireland, whom he attended in the capacity of domestic chaplain. In 1756 Dr Pococke was promoted to the bishopric of Ossory, vacant by the death of Dr Edward Maurice; in July 1765 he was translated to the see of Meath, which had been originally intended for the Bishop of Elphin, who, however, declined taking out his patent; and he died suddenly in September following, having been carried off by apoplexy, whilst engaged in visiting his diocese. As a traveller, Dr Pococke was equally distinguished for research, learning, and accuracy, to which ample justice has indeed been done by Jablonski, in the Preface to part third of his *Pantheon Ægyptiorum*. He penetrated farther up the Nile than the island of Philæ, called by the Arabs the Temple Island; whereas Norden, in 1737, proceeded as far as Derré, between the first and second cataracts. The two travellers are supposed to have met on the Nile, in the neighbourhood of Esneh, in January 1738; but, according to another account, they passed in the night without recognition.

Bishop Pococke visited other parts besides the East, and described some remarkable objects both in Scotland and Ireland. A French translation of his Travels appeared at Paris, 1771, in 7 vols. 12mo.

PODGORITZA, a town of European Turkey, in Albania, near the frontier of Montenegro, 38 miles N. of Scutari. It stands at the confluence of the rivers Moratsha and Chicuna, the latter of which is here crossed by a long wooden bridge. A short distance to the north lie the ruins of the ancient *Dioclea*, now called Dickla. They consist of temples, palaces, and isolated pillars; but they are gradually diminishing, as the people of Podgoritza make free use of the remains for building materials. Pop. 6000.

PODOLIA, or **PODOLSK**, a government of European Russia, lying between N. Lat. 47. 25. and 49. 45., E. Long. 26. 20. and 30. 55.; and bounded on the N. by the governments of Volhynia and Kiev, E. by that of Kherson, S. by those of Kherson and Bessarabia, and W. by the Austrian province of Galicia; length, from N.E. to S.W., 240 miles; greatest breadth, 80 miles; area, 16,449 square miles. The surface is generally level, slightly sloping from the Carpathians towards the S.E.; and a chain of hills, scarcely rising 500 feet above the sea, extends in that direction between the Dniester and the Bug. These two are the principal rivers of Podolia, and, with their affluents, water the entire country. The former only bounds the government on the S.W.; and the latter, rising on its northern confines, flows through it in a S.E. direction. The south-eastern part of the government is occupied with flat and sandy steppes. There are no lakes of any size in the country. Podolia enjoys a salubrious climate, an exceedingly rich soil, and contains much picturesque scenery. The principal mineral products are, saltpetre, lime, building-stone, and alabaster. Vines and mulberries grow here in the open air. Besides corn, the crops chiefly raised in the government are hemp, flax, hops, and tobacco. There are wide and rich meadows and pastures, on which large herds of excellent cattle are raised. A great part of the country is likewise occupied with forests, which produce excellent timber for ship-building. The extent of arable land in Podolia in 1849 was 5,577,736 acres; of meadow-land, 1,276,508 acres; of wood, 1,145,824 acres; and of waste land, 1,104,997 acres. The quantity of corn raised in the same year was 34,394,675 bushels; and that of potatoes, 2,454,880 bushels. The government contained in that year 96,436 horses, 353,864 horned cattle, 664,107 sheep, 160,086 swine, and 9933 goats. Hares, wolves, foxes, bustards, and other wild animals are found in Podolia; and the rivers are well supplied with fish. There is little manufacturing industry in the government; it contained, however, in 1849, in all 186 manufactories of various kinds, employing 2811 hands. Among the former, there were 10 tanneries, 15 manufactories of tobacco, 18 of tallow and candles, 85 of cloth, 12 of tiles, and 22 of beet-root sugar. The trade of the country, almost entirely carried on by Jews, consists mainly in exportation of corn to Odessa, and of cattle to Galicia. Most of the people belong to the Greek Church; but there are considerable numbers of Roman Catholics and of Jews, and a few Protestants and Mohammedans. The educational interests of the government are under the control of the university of Kiev; but they are in a low condition; and there are few schools in the country. Podolia is divided into twelve circles. The capital of the government is Kamenez Podolsk. Like the other governments in West Russia, Podolia once belonged to Poland, but has formed since 1772 a part of the Russian empire. Pop. (1851) 1,577,966.

POE, EDGAR ALLAN, author of the *Raven*, was born at Baltimore in the United States, in January 1811. His father, David Poe, while a student of law at Baltimore, had become enamoured of Elizabeth Arnold, an English actress, with whom he eloped. He married her, gave up his studies, and took to the stage. After a few years, they both died, leaving behind them three children in a state of utter destitution. The eldest, Edgar, a child of remarkable beauty and precocious wit, was then about six years old; and a Mr John Allan, a wealthy merchant, adopted him. In 1816 he visited Great Britain in company with Mr and Mrs Allan, and subsequently passed from four to five years with the Rev. Dr Barnsby, in a school kept at Stoke-Newington, near London. On his return to the United States he entered the university at Charlottesville, and there gave evidence of feats of hardihood, reckless wildness, and considerable genius. Gambling and intemperance induced his expulsion from the university. He quitted the place much in debt; and on Allan's refusal to accept some of the drafts, he wrote him an abusive letter, quitted the place, and sailed for Greece, then engaged in a struggle with the Turks. We know but little of his adventures for a year; at the end of which time he broke in upon the slumbers of the American minister in St Petersburg, to save him from penalties incurred in a drunken debauch. Through the ambassador's intercession, he was enabled to return to the United States. He became a cadet in the military academy, and, after passing ten months there, he was cashiered for dissipation and neglect of duty. He returned to Allan, who was still disposed to treat him as a son; but owing to a quarrel with the future Mrs Allan, he and his patron parted for ever. He published a small volume of verses, enlisted as a private soldier, was recognised by officers at the military academy, who were forming measures for his release, with prospects of success, when it was discovered that he had deserted. Two prizes were now offered by the proprietor of the *Baltimore Saturday Visitor* for the best tale and poem suited to his magazine. Poe competed, and was successful. This award was published 12th October 1833. He obtained, through the exertions of this committee, the editorship of a magazine published at Richmond, Virginia; but after the lapse of a few months, he fell into a state of brutish drunkenness, which resulted in his dismissal. While at Richmond, in January 1837, he had married his cousin, Virginia Clemm, a very amiable and lovely girl, who was as poor as himself. He went from Richmond to Baltimore, from Baltimore to Philadelphia, and from Philadelphia to New York. Towards the end of 1838 he settled in Philadelphia, and became editor of a magazine which Burton the comedian had recently established. Here he stayed for more than a year: his works were appreciated; his fame was increasing; when, before the summer was over, he relapsed into his former habits, and was for weeks regardless of everything. This led to his dismissal. Some months afterwards he became editor of *Graham's Magazine*. His connection with this periodical, which continued about a year and a half, was one of the most active and brilliant periods of his literary life. He wrote for it some of his finest tales and most charming criticisms. During his residence at Philadelphia his manner was usually very quiet and gentlemanly; he was generally dressed with simplicity and elegance; and there was a singular neatness and air of refinement about his home. For this he was mainly indebted to his mother-in-law, who loved him with more than maternal devotion and constancy. In 1844 he removed to New York, where he was received into circles accustomed to the appreciation as well as to the production of literature. It was here, during the outset of his career, that he published his poem of the *Raven*, of which Mr Willis justly observed, "It is the most effective single example of fugitive poetry ever published in America." His reputation as a magazinist rose rapidly; and his tales and critical articles set him on the high road to fame. In 1846 Poe's constancy again gave way, and he was reduced to quite an alarming destitution. He was ill; his wife was dying; and his mother-in-law, with his manuscript in her hand, was wandering the streets of New York. In 1848 he advertised several lectures, with the view of obtaining money to start a long-contemplated monthly journal. They were subsequently published as *Eureka, a Prose Poem*, on the cosmogony of the universe, to the composition of which he brought his subtlest and highest gifts in their fullest power. From this period Poe did not write much; he had quarrelled with most of the chief magazines for which he had formerly written. His name was associated about this time with one of the most brilliant women of New England; and he has immortalized her by the poem, "I saw thee once—once only—years ago." They were not married, however; and the breaking of the engagement seems entirely owing to his own wilful caprice. After a temporary absence from New York in the autumn of 1849, he arrived in Baltimore. He met acquaintances who induced him to drink, and, after a night of insanity and exposure, he was borne to an hospital, where he died the same evening at the age of thirty-eight.

In person, Poe was below the middle height, slenderly but compactly formed, and in his better moments was gentlemanly in an eminent degree. His voice was modulated with astonishing skill, and his elocution was at times wellnigh supra-mortal. He was at all times a dreamer, dwelling in ideal realms peopled with the creatures and accidents of his brain. His harsh experience had apparently deprived him of all faith in man and woman. His poetry is characterized by great originality and sweetness. He was a master of rythm; and put nothing out of his hand that did not bear the stamp of his genius. He wrote but little; but that little was in general of the highest mark. No American poet has reached the poetical heights which were familiar to Poe. His verses have all a dreamy, unworldly grandeur about them; sufficiently real to awaken an interest in the reader, and sufficiently ideal to carry him beyond himself and the things of sense and time. For a perfect mastery over language, and that subtle harmony which constitutes the very highest music, Poe knew but few equals. His versification was liquid and musical; and his entire composition was constructed with the design of being as near perfection as possible. His prose tales are very much like his poetry; but with this difference, that in general he chooses for his poetry subjects fitted to awaken melancholy, or at most exquisite sorrow; while in his prose he harrows up to the foundation the very roots of one's nature, and seems to take a positive pleasure in the exercise. A number of his pieces, to be sure, mainly address themselves to our curiosity, without involving the reader in any fit of feverish anxiety; yet so masterly is this executed, that one might safely say, no one, of any measure of culture, began a story of Poe's without completing it with breathless interest. The style is so simple and yet so accurate, so smooth and yet so highly finished, that it is only on reflection that one perceives the charming vehicle on which he has been carried along. He had a most subtle and delicate intellect, and an imagination singularly weird and unworldly. His works, and especially his poems, were more or less a reflection of his life. He wrote with fastidious difficulty, and in a style too high to be well paid. His works have been published in 4 vols., 1857.

POELEMBURG, Cornelius, an eminent Dutch landscape-painter, was born at Utrecht in 1586, and after receiving the first principles of his art from Bloemart, repaired to Rome to study the works of Raphael. He formed in course of time a style of his own. His custom was, to represent on a small canvas, with a light and delicate touch, a well-selected landscape. Neat figures and imposing ruins were introduced to add to the picturesque effect. The whole scene was finished with a delicate colouring which equalled the suavity of enamel. This artistic excellence soon introduced Poelemburg to a brilliant career of popularity. During a residence of several years at Rome, his studio was the resort of cardinals and other dignitaries. On his way home, the Grand Duke of Florence would fain have retained him at court. After his return to Utrecht, he was summoned in 1637 to England to paint for Charles I. and the nobility. Nor did prosperity desert him when he sought again his native city. He continued to amass a large fortune, and to see his pictures imitated by many rising artists, till his death in 1660. The pictures of Poelemburg are scarce. Many of his figures may be seen in the landscapes of Claude, Jan Both, and Kiering.

POETRY.

Definition.

The difficulty of giving a definition of poetry, which shall include all that essentially belongs to it, and exclude all that is foreign or accidental to it, has been long felt and admitted. The definition of the ancients, which makes poetry "an imitative art," is obviously exposed to the double objection of being at once too comprehensive, since it would equally apply to the other imitative arts of painting and sculpture; and too limited, since it would exclude many departments of poetry, in which, as in the lyrical, the art is not properly *imitative*, but *expressive;* not copying in any sense the thoughts and actions of others, but presenting to the sympathy of the reader the emotions of the poet himself. Not less objectionable is the definition, that poetry is "the art of expressing our thoughts by fiction;" which, while it is equally applicable to the novel and the romance, is, in fact, not necessarily true of poetry at all, except in this sense, that in all high poetry a certain transforming and beautifying power of imagination is excited, which in some measure transmutes the forms of things from their actual prosaic aspect,

> Clothing the palpable and the familiar
> With golden exhalations of the dawn.

Still less can verse or metrical form be regarded as constituting the essence, or even one of the essentials, of poetry. It no doubt heightens its effect; it increases its charm and power of pleasing, by enlisting the aid of musical sound and cadence on the side of imaginative language or touching sentiment; but it must yet be regarded as amongst the externals of poetry,—something which will never make poetry of itself, and without which poetry is not only conceivable, but has in fact existed, and that in very striking and impressive forms.

Object of poetry the communication of intellectual pleasure.

Poetry may perhaps be defined to be an art which has creation of intellectual pleasure for its object, which attains its end by the use of language natural in an excited state of the imagination and the feelings, and generally, though not necessarily, formed into regular numbers. The proper antithesis, therefore, to poetry, as Mr Coleridge has remarked, is not prose, but science. The proper antithesis to prose is verse. Science seeks to instruct, to discover and to communicate truth; "the proper and immediate object of poetry is the communication of immediate pleasure." Poetry may indeed incidentally instruct, as science may indirectly communicate pleasure; but the object of each must be gathered from its main direction and bearing, and in this sense the production of intellectual *enjoyment* is unquestionably the aim and the proper province of poetry.

This a pleasure conducive to morality.

But so closely are the intellectual and refined pleasures of man connected with his moral qualities; so much does his relish for the higher and more spiritual pleasures of the imagination depend on a sound and healthy state of morality in the first instance, and so much is this state in turn promoted and encouraged by stimulating and keeping alive the activity of the imagination and the sensibilities of the heart, that poetry, though generally avoiding the form of direct instruction, may yet be said, with justice, to be the most important handmaid and assistant of moral education, by its appeals to those affections which are apt to become indolent and dormant amidst the commerce of the world, and the revival of those purer and more enthusiastic feelings which are associated with the earlier and least selfish period of our existence. Immersed in business, which, if it sharpen the edge of intellect, leaves the heart barren; toiling after material wealth or power, or struggling with fortune for existence; seeing selfishness reflected all around us from the hard and glittering surface of society, as from a cold and polished mirror; it would go hard with man in adversity, perhaps still more in prosperity, if some resource were not provided for him, which, under the form of an amusement and a recreation, administered a secret but powerful balm in the one case, and an antidote in the other. This resource is afforded us by the influences of poetry. "Whatever withdraws us from the power of the senses; whatever makes the past, the distant, and the future, predominate over the present, advances us in the dignity of human beings." Sometimes, no doubt, poetry openly assumes the garb of morality, but it is generally least instructive when most directly *didactic*, and practically attains the end of instruction with most success when the instructor is himself unconscious of the lesson he conveys. In an indirect form, however, and through the medium of the feelings and the imagination rather than the mere reason, its efficiency as a moral agent is great and undeniable. And as upon the intellectual worth and nobleness of individuals depends the standard of a national morality, it may with truth be said that the fame and character of nations,—those qualities the presence of which makes the smallest state conspicuous in the world's eye, and the absence of which renders the widest empire, on which the sun never sets, insignificant; namely, national pride, honour, fidelity to engagements, courage to act, fortitude to suffer, a generous and far-seeing policy, disdaining all mean or questionable advantages; are to some extent derived, and, at all events, continually cherished and fostered, by the influence of a pure and ennobling national poetry. If Plato had succeeded in banishing poets from his ideal republic, he would assuredly have conferred no benefit upon morals. He would have created a hard and utilitarian frame of society, inaccessible to generous feeling, and incapable of those great efforts, either of action or of endurance, which have their source only in enthusiasm, and cannot be suggested by any principle of expediency, however enlarged may be the basis of calculation.

No poetry permanently popular which is of an immoral nature.

It is the conviction of this intimate though indirect connection between poetry and morality, and the consequent bearing of the former upon human welfare, that explains the veneration which mankind have always felt for those poets who, acting under an impression of the sacredness of the task committed to them, and of the power of the talisman which genius has placed in their hands, have devoted their labours to the purest forms of poetry, and to the excitement of emotions, either virtuous in themselves, or conducive to virtue. It is this conviction which accounts for the aversion which they have never failed in the end to manifest against all those who have made the fascinations of poetry and wit subservient to the gratification of baser feelings or meaner propensities. For men taken in the mass judge rightly, even when they act wrongly; and moral opinion, so variable and wavering when applied to our own case or that of our friends, is found a safe and steady guide when applied to the mere *representation* of human thought and action in the forms with which they are invested by the poet. Hence the feelings of all men are enlisted and warmly excited on the side of virtue in fictitious composition, and still more in the most fascinating form of fictitious composition, poetry. For here the *tendency* of the poem is felt to be no mere speculative question, but a real dispute "pro aris et focis;" a contest whether, as is said to be often the case in India, poison is to be conveyed into the wells from which pure and refreshing water ought to be drawn. And this practical bearing upon important interests, of the abuse of a fine art, is more felt, and justly, in poetry than in any other. In painting, for instance, Parrhasius, Julio Romano, Annibal Caracci, and Titian, have ministered by their pictures to the promotion of vice; in sculpture, some have even endeavoured to pervert the pure marble into a vehicle of impure representations; but the circle of their operation is limited; to the mass of men their iniquities of this nature are even unknown: but poetry, multiplied indefinitely by printing, finding its way into every quarter of the globe, and penetrating into the humblest as well as the highest class of society, has a sphere of operation bounded only by the globe itself, and a practical influence, through their sympathies, upon men's habits of thought, and consequently upon their morality and their happiness, which is not the less certain and extensive, that its limits do not admit of any precise or distinct determination.

Hence it is a remarkable fact in the history of poetry, that no work essentially immoral, or even exhibiting a manifest indifference to moral feeling, has ever maintained a permanent popularity. The low ribaldry which deforms the splendid talents of Aristophanes will always render the perusal of his plays a painful task; the witty licentiousness of the Pucelle is already all but forgotten; and the next generation, while they treasure the better parts of Byron, will assuredly consign to oblivion much of his gloomy reasonings, his contempt for human nature, and his ridicule of generous feelings. The poets who are found to retain their hold over all hearts, and whose influence even appears to extend with the progress of ages, Homer, Shakspeare, Milton, Spenser, Calderon, Tasso, are those who have done their utmost to elevate rather than to depress the spirit and the hopes of men; to make existence brighter about us, and to embody in their strains the principles of faith and hope, of purity and universal charity. For it need hardly be observed, that we are not to condemn a work as immoral on account of a few brief passages, in which the poet, led away by a too lively imagination, has admitted scenes or images of an objectionable kind. Such, indeed, are to be found in Shakspeare, and in the pure and religious poems of Spenser; more rarely also in Tasso; but the general strain of the poem, and the obvious aim of the poet, being to promote the cause of virtue, the few objectionable particulars are lost in the general effect, and cease to be dangerous from their proximity to so much that is calculated to purify and to elevate the mind.

Painting and poetry; qualities common to both.

If it be difficult to give an accurate definition of poetry, it is still more difficult to describe the precise combination of the mental and moral qualities which are required for its production, so as to distinguish these from the qualities requisite for perfection in the other imitative arts. The sensibility to natural and moral beauty; the study both of the outward world and of the mind of man; imagination and fancy to furnish the materials; judgment and taste to select and arrange them; these are common to the great poet and the great painter. What determines these energies and capabilities to the one direction more than to the other, and makes one man paint to the bodily eye in colours, the other to the eye of the mind in words, is that secret undefinable instinct which we call genius, which it is impossible to resolve into any mere result of the force of circumstances, and which, all experience teaches us, is born with the artist, and, like an instinct, directs his after-course. A genius for poetry or for painting is as certainly dependent on an organization mental and physical, with which we come into the world, as a musical ear; no education can give them; no general superiority of intellect will enable a man to turn with equal success to either; nature made him with the elements of a poet or a painter, and what she has so framed, art and education will never alter.

But though it is difficult to enumerate any quality requisite to form a great poet which is not necessary also to form a great painter, it is easy to see, that from the nature of the materials with which they deal, as well as their modes of operation; the one producing its effects by a momentary impression, the other by a continuous exertion; the degree in which the different component qualities of mind are employed in these respective arts is materially different.

Imagination.

Foremost amongst the qualities that constitute the poet is imagination, that creative principle of the mind which forms new conceptions out of previously existing materials; "conceptions not absolutely justifiable by the rules of logic, but quite intelligible to the mind when duly elevated; intelligible through our sympathies or sensibilities, though not sufficiently definite nor strictly coherent to stand the cold survey of our reason." This is indeed the most essential gift of the poet, "where either he must live or have no life;" with it, he may triumph over every other defect; without it, no combination of qualities will ever render him a great poet. This is the power which emancipates the poet from the trammels of space and time; carries him back into the spirit of past ages; enables him to create and to endow with coherent attributes beings of a nature different from our own, and yet having for us a real existence, so far as our sympathies are concerned: to conceive and consistently to follow out the thoughts, and words, and passions of imaginary actors, and all this not by a metaphysical analysis of the emotions or passions, nor by a course of induction from actual observation in the world about him, but by a secret consciousness, flashing upon his mind, in a concentrated shape, the result of all philosophy, embodying all which conception, abstraction, and judgment would have separately furnished. It supersedes the necessity of observation in every special case, because it furnishes him with those primary elements of our nature which give the formula for the solution of all. The value of patient observation and study of life and character, in addition to the suggestions of the imagination, we do not dispute; we shall afterwards see, that within certain limits, and for certain departments of poetry, they are indispensable. But we may be assured, that for those elemental conceptions of character which are unmodified by mere manners, local position, or age; the conception, for instance, of a Lear or a Miranda, a Caliban, an Ariel, or a Hamlet; no observation of human character in the actual world, nor dissection of the component passions and sympathies that make up character, would have sufficed. We have but to look at the range of Shakspeare's characters to be at once satisfied of this. Pre-eminent amongst these are his characters of women; and yet from what analysis of character, or observation of society, could these have been drawn? Where could a youth, whose chief companions had been deer-stalkers, actors, or play-writers of no high repute, and to whom female society, at least in its most refined form, must have been unknown, have gleaned the materials which enable him to pourtray, with equal mastery, the fierce overbearing spirit of Lady Macbeth and Constance, the tranquil regal dignity of Hermione and Katharine of Aragon, or the totally dissimilar aspect of female character presented in the passion of Juliet, the purity of Miranda, the simplicity of Ophelia, or the tender submission and wife-like confidence of Imogen and Desdemona? No prototypes existed in the society around him from which these could be drawn. The streets and taverns of London might indeed furnish him with Bardolphs and Pistols; his acquaintance with Lord Southampton, or with the other gallants of the court, might afford the outlines of his Prince Henry or Hotspur; but his female creations are obviously drawn from no other sphere but his own breast. They are the offspring of an imagination "all compact," not elaborately constructing, but almost unconsciously creating.

The power of imagination is shown in its most imposing form in the conception of character, incident, situation, and scenery,—in the general scope and design of the poem; but its value and importance as an element of poetry is scarcely less felt in the details, in the manner in which it informs and transforms the whole language of the poem; studding it with imagery, simple or complex, often making a single word act like a spell, and conjure up a host of magical associations. Its province in this respect is not to be confounded with that lower department of the poetical art which is called diction, and which, when the idea is formed, simply dictates the selection of the *word* most appropriate to express the precise *idea* to be conveyed. Imagination supplies the idea itself, or fasciculus of ideas, to be embodied in the word; and in the number, novelty, and judicious selection of associations which can be suggested to the mind within any equal space, lies the chief difference between the work of a great poet and an inferior one, between an original or an imitative mind.

The images suggested by the imagination, we have said, are frequently complex. It seems to fuse many in one, to divide one into many, and to present the mass to the mind in a form which suggests all the particulars of which it is composed. It is certain, too, that many of the images which it suggests, and the effect of which upon the mind is immediately felt by all lovers of poetry to be beautiful, can by no means be justified upon the principles of logic, or their coherence made clear to the understanding. " When Milton tells us of ' darkness visible,' " says a writer on poetry, " we feel that he has uttered a fine paradox; we *feel* its truth, but cannot prove it. And when in that appalling passage where the poet stands face to face with Night and Chaos in their dark pavilion, ' spread wide on the wasteful deep,' and says that

By them *stood*
Orcus and Ades, and the dreaded *name*
Of Demogorgon,

how is it possible to reconcile such expressions to a mere prosaic understanding? Darkness is, strictly speaking, absence of light. How then shall we say that it is visible, when we see only by the aid of light? And with respect to the ' *name*' of Demogorgon, which *stands* by Orcus and Ades, how can such a phrase be justified by the rules of reason? Nevertheless it is as magnificent as words can make it. It is clothed in a dark and spectral grandeur, and presses upon our apprehensions like a mighty dream."[1] Take another instance also from Milton, where he speaks of music

At every fall smoothing the raven down
Of darkness till it smiled.

Here also it is impossible to perceive the mere logical connection of the images; for, allowing darkness to be embodied under the notion of some bird with glossy and raven plumage, it would certainly puzzle any critic to show how musical sounds could smooth such plumage; and yet we should have little hesitation in putting this passage to any one as a test whether he possessed a feeling or sense of poetry, or whether his mind was entirely of a prosaic character. In these, and a thousand similar instances, particularly in Shakspeare, it is clear that the poetical effect can be explained upon no ordinary principle of reason. The metaphors are what are called broken; they cannot logically be united, and yet they have a sufficient poetical coherence. How this result is produced we shall only be enabled to explain when the whole laws which govern the faculty of imagination, as yet most imperfectly understood, shall be discovered.

It is somewhat difficult to establish a plain and practical distinction between fancy and imagination, so far as regards the imagery or ornaments of poetry; though, as we have already said, the higher efforts of conception, and the general design, fall almost entirely, in serious and heroic poetry, under the province of imagination. From Milton's line, " Sweetest Shakspeare, Fancy's child," it would seem that the words fancy and imagination had then been used as having the same meaning; for certainly any one now endeavouring to describe the most remarkable of Shakspeare's qualities would refer to his imagination rather than his fancy. Yet fancy may perhaps be said to be imagination at a lower point of excitement; not dealing with passions, or creating character; nor pouring out unconsciously, under the influence of strong feeling, images as they arise massed and clustered; but going in search of comparisons and illustrations, and when it invests them with personality, as in metaphors, still adhering much more closely to the logical fitness and sequence which govern similar ornaments in prose. It seems to act like a colder and weaker species of imagination, furnishing the thoughts which " play round the head, but do not touch the heart;" pleasing the eye and the ear; creating or heightening the idea of the beautiful, much more than of the sublime. It is not careful, like imagination, to make the whole bear on the general design, and heighten the main impression sought to be produced, but rather strives to excite our pleasure, and to bespeak our admiration for the images which it suggests. Its natural field, so far as regards the general design, is in poems like the Rape of the Lock, or the Lutrin, where the object is to give a poetical dress to a subject essentially prosaic, and excluding passion or high imagination. To these it lends an airy machinery, ingenious comparisons, imagery of a lively and pleasing cast in harmony with the level tone of the subject, and thus brings them within the domain of poetry. Some have represented the distinction between the effects of imagination and fancy to consist in this, " that the former altogether changes and remodels the original idea, impregnating it with something extraneous; the latter leaves it undisturbed, but associated with things to which, in some view or other, it bears a resemblance." But this distinction cannot be admitted; fancy, though in a less degree, does create, or change and remodel ideas; the difference between them must be sought more in the sort of ideas on which they operate, and the purposes to which they apply them, than in the plastic power supposed to be exercised in the one case and not in the other. " Fancy," says Mr Wordsworth, in a fine passage in his preface, " depends upon the rapidity and profusion with which she scatters her thoughts and images, trusting that their number, and the felicity with which they are linked together, will make amends for the want of individual value; or she prides herself upon the curious subtilty and the successful elaboration with which she can detect their lurking affinities. If she can win you over to her purpose, and impart to you her feelings, she cares not how mutable and transitory may be her influence, knowing that it will not be out of her power to resume it upon an apt occasion. But the imagination is conscious of an indestructible dominion; the soul may fall away from it, not being able to sustain its grandeur; but if once felt and acknowledged, by no act of any other faculty of the mind can it be relaxed, impaired, or diminished. Fancy is given to quicken and to beguile the temporal part of our nature, imagination to incite and support the eternal. Yet it is not the less true, that fancy, as she is an active, is also, under her own laws and in her own spirit, a creative faculty. In what manner fancy ambitiously aims at a rivalship with the imagination, and imagination stoops to work with the materials of fancy, might be illustrated from the compositions of all eloquent writers, whether in prose or verse, and chiefly from those of our own country. Scarcely a page of the impassioned parts of Bishop Taylor's works can be opened that shall not afford examples. Referring the reader to these inestimable volumes, we will content ourselves with placing a conceit, ascribed to Lord

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[1] Edinburgh Review, 1825.

Chesterfield, in contrast with a passage from the Paradise Lost.

> The dews of the evening most carefully shun;
> They are tears of the sky for the loss of the sun.

After the transgression of Adam, Milton, with other appearances of sympathizing nature, thus marks the immediate consequence.

> Sky lowered, and, muttering thunder, some sad drops
> Wept at completion of the mortal sin.

The associating link is the very same in each instance; dew and rain, not distinguishable from the liquid substance of tears, are employed as indications of sorrow. A flash of surprise is the effect in the former case; a flash of surprise and nothing more; for the nature of things does not sustain the combination. In the latter, the effects of the act, of which there is this immediate consequence and visible sign, are so momentous, that the mind acknowledges the justice and reasonableness of the sympathy in nature so manifested; and the sky weeps drops of water, as if with human eyes, as earth had before trembled from her entrails, and nature given a second groan.” It is evident, that in the parallel passages thus opposed to each other by Wordsworth, the creative or remodelling operation produced by fancy in the former case, and by imagination in the latter, is the same; in both the sky is endowed with personality and human feeling; it is the propriety of the action attributed to the imaginary being in the one case, and its unreasonableness in the other, which makes the former merely fanciful, the latter highly imaginative.

Danger of an excess of fancy.

It will readily be perceived, from what has here been said of the nature of fancy, that when unregulated by a strong judgment, and unwarmed by strong passion, it is one of the most dangerous qualities which a poet can possess. To the predominance of this quality, indeed, to the consciousness of a facility of finding ingenious analogies or subtile distinctions, of conjuring up a multitude of fantastic resemblances, pleasing in themselves, but in no way heightening the leading impression sought to be conveyed, are to be ascribed many of the errors of taste by which modern poetry has been deformed. To this must be ascribed those conceits, from which scarcely a single Italian writer prior to the eighteenth century is free, and which reached their consummation in Marino; to this the similar extravagancies of Gongora, Quevedo, and their followers in Spain; the affected taste introduced by Voiture and Balzac in France, and exploded by the good sense of Molière; and the similar extravagancies of our own metaphysical poets. An excess of imagination cannot lead to bad taste in style; an excess of fancy is but too apt to produce that effect.

Judgment.

Of judgment, which is the regulating and controlling power by which the active and creative faculties of imagination and fancy are guided, checking the too daring flight of the one, and pruning the excesses of the other, it is needless to speak; since it is a quality not more peculiarly requisite in poetry than in oratory, or any of those departments of intellectual exertion which depend not on demonstration, but on the balance of probabilities. In fact, the highest range of imagination has invariably been found to be accompanied by a corresponding depth and comprehensiveness of judgment; or rather, perhaps, it would be more philosophical to say, that judgment is involved and constitutes one of the component parts of high imagination. For the imagination, as is justly remarked by Mr Stewart, is a *complex* power. “It includes conception or simple apprehension, which enables us to form a notion of those former objects of perception or knowledge, out of which we are to make a selection (in the fine arts); abstraction, which separates the selected materials from the qualities and circumstances which are connected with them in nature; and judgment or taste, which selects the materials, and directs their combination.” It is only in minds where imagination is limited, and where its possessor tries by effort and straining to enlarge it beyond its appointed bounds, that the judgment is generally found defective. Homer and Shakspeare, the most inventive and imaginative of poets, are also the most sagacious, the most practical, the most abounding in wisdom, both of a worldly and of a higher kind.

Study necessary to form a poet.

But, in addition to the natural gifts of sensibility to feel, memory to retain impressions, imagination and fancy to fashion new conceptions, and judgment to blend in harmony all the materials which have been thus accumulated, study is just as essential for the formation of the poet as for the acquisition and practice of the most mechanical art. That study regards both the materials of poetry and the language by which they are to be communicated in a sensible form to others. Study of men in the different conditions of life, and the habit of observing and systematising these observations; study of external nature, so as to mark the peculiarities which escape common eyes; the accustoming the mind to search for resemblances among things different, and to lay them up in the memory as in a treasury; these are assistances which no poet can overlook, and without which the imaginative faculty is deprived of its due nourishment, and of half its power. For even imagination does not strictly create out of nothing; it must be quickened and set in motion by something external, and demands materials on which it can try its processes of change or recombination. All great poets, therefore, have steadily pursued this course of study of nature, both moral and physical; though, after the habit is once formed, these mental operations are carried on almost unconsciously, and the treasures of poetical observation grow upon their possessor, without his being conscious of any effort in their accumulation. A remarkable instance of the attention paid by great poets to the minutest peculiarities of external nature, and of course equally applicable to the study of mental phenomena, is afforded by the case of Sir Walter Scott. Every one knows the graphic truth as well as the wonderful variety of his descriptions of scenery, which, by their selection of every thing that is characteristic, embody the very spirit of the place, and call back to our minds the impression with which we had first viewed it, and which had faded away and become forgotten. It is evident that in such descriptions Scott trusted little to the imagination, as able to compensate the observation of reality. Mr Morritt mentions, that whilst he was engaged in the composition of Rokeby, he observed him noting down even the peculiar little wild flowers and herbs that accidentally grew round and on the side of a crag near his intended cave of Guy Denzil; and on his saying that he need not have taken the trouble, since daisies, violets, and primroses, would have suited his purpose as well as the humble plants he was examining, the poet replied, “that in nature herself no two scenes are exactly alike, and that whoever copied truly what was before his eyes, would possess the same variety in his descriptions, and exhibit apparently an imagination as boundless as the range of nature in the scenes he recorded; whereas, whoever trusted to imagination would soon find his own mind circumscribed and contracted to a few favourite images, and the repetition of these would, sooner or later, produce that very monotony and barrenness which had always haunted descriptive poetry in the hands of any but the patient worshippers of truth.”

Diction.

The other department of the poet’s study relates to the use of the medium through which his ideal creations are to be conveyed to others; in other words, diction, or the choice and arrangement of the words most appropriate to convey the precise shade of meaning, and to convey it divested of all those associations of a low or ludicrous character, which usage sometimes connects with words, and assisted by all the charms of musical sound. All men who seek to command the minds of others through speech must by study learn to apprehend the power and perfect force, as affecting thought, imagination, and passion, of every word which his fellowmen have used for ages as the vivid image of some conception of the soul. They must acquire a perception of the value of words, at once exact, delicate, and passionate. This careful and fond study of language, however, is peculiarly requisite to the poet, and has been carried to higher perfection by them than by prose writers; "because, in the composition of poetry, the mind, attempered to delight, feels more sensitively the exquisite form into which the material expression of its conception is wrought." The very shackles imposed by metre and rhyme, though they may occasionally tempt an inferior poet into the use of a word which is not the one most apt to express his conception, unquestionably only operate as a stimulus to the great poet to make himself master of all the resources of words which the language supplies, so as to comply with the necessities of rhyme and musical sound without sacrificing any portion of the substance of his conception. Without this thorough command of the whole armament of language, and the utmost patience and perseverance in its use, we may be assured that no poet has ever succeeded in attaining a general and permanent popularity. Verse cannot leap full armed from the brain of the poet. The steps which lead from the rudeness of the first conception to the elegance of the last, though they cannot be seen, are undoubtedly many. The ideas must be patiently wrought into shape; words weighed and rejected; shades of meaning of the nicest kind discriminated; associations foreseen and guarded against; and an arrangement of words throughout preserved, which, while it differs from that of prose, never allows the inversions which are admitted in poetry to obscure the meaning. The practice of the greatest poets we know to have been in conformity to these rules. We find Virgil dictating a number of verses in the morning, spending the day in revising, correcting, and reducing them, and comparing himself, as Aulus Gellius mentions, to a she-bear licking her misshapen offspring into shape. We see Petrarch returning day after day to his sonnets, to alter some single word, or make some apparently trifling change in the arrangement of a line. The manuscripts of Ariosto, whose style appears the very perfection of ease, and an almost spontaneous emanation, still exist at Ferrara, and show that many of the favourite passages in the Orlando were written eight times over. Scarcely less attention was bestowed upon the stanzas of the Gerusalemme by Tasso. Milton's study of English speech, and mastery of the artifice of language, as well as the critical care with which he built up "the lofty rhyme," are well known:

> "He with difficulty and labour hard
> Moved on; with difficulty and labour he."

The specimens of Pope's *Iliad* given in Johnson's Life, exhibiting the successive changes which the lines underwent before they assumed that compact and harmonious form in which they appeared before the public, must be in the recollection of every reader. And we see from the letters of Lord Byron that the same laborious process of polishing was not disdained even by his impetuous mind. It is indeed scarcely too much to say, that no composition of any length which has obtained a permanent popularity was ever thrown off at a heat; and that the nearer the work approaches to the appearance of spontaneity, the greater has in general been the extent of the labour which has been employed upon it.

Q lities co mon to al good p try.

Such being the qualities and habits of mind that make the poet, it may be asked what are the common qualities to be found in all poetry which has permanently commanded the admiration of mankind. Milton has endeavoured to condense these into a sentence. Poetry, he says, must be "simple, sensuous, passionate."

Poetry must be simple.

By the first quality, simplicity, which applies both to the matter and the language, he seems to indicate the necessity of dealing in poetry with the simple elements of human nature; keeping the broad highways of feeling, avoiding affectation of sentiment, over-refinement, or morbid peculiarity of any kind. "It distinguishes poetry from the arduous processes of science labouring towards an end not yet arrived at, and supposes a smooth and finished road on which the reader is to walk onward easily, with streams murmuring by his side, and trees, and flowers, and human dwellings, to make his journey as delightful as the object of it is desirable, instead of having to toil with the pioneers, and painfully to make the road on which others are to travel."[1] And unquestionably it is the fact, that the works of the greatest poets are the simplest, the most level to ordinary apprehension, the most adapted to ordinary sympathies. Homer, in whose works nature is reflected without change, is understood and relished equally by the youth and the man, by nations the most distant from each other both in space and time. Shakspeare, in like manner, in whose works we can detect no subjective influence produced by his own mind, and who seems to range like the universal sun over the provinces of emotion, enlightening all alike, produces the same deep impression on the learned and the unlearned. Both concur in this, that they do not paint the exceptional, but the customary; not the peculiarities, but the common features of humanity; and that they paint these broadly and simply, instead of endeavouring, by a complex apparatus of singular traits and colours, to display their own artistic skill.

Sensuous.

The second of the qualities enumerated by Milton is, that poetry must be "sensuous;" that is, that it shall have that character of sensible reality which shall prevent its degenerating into mere dreams and abstractions; that it shall be so far connected with the world about us, and with our actual interests and pursuits as not to appear altogether the creature of another sphere, and this both as to the nature of the subject and the definite nature of the imagery employed upon it. The right understanding and application of this rule would have saved the world from many of those hazy poetical abstractions, or attempts to transmute political or metaphysical theories into poetry, with which, in the present age in particular, the public has been inundated. It is the neglect of it which renders the metaphysical poetry of the sixteenth century, with all its grandeur and force of thought, so often unreadable.

Passionate.

The third requisite of poetry is that it be passionate. It is not enough that thought and imagery be sensuous, or objective and definite; the *passio vera* of humanity, as Coleridge remarks, must animate both. It is by our sympathies that poetry lays its strongest hold on us; and it is by the representation of passion that these must be set in motion. Even the lower and more level departments of poetry must be warmed by it; of the epic, and still more the dramatic, it constitutes the mainspring. Didactic and descriptive poetry would become wearisome were they not enlivened by the occasional introduction of scenes awakening the feelings of love or pity. In lyric poetry, the song constantly exhibits its condensed expression; in fact, so powerful is its influence, that genuine passion will often support a poem which has but slender claims to fancy or imagination. The mere literal and truthful exhibition of the greater passions of our nature so stirs within us the sense of the sublime or the terrible, so rouses our curiosity and suspense, that for a time we are willing to dispense with the more ethereal colouring which imagination might impart to them. We say, however, for a time only; for a literal picture of human passions, if prolonged through a whole drama, and unrelieved by imagery or the expression of calmer thought, is felt to be painful and harrowing to the mind. Such is the effect produced by the Newgate Calendar dramas of Lillo, George Barnwell, Arden of Feversham, and the Fatal Curiosity, and by the similar German tragedy of Werner, the Twenty-Ninth of February. So great was the effect produced by the scene in Lillo's play representing the murder of Arden, that the audience, unable to endure the excitement of the representation, rose up with one accord and interrupted it. Appeals to our passions, presented in this bleak and naked reality, have the same painful effect upon the mind which exhibitions of crime and suffering have in real life. To make them produce a pleasing effect in poetry, at least for any length of time, they must be blended with associations of a less vulgar and less agitating kind; and the pain which attends our sympathy must be tempered by the soothing imagery suggested by the imaginative and reflective faculties.

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[1] Coleridge's *Literary Remains*, vol. ii. p. 10.

Poetry changes with society.

The qualities enumerated by Milton may be considered as fixed and inherent in all good poetry; beyond these it is difficult to point out any which are of permanent and universal necessity. That poetry which seeks to please through our sympathies must shift and vary, both in its themes and in the manner of treating them, with the changes of society, is a truism on which it is needless to enlarge. If the opinions of men change, if their habits and the objects and associations which interest them alter, poetry must adapt itself to this altered state of things. It does so indeed unconsciously; it cannot avoid doing so; for the poet's own nature has partaken of the change.

Effect of increased civilization on poetry.

It is a more important question, whether the progress of society, the advancement in civilization, and the moral habits and intellectual constitution which accompany it, operate favourably or unfavourably on poetry; in other words, is there reason to believe that the imaginative faculty in poets, and the sensibilities of their readers, decline with the progress of refinement in the arts; or that the imagination no longer finds the same materials in actual life on which its plastic power can be excited?

The tendency of most of the late inquiries into the question has been towards the opinion of its unfavourable influence. The faculty of imagination is supposed to decline as knowledge becomes more exact; the turn for analysis, which is the characteristic of advancing civilization, and which shows itself in the philosophical character which language assumes, is maintained to be destructive of that individuality and distinctness which is the life of poetry; substituting general abstractions for particulars, vague phrases instead of images, and personified qualities instead of men. In a half-civilized state of society, too, life is a romance, a tissue of adventures, powerfully exciting the feelings of fear, wonder, and enthusiasm. In more refined periods these sources of excitement cease; and, even where they exist, they are veiled by the caution which the fear of ridicule produces, a restraint which in the ruder periods of society is comparatively unknown. Hence both the imagination of the poet and the sensibilities of the reader of poetry are chilled. "Poetry," says one of the ablest exponents of this unfavourable view of the effects of civilization on the arts, "produces an illusion on the eye of the mind, as a magic lantern produces an illusion on the eye of the body. And as the magic lantern acts best in a dark room, poetry effects its purpose most completely in a dark age. As the light of knowledge breaks in upon its exhibitions—as the outlines of certainty become more and more definite, and the shades of probability more and more distinct—the hues and lineaments of the phantoms which it calls up grow fainter and fainter. We cannot unite the incompatible advantages of reality and deception, the clear discernment of truth and the exquisite enjoyment of fiction."

Yet these observations, though true to some extent, must be received also with some qualification. If language loses something in picturesqueness, it becomes far more pliant, far better adapted to convey the exact idea intended; if phrases which originally conveyed images have by long use ceased to be metaphorical, we see that genius is constantly creating and giving currency to new combinations. Knowledge and learning and mechanical improvements, if they tend to repress enthusiastic feeling, at least supply poetry with a host of illustrations unknown to earlier periods; but, above all, it may be doubted whether the enthusiastic and imaginative faculties within us can ever be materially affected by the changes of society, however their outward manifestations may be repressed. Whilst men feel that they are connected with eternity, mysteriously surrounded by influences which they feel and acknowledge though they cannot account for them; whilst love still holds a place in the heart, and carries the spirit of romance into the barest realities of existence; whilst men have a country to honour and defend; whilst they can still be animated to enthusiastic concert in the cause of humanity; whilst the strange accidents by which even our decorous and conventional course of life is at times broken, still present to them a thousand scenes of joy or calamity; there seems little reason to apprehend that the imaginative faculty can ever be so impaired from want of external nutriment or inward vigour, but that a truly great poet will always find the means of speaking to the hearts and sympathies of men, in different language it may be, but with undiminished power.

Still less reason is there for the apprehension, that the materials for description and illustration which external nature offers to the poet are likely to be in time exhausted, or even materially encroached upon. Certainly the first and the more obvious of its features are caught by the first labourers in the field of poetry, with a truth and liveliness which no subsequent efforts are likely to surpass; and if poetical imitation were, like literal landscape or portrait painting, a mere transcript of the scene before us, there might be reason to think that all the more striking aspects and points of view would, in the course of time, come to be exhausted, and the poet driven either to mere repetition in a feebler form, or to seek for novelty by endeavouring to turn to account the materials which his predecessors had thrown aside as least fit for their purposes. But when it is recollected how infinite are the varieties and combinations of which the objects of moral and material nature are susceptible, how largely, too, a creative and changing power is exercised in poetical imitation; and in how many different lights, independently of this process of imaginative change, the objects around us are placed by natural differences of associations in the person who contemplates them; it may be safely assumed that the materials of poetry are inexhaustible.

That poetry must have existed from the very earliest periods is undoubted. As the expression in language, of that feeling of excitement and elevation produced either by moral or material grandeur or beauty, it had its seat and origin in human nature itself, and in its simplest form must necessarily have existed as soon as man felt the desire of recording his impressions, or communicating them to others. In its first shape it may have been destitute either of rhythm or metre; although so close is the connection between that state of the imagination which gives birth to poetical conceptions, and a tendency to assist the effect of these by certain intonations of the voice approaching to musical sounds, that it is far more probable that even from the first something of measure was imparted to it, probably without effort or consciousness on the part of the reciter. At any rate, the power of measure as an assistant to memory, and as furnishing a species of gratification to the ear, apart from the mere effect of the ideas upon the mind, could not fail to be soon perceived and acted upon. At first, in fact, poetry and music seem to have been constantly associated; for the study of music, as something separate from the accompaniment of words, is one which arises only at a later period; and in all the poetical compositions which have descended to us, the elements of versification, or division of lines into certain measures, are discernible.

Hebrew Poetry.

The poetry of the Hebrews is the oldest in the world. It stands apart from all the rest, in solitary grandeur, like a pillar of fire in the poetical wilderness. The poetry of Greece, for instance, only begins to exist centuries after the noblest efforts of the Hebrew muse had been produced and committed to writing. Even the oldest poetry of the Arabians, whose language is a kindred one to the Hebrew, is of far more recent date than the Jewish Scriptures, in fact not much older than the time of Mahommed. The Hebrew poetry, as it has come down to us, seems limited in its field, though within that field it has attained a mastery never excelled. Almost all its compositions are lyrical, and chiefly in the highest department of the lyric, resembling, though in a less regular and artful form, the ode of the classical poetry. Its characteristics appear to be unequalled majesty of thought and expression, a fervour and flow which, more than in any other poetry in existence, suggest the idea of an inspiration or divine afflatus, dictating, through the poet as a mere organ, the sublimest ideas in words of corresponding weight and grandeur; a profusion of imagery and illustration, which, though it at first appears excessive and overpowering to the critic of modern times, and colder climes, is seen upon further study to be in the closest harmony with the Hebrew character, and that of all the oriental nations, and is remarkable for the absence of any thing farfetched or elaborate; a rapid desultory movement from one train of thought or illustration to another, without formally supplying the links in the chain of association which have led to the new topic,—as if the poet relied upon a corresponding excitement in his readers or hearers to supply that elevation and reach of poetical vision necessary for tracing the chain of ideas from first to last. It is certain, however, that to the Hebrews themselves there was much less of abruptness and want of connection in their lyrics than at first sight appears to us; and that slight hints were sufficient to awaken trains of associations to which, from our altered circumstances and character of mind, we have now no clue; and this observation, in fact, applies equally to the Hebrew and to great part of the classical poetry of Greece and Rome.

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When we look to the Hebrew character and poetry, and to the local situation and manners of the country, we perceive a combination of circumstances highly favourable to the growth and development of that department of poetry in which alone they can be said to have attained distinguished eminence. All the elements out of which a great national lyric poetry is formed existed amongst the Hebrews, both as regarded the impulses of the mind and the external influences by which they were surrounded and daily acted on. They had been selected as God's peculiar people from among the nations; they held as it were a commission from heaven, giving them authority over the world; they looked upon themselves as the race from which its Saviour was to spring. They had triumphed, by the divine aid, over the kings, and princes, and Pharaohs of the earth; they had the recollection of all their strange wanderings, their miraculous deliverances, their acquisition of the promised land, and their law given amidst audible thunders and visible smoke from Mount Sinai, in the presence of assembled myriads. They had a religion which, excluding the worship of the Deity under visible symbols, only made the image of the Deity more deeply and impressively worshipped within the temple of the heart and the imagination: while the connection of religion with all the affairs of life; the constant rites and ceremonies and festivals of rejoicing or humiliation; the presence of the Deity, kept before their thoughts by the ark, which was supposed to be his peculiar seat, and the sacredness of which had been more than once guarded or avenged by prodigies; prevented that religion from becoming a mere abstraction, and gave to their conceptions of the Deity a warmth and life peculiarly suited to the poetry of devotion, as blending the ideas of the visible and the spiritual, without any admission of those palpable, material, and degrading conceptions which mingle with and deform, to our associations, the mythological or religious poetry of Grecian polytheism. No commercial pursuits tended to excite among the earlier Hebrews the prosaic love of gain. They were shepherds, husbandmen, or warriors, deriving subsistence from the soil, and attached to it by a train of recollections. Frequent public ceremonies, festivals, jubilees, gave occasion for the assemblage of the people in large masses, for a common purpose; the occasion of all others most likely to call forth, by a common sympathy, the enthusiasm which stimulates the imagination into poetical activity. Add to these a climate bright and cheerful, but admitting also of every variation and interchange of serenity or tempest; a country, the external aspect of which presented the strongest contrasts of barrenness and luxuriance; fertile plains, with mountain ranges of the most bleak and desolate grandeur; gardens like those of Damascus, with dreary lakes like the Dead Sea, whose stagnant waters still spoke of the fall of the cities of the plain, or wildernesses haunted by the lion, the rhinoceros, and the serpent; and it would indeed be matter of surprise if the Hebrew sacred poetry were not characterized by a remarkable feeling of national pride, of sublimity, simplicity, and natural pathos in its sentiment, and by a peculiar freshness, truth, and boldness in its pictures of nature, or illustrations derived from external scenery. The parched plains of Judæa, the rocky top of Sinai, the towers of Damascus, and the gardens of Lebanon and Carmel, supply them with figures or allusions which have an unspeakable charm of picturesqueness and beauty. The climate is vividly brought before us in the allusions to the wellsprings that water the desert, and to the shadow of the great rock in a weary land. We see the simple character of their life in their pastoral images, so constantly derived from the tending of flocks and herds; imagery so congenial to their minds, that it is employed by the Author of our faith in some of the most touching passages of the New Testament. Such is the character of those books of the Hebrew Scriptures which are on all hands admitted to be poetical, though we know too little of the laws of Hebrew prosody to be able to say whether they are written in verse, though a species of rhythm, and apparent equality in the divisions of portions of the sentences, appear to indicate that they are. Such are the Book of Psalms; one of which (the ninetieth) is even ascribed to Moses, whilst several others were the production of predecessors or contemporaries of David. It is certain, however, that those ascribed to him are the finest and the most affecting of the whole, though perhaps not the most magnificent in point of stateliness of diction and imagery. "Nor is it in tragic so much as in joyous expression," says Mr Campbell, "that I conceive the power of his genius to consist. Its most inspired aspect appears to present itself when he looks abroad on the universe with the eye of a poet and with the breast of a glad and grateful worshipper. When he looks up to the starry firmament, his soul assimilates to the splendour and serenity which he contemplates. His lofty but bland spirit of devotion peculiarly reigns in the eighth and in the nineteenth psalms. But, above all, it expands itself in the 114th into a minute and richly diversified picture of the creation. Verse after verse in that psalm leads on the mind through the various objects of nature, as through a mighty landscape; and the atmosphere of the scene is coloured, not with a dim or mystic, but with a warm and clear light of religious feeling. He spreads his sympathies over the face of the world, and rejoices in the power and goodness of its protecting Deity. The impressions of that exquisite ode dilate the heart with a pleasure too instinctive and simple to be described."[1] Such also are the Song of Solomon, the Proverbs, Ecclesiastes, the Lamentations, and the Book of Job, with large portions of the prophetic books, and occasional passages even in the narrative books, such as the Song of Moses and Miriam, Jacob's dying prophecies to his sons, the triumphal chant of Deborah, Balak's involuntary blessing on the people whom he came to curse, and, above all, the exquisitely pathetic and beautiful lamentation of David over Saul and Jonathan. Amongst the Hebrew prophets, viewing their writings apart from their divine inspiration, and merely in the light of poetical compositions, the highest rank is universally ascribed to Isaiah; and that on account of the union of excellencies which his sacred poetry exhibits. Deeply pathetic in some portions, as in those where he paints the destruction which is about to fall upon Judah; awfully sublime in others, as where he describes the descent of the Assyrian king into the regions of hell, while all the dead monarchs of the earth rise up to greet him with reproaches; he rises with equal ease to themes of rapturous exultation, or spreads out in minute portraiture all the tranquil and soothing images of a coming millennium. "Joel," says Mr Campbell, "may be deemed to surpass him in continuity, and both Joel and Habakkuk are at moments more sublime. But their compositions are much shorter than his, and give us not the same conception of copious and unwearied inspiration. Isaiah's genius goes farther on an even wing, and burns longer with an unwavering fire. When he has merely to relate, his language has the utmost plainness; and his expositions are remarkably clear, considering the nature of oracular poetry. He unites the same simplicity with his rich and high visionary scenes, which are neither meagre like Jeremiah's, nor ambitiously overwrought and complex like Ezekiel's. A deliberate air, a divine self-possession, turns the very scorn and wrath of his spirit into movements of grace and beauty."

Jeremiah and Ezekiel belong to the declining period of Hebrew literature. They had fallen upon the evil days of their country, and the influence which its misfortunes and degradation produced on the mind, is peculiarly visible in the melancholy strains of Jeremiah. "His genius seems to bend, his voice to falter, under the burden of prophecy; and though sometimes pleasingly affecting, he generally prolongs the accents of grief to monotony, and seldom avoids tautology except where he abridges the works of other prophets." Ezekiel is the last great prophetic poet of the Hebrew line; and opinions have been divided as to the poetical rank to which he is entitled. Dr Lowth thinks that he is not excelled in sublimity even by Isaiah himself; Michaelis, on the contrary, that he displays more luxuriance in amplifying and decorating his subject than is consistent with true poetical fervour. Mr Campbell adopts the view of Michaelis, but adds, that the fancy of Ezekiel is daring and ingenious. Ingenious hardly appears to be the term applicable to the imagination of Ezekiel, which revels with peculiar pleasure in visions of a mystical, and, it must be admitted, somewhat confused sublimity. Some passages, however, are most powerfully impressive, such as the vision of the four cherubims in the first chapter, and the resurrection of the dry bones in the thirty-seventh, when there was "a noise and a shaking, and the bones came together, bone unto his bone;" and the prophet calls unto the wind, "Come from the four winds, O breath, and breathe upon these slain, that they may live; and they stood up on their feet, an exceeding great army."

But whilst the Hebrew poetry equals, and indeed far excels, that of any other nation in the sacred lyric, it is singularly defective in the other departments. The Song of Solomon, laying aside its spiritual meaning, may be admitted to be a fine specimen of the pastoral: but of dramatic and narrative poetry the Hebrews have left no specimens; for, though the book of Job has to a certain extent a dramatic form, it has clearly nothing of the essential qualities of the drama. This has been ascribed mainly to the theocratic nature of the Jewish constitution, in which the Levites or priesthood formed the sole and literary aristocracy; thus devoting poetry exclusively to religious themes. But, considering the ample field which the Jewish national religious history afforded, it is not easy to see why, if the genius of the people had inclined toward narrative or dramatic poetry, the Exodus, the wanderings in the desert, the wars carried on under the judges, and the many other striking events which gave interest to their annals, should not have been embodied in verse, as they were in prose, in the narrative books of the Old Testament.

But, though the poetry of the Hebrews is the first in the order of time, it cannot properly be regarded as the fountain-head of that literature, the course and connection of which we trace in an unbroken series of great works down to the present time.

The sacred poetry of the Hebrews, no doubt, impressed upon the literature of Christianity some strong and remarkable features; but it was from the fountain of classical literature that the genius of modern Europe first drew its inspiration. It is therefore to Greece that we must turn, as the head of that great family of literature with which we feel ourselves connected by relationship of thought and association.

Greek Poetry

On turning from the poetry of the Hebrews to that of Greece, we are immediately struck with one distinctive feature, which, as applicable to the whole of its poetry, we may notice before adverting to the different departments into which it is subdivided, viz. the more palpable, material, and distinct character of all its conceptions and imagery. This immaterial, vague, and spiritual character of the Hebrew poetry, dwelling more on emotions of the mind than on actions, and on the invisible rather than the outward and visible, is unquestionably to be ascribed in a great measure to the predominance, in the national mind, of a pure and elevating religious creed. On the other hand, the Grecian mind, formed under the influence of a mythology which was in fact a mere deification of the material world, and which certainly exercised no strong influence save on the fancy, banished those themes and trains of thought which led beyond the visible diurnal sphere, and, concentrating its attention upon the present, gave to all its imagery a distinctness of outline, a simplicity and pellucid clearness in the thought, which, if less suited than the Hebrew to the excitement of the evidences of the sublime, was certainly in a corresponding degree favourable to the creation of beauty. The Hebrew poetry, therefore, is contemplative and subjective; the Grecian plastic and objective.

In an outline like the present, of the progress of poetry, it is needless to dwell upon the subject of the antè-homeric poets of Greece. That there were poets before Homer, we know; and this is really the extent of what is known on the subject. That the *art* of poetry had been cultivated to a considerable extent, that its principles had been subjected to reflection and experiment, when Homer lived, is as clear as internal evidence in any case can make it.

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[1] Campbell's Lectures on Poetry, i.

Poetry improves only as painting and sculpture rise to perfection. "In sculpture," says Herder, "what a track must it have travelled over in passing from the figures on the chest of Cypselus to the decorations of the Propyleia and the Minerva of Phidias, or from the sculptures of Dædalus to the Olympic Jupiter. A like track was travelled by poetry in advancing from the rude lays in honour of gods and chiefs to the Homeric Epos." We know, indeed, that many of the minstrels before Homer had sung theogonies and cosmogonies, the adventures of Titans and heroes, of Hercules, Theseus, and the Argonauts; and in all probability the legends of the siege of Troy, and the return of the chiefs engaged in that enterprise, had formed the subject of many a ballad or rhapsody, ere a Homer arose to give them unity, proportion, and poetic life. All these have faded and been forgotten, for the tablet of human memory is narrow, and, to give room for the last and best, the older and ruder inscriptions must be erazed. Not one of these, accordingly, has descended to us in any authentic form; whilst the spuriousness of most of the Orphic poetry is unquestionable. Whether even an Orpheus ever existed, was doubted by Aristotle; and Herodotus distinctly states his belief, that the poets given out as older than Homer were in fact of more recent date.

We do not enter into the details of the question whether the works which bear the name of Homer were the productions of one man, and written in their present form at the period commonly ascribed to them, namely, nine hundred years before Christ, or whether they were originally the work of many rhapsodists, in portions separate and distinct, and afterwards woven together in a collected form about the time of Solon and Pisistratus. The question is, in fact, of less importance in reference to the history of poetry than might at first sight appear. For whatever view may be adopted, it is clear that the spirit, the tone, and the manners which are described in the separate lays, supposed to have been ultimately incorporated in one, are those of the earlier and not of the later period, and that the Iliad paints the Grecian mind and character as it appeared three or four hundred years before the time of Solon, and that from draughts made at the time. If so, the only way in which the adoption of the modern theory of Wolff affects the question is, that it deprives Homer of the merit of one grand general design, consistently followed out. It is certain, however, that whatever difficulties may attend the supposition of the Iliad and Odyssey being written by one man, in their present form, and at the early date ascribed to them, and preserved in the absence of writing by mere oral tradition, the difficulties on the other side are infinitely greater. To suppose that a set of scattered lays, composed by a number of unconnected minstrels, should ever have been made to cohere so smoothly and compactly, evincing such perfect unity of plot and purpose; that they should have been confined to so small a portion of the Trojan legendary history, and have given such prominence to a single Thessalian hero; seems a supposition far more startling than any that attends the belief that the Iliad is the work of a single author. "For inspiration is a solitary creative spirit; and it is not to knots and groups, or accidental fabricators, that she has ever intrusted those great conceptions in poetry or painting, or the fine arts, that have commanded the permanent homage of mankind." Many smaller additions, by other hands, in the same spirit and style, may have been afterwards superinduced upon the original work of Homer. (See the article HOMER.)

Epic poetry.

The two great poems of Homer are the first specimens of *The Epic*, or narrative poem. It is, in fact, from the Iliad in particular that our conceptions of an epic poem have been derived, and its canons deduced. What Homer has done has been consecrated as establishing inviolable rules to be observed by his successors. The epic is, upon the whole, the noblest form of poetry; that which demands the highest and most sustained power of imagination, combined with the simplest and purest taste. The power of tragedy is greater for the moment; for its presentations, assisted by action and visible form, are more vivid; but the epic, possessing a wider compass, and painting only by words to the eye of the mind, has a more diversified, enduring, and tranquil operation. Rapidity, strength of passion, vehement and animated dialogue, are the essential requisites of tragedy; a calm, sustained, progressive, and sober majesty the characteristic of the epic. "Of dramatic pieces," says Herder, "we remember sentences; the characters move before our eyes, we feel their emotions with them. But this emotion being stronger, is also briefer; it passes away. The epopee, with its more quiet working, with its proportions too vast for any stage to compass, fills the soul, and there abides." The other points noticed by Aristotle, "revolutions of fortune, recognitions, characters, passions," are common to both, as well as to fictitious composition in prose. Every romance written on any high principle is, in fact, a prose epic; the epopee in verse merely adds to the other sources of interest the charm of poetical diction, and of those elaborate ornaments of figures and similes, which, though stately and appropriate in verse, only produce a bombastic and ridiculous effect in the prose of Fenelon, or still more in that of Macpherson.

Essentials of the epic.

An epic, then, is the poetical development, in narrative, of some great and interesting event, or series of events, sufficiently separate from what goes before or follows, to possess the character of a whole; having, therefore, a clear and distinct beginning, middle, and end; an action simple at first, leading into a complication of plot, and terminating in a natural and soothing solution. These are its essentials; amongst its accidental features are the employment of supernatural agency as a medium either of heightening emotion or of conducting the plot; the introduction of episodes, of formal addresses, invocations, and similes; matters which have no essential connection with epic poetry, and the propriety of the introduction of which varies with the theme, the age, and the national associations of the poet.

How far suited to modern times.

To the confusion of these accidental qualities, many of which are certainly quite unsuited to the taste of modern times, with those essential features which must have an equal interest for all time, must be ascribed the numerous failures which in modern times have thrown a certain discredit and air of ridicule upon the epic poem; as well as the belief that appears to prevail, that the time for epic poetry is past. Unquestionably any epic now written which deals with fabulous mythologies or exploded superstitions, and employs in the nineteenth century the long elaborate speeches, the minutely touched similes, the formal enumeration of ships, and muster-rolls of regiments, which suited the primitive times of Homer, when description was new, will probably share the fate of the Leonidas of Glover, or the Epigoniad of Wilkie. But in the hands of a poet selecting a theme of sufficient natural and human interest, remote enough to allow play for the imagination, yet near enough to make us understand and sympathize with his actors, and treating it, not in a slavish spirit of imagination, but with the vigour and independence of original thought, we are persuaded that the epic would be found to have lost none of its power. It seems to be an entirely mistaken opinion, that the epic is only the production of an early and comparatively simple state of society, and therefore unlikely to harmonize with the more complex nature and critical taste of more advanced civilization. On the contrary, the Jerusalem of Tasso, the Paradise Lost of

Milton, and the Lusiad of Camoens, the only three modern epics which deserve the name, are the productions of what may be termed the golden age in point of taste in each country, and of individuals uniting to poetical inspiration all the stores which the widest reading and most sedulous cultivation of learning could supply.

The Homeric epics, and their characteristics.

The great poems of Homer are distinguished from all modern epics, by their wonderful air of truth, their broad clear portraiture of character, infinitely varied, and yet not antithetically contrasted; their perfect absence of all affectation, false sentiment, or exaggeration, either in character or sentiment; their calm and impartial spirit; their serenity, cheerfulness, and good sense. Such a union is indeed not to be expected in a modern state of society; after poetical description has already traced all the leading outlines both of moral and material nature, and when men, insensibly and unavoidably subjecting the influences from things without to a process of intellectual chemistry from within, and thus, connecting them with peculiar associations, cease to have either the power or the inclination of simply reflecting back on their verses, as in a mirror, the impressions of nature as they fall upon the mind. Neither, although the power of delineation existed, can it ever be expected that such materials for broad, simple, and effective painting can be found in modern times, when differences of character are veiled, if not in a great measure obliterated, by community of education and habits, or are converted into mere humours or peculiarities, to which the shades of distinction are too minute for any grand poetical effect.

Even the greatest of our modern epic poets, in painting the manners and the moral habitudes to which chivalry gave birth, laboured under the disadvantages of pourtraying feelings which, springing, as they had done, out of a visionary and unreal, because exaggerated sentiment, had a tendency to run into caricature, and to give a monotonous and hyperbolical cast to their delineations of human character. The beings painted by Homer, who himself lived upon the outskirts of the heroic times of Greece, were in their features the men whom he saw around him; beings natural, open, and unsophisticated, both in their good and bad qualities: the manners simple, primitive, and homely, yet not without a touch of grave courtesy and refinement; the scenery which forms the foreground or background of his human groups as yet undepicted, the incidents through which they pass unhackneyed; all nature was before him where to choose: while the language which was to be employed as the medium of his art, neither debased by vulgar associations, nor diluted from its original freshness and strength by metaphysical refinements, which diminish its picturesqueness in proportion as they render it more complex and philosophical, affected the mind with all the distinctness of sounds and colours, and stamped upon it an impression fresh and immediate, as from the signet of nature.

The power of invention displayed by Homer in his two great poems in the conception of character, can only be fully appreciated when we recollect, that the germ or outline of almost every character which has since figured in epic poetry is to be found in the Iliad. Now, though the wonderful variety of his incidents, his battles, sieges, and storms, his nocturnal adventures, his combats of gods and men, and his scenes of enchantment, may have been in a considerable degree derived from his predecessors, and, in fact, the hereditary and traditional *properties* of the ballad minstrels of Greece, it is impossible to conceive that he could have derived much aid from this source in giving individuality and life to character. And yet, with the exception of characters under the influence of the passion of love, such as Dido, Armida, and Erminia, scarcely any substantial addition has been made to the picture gallery of Homer by later epic poets. His characters, in fact, have been like stereotypes, from which new impressions are constantly reproduced. Achilles, with his union of ferocity and gentleness, generosity and vindictive feeling, has been the model of all our mixed characters of passion since, and reappears in Turnus and Rinaldo; just as the kingly Agamemnon, with his grave dignity, has formed the archetype of those which represent the ascendency of reflection, and the moral power of sustained and tranquil grandeur, as in the Godfrey of Tasso's poem.

The Iliad.

The characters of the Iliad are naturally the more varied, because its subject was a great public event, and the actors were the congregated princes and heroes of Greece and Asia; the Odyssey is the poem of domestic life, the tale of the fortunes of a single hero, to whom all the other personages are purposely placed in subordination, but whose character, by this isolation, gains a degree of distinctness and natural truth absolutely unequalled in fiction, save in some of the creations of Shakspeare. The remarks of Mr Campbell on the characters of the Iliad are so just and beautiful, that we cannot deny ourselves the pleasure of quoting them.

"Achilles, in the centre, is of the order of spirits that electrify and command mankind. His alarming and sensitive being is the soul of the Iliad, and his very absence and repose are the causes of its disastrous action. He is unquestionably ferocious, but his quarrel is just; he is wronged, high minded, hating falsehood like the gates of hell, young, beautiful, and predestined to fall. Casual glimpses of his manners are also given, that interestingly soften our conception of him. He is the only hero of the Iliad who amuses himself with music and poetry. The deputies of the army find him in his tent playing on his lyre, and chanting heroic songs; and, though he knows their hateful errand, he receives them with a calm and manly benignity. Horace does him injustice when he calls him a disclaimer of laws, and inexorable; for he melts into tears at the prostrate gray hairs of Priam, the father of the slayer of his friend, though he had lately withstood all the eloquence of Nestor.

"It shows the security of Homer in his inspiration to have introduced such an opponent to Achilles as Hector. But when he leads us to Troy, he makes us Trojans in our affections, and almost seems to become so himself. Prodigal in sympathy with the events and agents which he conjures up, his imagination as tenderly conceives the lamentations of Hecuba, and the heart-sick swoon of Andromache, as it makes itself impetuously congenial with the vengeance of Achilles. Like nature, he is fruitful in creating characters, and, like her, impartial in distributing and intrusting virtues to contending parties. Conscious that Achilles could shine by his own light, he fears not to show us his image through tears for the fate of Hector. In delineating Hector by the eulogies of his weeping country and friends, the climax is exquisitely perfected by Helen. All others who had bewailed him, she says, were bound to him by reciprocal ties; but hers was the grief of gratitude for the undeserved and gratuitous kindness of his mighty heart. He had interposed when others had reproached her; he had soothed her when her tears flowed at their reproaches.

"Æneas creates a less ardent, though still respectable interest; and it is increased by a hint, which is thrown out with an air of minute historical probability, that Priam was jealous of his greatness, and that his virtues had been partially thrown into the shade. What expression in every figure of this mighty tablet! What diversity even between men incompetent to great actions; as between the abject coward and vulgar braggart Thersites, and the gay good-natured Paris, whose spirit, though sunk in luxury, still shows some traces of his noble breed! The stout heart and arm of Ajax stand him in lieu of all piety, craft, or sensibility; whilst Sarpedon, bleeding in warfare not his own, spends his last generous breath in exhorting the brave to rally the battle. Homer is above all artificial antithesis in the painting of character; but in describing natures remotely different, he could not avoid exhibiting contrasts; and that which is visible between Achilles and Ulysses is as perfect as heroic nature can afford.

"The youthful Diomed is, among the Greeks, next to Achilles, the apparent favourite of the poet: all spirit and lustre, his valour burns like 'the unwearied fire that plays on his shield and crest.' Like Achilles, he is insulted by Agamemnon, who charges him with cowardice on the eve of battle; but he is wise as well as warlike, and it is not till his actions have belied the imputation, that he retaliates upon his commander. When the Greeks have been worsted, and when Agamemnon proposes abandoning the siege, Diomed, the youngest of all the chiefs, rises in the council, and gives him a dignified rebuke. Agamemnon himself is not without the virtues of fraternal affection, and willingness to listen to able counsellors. He has also his day of distinction in the field. But his importance altogether is more royal than personal, and his faults are made conspicuous by his supremacy. Alternately presumptuous and despondent, he is the readiest to tax others with deficient courage, and the first himself to despair under public reverses. He is also unmerciful in victory. The cry for quarter is addressed to him in vain, and he makes two of the most atrocious refusals to spare that occur in the Iliad. It has been remarked, that Homer speaks as a friend to royal government; but still he describes it as too limited, or rather as too undefined, to be despotic; and the chiefs in the councils of the Iliad present us with a sort of Greek picture of Gothic feudalism. And if he shows respect for monarchy, he makes his kings no monopolists of virtue. In poetical justice, he seems to have thought it sufficient to give Agamemnon the diadem, and a few good qualities, as his share of importance in the poem, leaving brighter heroic endowments to chiefs subordinate in political power.

"Amidst these forms which the Iliad exhibits in the bloom or strength of heroism, the aged characters are no less happily distinguished. Nestor looks back on a life of greatness and wisdom:—he has no rival in venerable years; his powers have reached the last ripeness of experience, but they have also something of the mellow tint that precedes decay. He dwells on his own exploits with an egotism and fulness that could only be endured in the most ancient of men. Phœnix, the friend of Achilles, on the other hand, is also old, but his youth had been embittered by misery and vindictive passions; and when he comes to exhort the hero against excessive resentment, he confesses his early errors in a tone very different from the self-complacency of Nestor.

"Priam is neither very wise nor energetic; but his heart is warm with natural affections, and his woes and years sustain our reverence and solicitude. When the wail of the Trojans bursts from their walls, at the sight of Hector dragged in triumph by his conqueror, when the frantic father implores his friends to let him go forth and implore the pity of the destroyer, the struggle of his people to detain him, and the voice of his instinctive agony, surpass almost everything in the pathos of poetry, and affect us more like an event passing before our eyes, than a scene of fictitious calamity. Never was the contrast of weakness and strength more fearful, than when he throws himself at the feet of Achilles, whilst his feeble perspicacity makes us tremble at every moment, lest he should light up the inflammable temper of Achilles, fluctuating between wrath and compassion. Yet, hallowed by paternal sorrow, age and weakness prevail. The old man accomplishes his point, and the terrific victor condescends to the delicacy of even veiling Hector's corpse from his view."

The Odyssey.

The Odyssey, with certain common resemblances to the Iliad, is marked also by striking differences; so great, indeed, as to afford room for believing, not that it was the work of several hands, but that it may be the work of a different poet from the author of the Iliad. None of the gods and goddesses who play a part both in the Iliad and Odyssey appear the same in the latter poem as in the former. Jupiter, the representative of force or power, and the arbiter of all things in the Iliad, resigns the conduct of the hero to Minerva, the personification of wisdom. Menelaus, Helen, and Ulysses himself, leave a different impression on the mind. Manners and morals have changed. There is a perceptible advance in knowledge and the mechanical arts. There seems a decline in physical strength. The chivalrous spirit of the Iliad is exchanged for a more prudential and calculating one. Voyaging and wandering come in place of warfare. The qualities most valued are no longer the wild strength and energy of Achilles, but the self-possession, energy, forecast, invention, and eloquence of Ulysses. The agency of Magic, in room of a purely divine agency, a power of which we have no hint in the Iliad, finds a place. Wonders and prodigies are scattered with a profusion unknown to the Iliad. Many portions of the Odyssey have an air of resemblance to the Arabian Nights; and Sinbad would seem to have borrowed more than one of his adventures from Ulysses. It is not even difficult to perceive that the vocabulary and syntax of the language have in some measure altered. Each poem seems, as Herder remarks, to have its peculiar atmosphere, its sky, its panorama of objects in the upper, the middle, and the nether world.

Ulysses, the hero of the latter poem, is a conception more in harmony with ancient than modern views of heroism. Our ideas on the subject have been so strongly influenced by those notions of the point of honour introduced by chivalry, that we do not easily sympathize with a hero who, though not deficient in bravery, is always more ready to employ craft than courage, and only appeals to arms when artifice is found to be ineffectual. The character embodies, as Mr Coleridge observes, the idea of an accomplished man of the world, after the manner of ancient paganism; and it is therefore with some effort that we, whose ideal of such a personage is so different, interest ourselves in his fate. Yet he does make his way at last into our affections. His character grows upon us like the gradual influence of good sense. Human traits peep forth under the guise of impassive constancy and caution. His home-sick longings for Ithaca, his abandonment to the power of love under the influence of Circe, remind us of our common humanity. He bears his trials so firmly, he steers through difficulties with such tact and skill, and meets danger, when it must be met, with such self-reliance and courage, that he gradually acquires our admiration; and when we become more familiar with the kindly and warm affections which, after all, burn on in his breast beneath the crust of stoicism, he at last engages our sympathy and our love.

Hesiod.

The poems of Homer are at once the first and the last great specimens of heroic song in Grecian poetry; for it were out of place, in an outline like this, to allude to the middle school of the epic, while even the attempt to revive heroic poetry in the Alexandrian period only proved that its life and soul was extinct. Even in the Odyssey, as already mentioned, we perceive a decline of the enthusiastic and chivalrous spirit, a tendency towards the commercial and the peaceful. Imagination is gradually "fading into the light of common day." This tendency appears, however, far more remarkable in the works of Homer's immediate successor, Hesiod. We say successor, because, although some authorities represent him as older than Homer, and Herodotus speaks of him as Homer's contemporary, the balance of evidence is clearly in favour of the superior antiquity of Homer. The precise date of his appearance,

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however, cannot be fixed with more precision than as having been between eight and nine hundred years before Christ. The works which bear his name consist of the Weeks and Days, the Theogony, and the Shield of Hercules, of which the latter is generally regarded as spurious. Looking to the subjects and character of his poems, which are of a domestic and peaceful character; to his style, which, though highly natural and simple, is, in the main, flat, level, and uninspired by high imagination; we should almost imagine that a full century must have elapsed between the Odyssey and the Weeks and Days. The time, adventures, battles, moving accidents by flood and field, and expeditions undertaken to recover some fair runaway "that enchants the world," seem to be for ever gone. In their stead we have an account how labour fell to the lot of man, the story of Pandora, our gradual degeneracy from the gold to the iron age, precepts of agriculture and commerce, moral and religious admonitions, which have much the air of trite proverbs and commonplaces of what deserves no better name than cunning and worldly wisdom; every thing, in short, indicates the triumph of the spirit of peace over that of war. The Theogony is in a somewhat more ambitious style; and, as a catalogue or muster-roll of the Grecian divinities, with a regular deduction of their genealogies, is curious. Unfortunately, however, its finest passage, the battle of the gods and Titans, a piece of genuine vigour and sublimity, appears so different from the style of Hesiod, that it would rather seem interpolated at a later time by some scholar, whose work has in this case very far surpassed his master's. On the whole, Quinctilian has criticised Hesiod with judgment and fairness. "Raro assurgit Hesiodus, magnaque pars ejus in nominibus est occupata; tamen utiles circa præcepta sententiæ lenitasque verborum et compositionis probabilis, daturque ei palma in illo medio genere dicendi."

The Homeric hymns.

The Homeric hymns, a series of compositions in praise of the gods, and probably of a date a little later than the age of Hesiod, seem to bridge over the passage from the epic and heroic poetry to the lyrical. The steps of the transition may even be in some measure traced, in the gradual ascendency acquired by the musical accompaniment which had from the first been employed in the recitation of the epic, but to which a greater prominence was given in the hymns, thus leading on to the decided influence of the lyre and pipe, and consequent accommodation both of the form and character of the poetry to that lyric mould in which it was thenceforward to be cast. Terpander himself composed the music for these Homeric rhapsodies; and Hesiod is said to have been denied admittance to the Pythian games because he could not accompany his verses on the harp. These hymns, strange, quaint, some almost comic; others, like that to Hermes (the finest of all), full of a wild and dancing gaiety; almost all treating the inhabitants of Olympus with a free and easy familiarity; abounding in rapid transitions, invocations, and reflections or sentiments of the writer; prepared the way for the more regular lyric, as it appeared in the strains of Archilochus (about 700 B.C.), to whom is assigned the distinction of being the father of the Grecian lyric.

The lyric poetry of Greece.

The perfection of the Greek lyric had grown out of the intimate connection of poetry with music, fusing the finest results of both into a whole, which, charming the senses and the soul at once, hurried away the listener with an irresistible sweep of enthusiasm. Every thing in the circumstances of Greece contributed to its rapid development and unfailing effect. A spirit of gaiety and social enjoyment was the national characteristic, heightened by the influence of a delightful climate, and by a religion whose airy and fantastic character interposed no gloomy reflection to check the enjoyment of the present. The public and family festivals, sacrifices, games, and poetical contests, assembling multitudes together, exciting the spirit of rivalry, and gratifying the poet as it were with a foretaste of his poetical immortality, the high honours and distinctions everywhere paid to song, rapidly advanced the art to perfection. It is probable, that if the whole mass of the Greek lyric poetry could now be recovered, not only would Horace, Catullus, and the Latin lyric writers, be unquestionably shorn of many of their finest passages, but, in all probability, we should be presented with the noblest and most varied collection that the world has ever produced. For if the light luxurious Bacchanalian spirit of the time be imaged in the graceful trifling of Anacreon's festive songs, we know how the deeper and more gloomy sentiments of a genuine passion were embodied in the burning lines of Sappho; the ardour of military enthusiasm in him who sang his verses to the Spartan fife, Tyrtæus; the inspiring themes of patriotism in "Alcæus, fancy drest, singing the sword in myrtles dressed;" the touching tenderness of maternal affection in the Danae of Simonides, weeping over her child in her frail and sea-beaten prison; and, above all, the loftiest strains of religious fervour, the praises of demigods and heroes, all the pride, pomp, and circumstance of human existence, in the odes of the greatest master of the Grecian lyre, Pindar. But, unfortunately, of the works of the nine who are enumerated by the ancients as forming the constellation of the lyric writers, and embracing the period from the death of Hesiod down to the great era of the Persian war, viz. Pindar, Bacchylides, Sappho, Anacreon, Stesichorus, Simonides, Ibycus, Alcæus, and Alcman, some have completely perished, and of others only the most trifling fragments remain. Anacreon and Pindar are the only two of which we possess any considerable specimens.

Sappho.

Judging from the few fragments we possess of Sappho, the loss of her works is particularly to be deplored; for she appears to have possessed not merely that wild fire and hurry of passion which predominate in her celebrated ode (with which every one is familiar in the version of Phillips), but a tenderness of heart, a power of presenting imagery in a line or a word, not surpassed by any of the ancient writers, and justly entitling her to the lofty title of the Tenth Muse, bestowed upon her by antiquity. How exquisite, for instance, is the fragment preserved by Demetrius Phalereus,

’Εσπερε παντα φερεις
φερεις οἰνον, φερεις αἰγα
φερεις ματερι παιδα.

Thus expanded, yet scarcely improved, by Lord Byron:—

O Hesperus, thou bringest all good things
Home to the weary, to the hungry cheer,
To the young bird the parent's brooding wings,
The welcome stall to the o'erlaboured steer;
Whate'er of peace about our hearthstone clings,
Whate'er our household gods protect of dear,
Are gathered round us by thy look of rest;
Thou bringst the child too to the mother's breast.

Pindar.

Pindar unquestionably occupied the highest place among the Greek lyrists; and though it is certain that we are in possession of only a small part of his works, for he appears to have written on every variety of theme, enough remains to satisfy us that the judgment of antiquity, which raised him to the lyric throne, was well founded. Forty-five triumphal lays, in honour of the victors in the public games, have descended to us, and the character and peculiar merits of these have been described with such eloquence, and at the same time critical justice, by Sir Daniel Sandford, in his able sketch of the rise and progress of literature, that we quote the passage in preference to any remarks of our own.

"The most careless reader of these odes must be struck by the excessive admiration of wealth, magnificence, and every species of greatness, to which we have alluded as a characteristic of Pindar's mind. Splendour was the passion of his soul; splendour of achievement, splendour of renown, splendour of station and outward circumstances. His very pride seems to have suggested to him that nothing but splendour was worthy of his muse. His genius, to use a figure of his own, was the eagle of Jove, that would not be severed from the sceptre and the god. These aristocratic predilections, this enthusiastic attachment to munificent monarchs and chiefs of ancient fame, were in perfect unison with the whole tenor of his destiny; born as he was in the midst of the Pythian festival, living surrounded by shows of solemn pomp, and dying, as he had lived, in the full blaze of public ceremony, in the centre of a theatre, and while rapt in those emotions of rejoicing sympathy which such scenes were sure to awaken in his bosom. To those, however, who may deem apology requisite for the indulgence of so stately a temper, it may be urged in behalf of Pindar, that, as in the case of many remarkable poets, the abstract feeling of veneration was predominant in his mental constitution, and that it was called forth not merely by rank and opulence among mankind, but even more powerfully by the contemplation of the divine attributes. Hence that glow of piety which shines so brightly in his odes, sometimes breaking out in expressions of the deepest awe, or in sublime pictures of deity, and sometimes assuming an aspect of moral beauty, adding force and lustre to the lessons of wisdom. The latter modification of religious feeling has given birth to some of the noblest passages in the poetry of Pindar. He was well aware that emotion does not exclude sentiment; that the ethics of the heart are not less sound than those of the brain; and that nature is often hurried, in moments of excitement, into the innermost shrines of truth. But he knew likewise, that the philosophy of such moments is prompt and peremptory; oracular, not syllogistic; and this knowledge has secured him from frequently offending against the genuine character of lyric song by lengthened trains of moral reflection."

When the lyric poetry of Greece had reached its perfection in Pindar, its drama rose into shape and grandeur in the tragedies of Æschylus. But for the history of the progress and decline of the Greek drama, tragic and comic, the reader is referred to the article DRAMA in this work.

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Little remains to be said of the declining portion of Greek poetry. General corruption, introduced by luxury, and the evil principles of the sophists; loss of liberty, when all the powers of Greece had yielded to the sway of Alexander; the introduction of a tumid oriental taste into eloquence and composition in general; such are the features which mark the period from the rise of Alexander the Great to the extinction of the poetical literature of Greece. After the death of Alexander, indeed, a strong effort was made by the Ptolemies to render Alexandria the rival of Athens, and to assemble about their court poets, orators, and men of science. In the latter point only their efforts were successful. Science continued to flourish, and long after Greece had ceased to produce any great works in the fine arts, we find geometrical invention carried to a height by Euclid, whilst the wonder-working science of Archimedes struck the Romans at the siege of Syracuse with terror and astonishment. But eloquence remained, as before, hollow and pompous, whilst poetry was in a great measure wasted in the vain attempt to give life and interest to the abstractions of science. This was the period of the learned or didactic poetry. Mythology, astronomy, botany, were the favourite subjects to which the art of the poet was devoted. One attempt, however, to revive the epic taste is visible in the elegant Argonautics of Apollonius Rhodius. He cannot indeed be regarded as an epic poet, for he wants fire and originality; but he is a graceful compiler of traditions, the effect of which he heightens by occasional touches of tenderness.

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The most interesting, however, and by far the most original, of the works of the decline of Greek poetry, are the Idylls of Theocritus (270 B. C.). One is at first surprised to find the appearance of the bucolic or pastoral poetry, so late in comparison with the heroic, the lyrical, and the dramatic. As it seems to paint a primitive period of human nature, we are led to think that it would be one of the first forms in which poetry would appear. The truth is, however, that it has generally made its appearance, and has always been most popular, in ages of great social refinement, when excess of luxury in the life of cities drives the mind back upon the supposed simplicity of rural life and its occupations. Such was the case with the Greek Idylls of Theocritus, with the Bucolics of Virgil; with the pastoral dramas of Tasso, Guarini, and Bonarelli; and with the pastorals of Pope and Phillips. They are all the growth of a period of great literary refinement. Frederick Schlegel observes justly, however, that there is an essential error in isolating pastoral poetry, as is generally done, and viewing the country life abstracted from its due situation in that picture of the world and of human life which it is the province of poetry to unfold. "Let us reflect for a moment on those passages in the heroic poems of antiquity, or in the chivalric romances of the moderns, which afford us glimpses of the simplicity and repose of rural manners. Their simplicity appears still more innocent, and their repose still more peaceful, from the situation in which they are placed in the midst of the guilty tumult of wars, and the fierce passions of heroes. Here everything appears in its true and natural connexion, and the poetry is as varied as the world and the men which it professes to represent." It is certain that this treatment of the rural life as a department of life, by narrowing within the most confined limits the materials of the poet, is the cause of that monotony which is generally found to pervade pastoral poetry. Nothing, in fact, becomes more wearisome than the repetition of Arcadian descriptions of the golden age,

Lactis uberes
Cantare rivos atque truncis
Lapsa cavis iterare mella.

But this fault is more prominent amongst the modern, particularly the Italian pastoral writings, than in Theocritus, who has in general painted his shepherds and peasants with a natural and manly simplicity, approaching even, as it seems to modern ideas, to coarseness. His Idylls, as indeed the name implies, are little poetical pictures or representations in miniature, sometimes of mythological subjects, at other times of matters of common life, but almost always amatory in their purpose and termination. With Theocritus may be classed, though far inferior to him in vigour, the "showy Bion and the delicate Moschus," the last names of any note which precede that period of exhaustion, when, the days of high imagination and great works being over, those of mere cleverness and neatness of execution, of slender trifles, epigrams, and anthologies, commenced.

LATIN POETRY.
Its rise.

But as the genius of one nation, yielding to the force of circumstances, declines, nature seems to provide a principle of compensation in the development of that of another. The course of literature and poetry appears to resemble an arctic summer, in which the sun scarcely dips in one quarter of the horizon before he re-appears in another. While the creative energies of Greece either sink into barrenness or expand into a rank and unwholesome luxuriance, as her morals are corrupted, and her liberties impaired and at last extinguished, we perceive in the Italian peninsula the rise of a national character and a literature, destined, alike in arts and arms, in polity or in literature, to give laws to the world.

This not till centuries after the existence of Rome.

Yet Italy, free and independent as she was, and animated by a consciousness of national pride and growing power, exhibits during the first five centuries of her history (735 B. C. to 253 B. C.) a mere blank, so far as poetry is concerned. That she *may* have possessed legendary ballads founded on those various mythic or semi-historical traditions which were afterwards interwoven by Livy into his history of Rome, is not improbable; but of the nature of these we know nothing, of their existence at all we have no certain traces; and nothing can be more fanciful than the extent to which Niebuhr, Schlegel, and other German writers have carried their conjectures on this subject.

Livius Andronicus.

In fact, we know nothing of Roman poetry prior to the introduction of the Greek language and literature, through the conquest of Tarentum (272 B. C.) and Magna Græcia; soon after which the rude attempts of a Greek slave, Livius Andronicus, to translate the Odyssey of Homer into Latin (240 B. C.), first gave the victors some idea of the poetical treasures of that nation, to which, though victors in the field of warfare, the Romans felt their inferiority in the more peaceful domain of literature. His preferring the wilder and more homely of Homer's poems to his more imposing, elaborate, and dignified performance, only showed that he rightly apprehended the tendencies of an infant taste. Children as they were in poetry, the power of the marvellous had attractions for the Romans, which that of simple yet heroic truth would probably not have possessed. The efforts of Andronicus to diffuse a taste for Greek literature did not stop here; for he was the translator also of several specimens both of the tragic and the comic drama of Greece.

Ennius.

He was succeeded by a Roman poet of original though coarse and unequal genius, Ennius (239 B. C.). Yet, with strong originality of mind, he was a worshipper of Greek literature; and his influence on his successors is probably owing in a higher degree to what he transplanted from the soil of Greece, than what he reared from the independent stores of his mind. He attempted by turns, epic, tragic, satiric, epigrammatic, didactic, and even acrostic poetry. He versified the Roman Historical Chronicles, a poem of which few specimens survive, but these calculated to excite much regret that a work, executed with so much force and feeling in parts, should have been irrecoverably consigned to oblivion. His vigorous and forcible style, with all its rudeness, conceits, and ridiculous jingles, appears in its better parts to have possessed great charms for the best judges of diction at an after period; for we find that Virgil, Lucretius, and Ovid, and particularly the first, have availed themselves most liberally, not only of the ideas, but of the precise expressions, and frequently whole lines, of Ennius;[1] while Horace, who seems to have had a warm feeling of the poetical fire that lay under the rude crust of the verses of Ennius, after citing two of his lines, says that the "disjecta membra poetæ would appear visible," however their arrangement might be transposed; a result which, he fairly admits, would not be the case with regard either to the satirical works of Lucilius or his own.

Plautus and Terence.

Neither in Ennius, however, nor in his dramatic successors, Plautus (died 184 B. C.) or Terence (born 195, died 159 B. C.), do we meet with much that is truly national. In all we are in fact perusing Greek compositions in Roman forms; for the plays of Plautus and Terence present to us, not the aspect of Roman life, but the state of Greek society, pretty much as it had appeared in the days of Menander. In the former we perceive more vigour, more variety, broader humour, but at the same time more coarseness; in the latter a limited invention, and characters reducing themselves to a few limited classes, generally an over-indulgent father, a profligate son, a rapacious mistress, and a knavish slave; to which Plautus is fond of adding some Bobadil or parasite, by way of relief. Yet in Terence's case we perceive the traces of genius, notwithstanding the close imitation by which he is fettered. His characters have a truthful air, his dialogue is always free from affectation, and sometimes touching and tender in the highest degree. In fact, a few of his best passages in this style are models of apparently artless and yet consummately artful and beautiful expression.

Lucretius.

Two other individuals of distinguished genius precede what is called the Augustan period of Roman poetry, Lucretius and Catullus; the one the most distinguished of the Roman didactic poets, the other unequalled in the short and tender lyric. Lucretius contended with an absolutely unmanageable subject; one which, from its unimaginative character, from the dreary details, psychological, meteorological, geological, which it necessitated, the inherent feeling of discomfort which it leaves behind, and the irreligious character of the opinions which it involves, necessarily interposed the most formidable difficulties in the way of the poet, which it is no disgrace even to the most distinguished genius, and such Lucretius possessed, not to have entirely overcome. It is, in fact, the highest proof of the ability and genuine inspiration of Lucretius, that he has infused a poetical vitality even into the dry bones of that philosophical mummy which he was attempting to animate; that he has treated with a feeling of poetical enthusiasm the coldest and most heartless of all creeds, the Epicurean; so that the very strains which he has employed in combating the belief of the immortality of the soul, bear upon their face the stamp of immortality. "In inspiration and in sublimity," says Frederick Schlegel, "he is the first of Roman poets; as a painter and worshipper of nature, he is the first of all the poets of antiquity whose writings have come down to us."

Catullus.

In Catullus the Epicurean theory, which wears a majestic aspect in Lucretius, appears in a less dignified but more probable form. *Carpe diem* is the motto which might be inscribed over all his compositions; yet with this enjoyment of the present mingles not absolutely a melancholy, but a pensive feeling, which gives a peculiar interest to them all. For compositions of a higher mood and more extended plan, Catullus apparently had as little ability as inclination; his taste was Grecian, and formed in the school of Alexandria; slight performances, epigrams, elegies, little lyric effusions expressive of individual feelings, like the charming lines to Sirmio, or the lament for the sparrow, and polished with the most exquisite felicity of diction, were the subjects to which his talents were devoted. There is, in fact, every reason to believe that his more ambitious performances, such as the Epithalamium of Peleus and Thetis, and the Atys, were simply editions in a Latin form of Greek originals.

The poets hitherto mentioned belong to the period of the republic; in their successors, the poets of the Augustan period, we perceive a considerable change both of spirit and expression. Under the calm but firm sway of Augustus, which had reduced all the contending parties under one powerful dominion, and conferred upon the country the blessings of peace, the art of poetry was peculiarly cultivated and patronized. And it is at this period that the Roman poetry first displays in its fullest extent that feature which Frederick Schlegel considers its truly national and original trait, namely, that exaltation of Rome and of the Roman character; that feeling of the unrivalled energies, the rapid growth and ever-increasing dominion of their country, which formed, to the imagination of the poet at least, an ample compensation for the loss of that liberty which, since the commencement of the troubles of the Gracchi, or the contests of Sylla and Marius, had been little better than a political phantom, or a party watchword with no real meaning.

Virgil

The great representatives of this Augustan period of poetry are Virgil and Horace. No two poets could be more dissimilar in the direction of their tastes, and yet it would be difficult to say to whom the palm of greater genius ought justly to be assigned. Even in his Pastorals, though an early work, the leading qualities of Virgil's mind, his exquisite taste and fine sensibility, are apparent, though they can hardly be considered in any other light than as graceful adaptations, and, it may be safely added, *improvements*, of the subjects and manner of Theocritus. In these he was painting from a painting; he was copying a Greek landscape in the colouring of the Latin tongue. But in his Georgics he drew from his own observation of Italian nature; and, bringing the native excellencies and qualities of his mind to bear upon imagery and events and associations which nature and experience had dictated, presenting us with delicious landscapes varied by all the natural occupations of the Italian agricultural life, gilded by sunshine, clouded by storm, or darkened and disturbed by tempests; combining these in the most dexterous manner with striking allusions to well-known events and catastrophes of Roman history, such as the prodigies which portend the death of Cæsar, or with old mythological traditions; and making the driest details of husbandry, such as the grafting of trees or the breeding of bees, prolific of imagery or of fable consecrated by early associations; the result is one of the most original and at the same time delightful poems which exists.

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[1] Dunlop, History of Roman Literature, vol. i. p. 21.

The Æneid was a great, but, it must be admitted, unsuccessful attempt to do that for Rome and the Roman people which Homer had done for Greece, namely, to give the Romans a great national poem. No one felt this failure more than Virgil. His reluctance to give publicity to the Æneid is well known. He could only be prevailed upon to read to Augustus the first, second, fourth, and sixth books. Several causes may be obviously assigned for its want of success. 1*st*, Not only did Virgil, from the intense admiration he felt for Homer, copy in many respects his characters and design; but he endeavoured to combine the distinct and almost incompatible characters of the Iliad and the Odyssey, the grand and warlike character of the former with the wandering and adventurous character of the latter poem. 2*d*, Although the notion of grafting the adventures of Æneas upon the origin of the Roman nation, was in itself a happy one; and the mythological traditions connected with it might have been brought to bear with much effect upon the subject; Virgil committed the great error from which Tasso has also suffered, of making an epic poem a mere instrument of political flattery, by identifying the character of his hero with that of Augustus. By depriving himself of the open and untrammelled field which the traditional character of Æneas presented, and making that character a mere portrait, *en beau*, of the cold-blooded, calculating, and critical emperor, he lost at once all hold over the sympathies of the reader in the fortunes of his hero, a cardinal point in all poems that pretend to the character of epic. 3*d*, Nay, he even enlisted those sympathies against him; for, as Voltaire, who is seldom wrong in what may be called the logic of poetry, observes, he represents him as a mere adventurer, who in the first place is guilty of the most shameless want of feeling in regard to Dido, whose sole object is to acquire a settlement in Italy; who, in breaking off the match of Turnus with Lavinia, is instigated, not by passion, but by policy; and who would in all probability have most willingly surrendered the Latian princess to his brave and generous though cruel rival, if *he* would have resigned the kingdom of Old Latinus to a Trojan stranger, and taken Lavinia, like Cordelia, without a dower.

Only one substantial addition has been made by Virgil to the characters of Homer, and for that character he may have received some hints from the Ariadne of Catullus; but it must be admitted to be one of the most deeply interesting in poetic fiction, we mean that of Dido. The great night-picture of the sack of Troy, and the episode of Dido, are indeed the finest things in the Æneid. In the character of the Carthaginian princess, we perceive the infinite advance which the delineation of the passion of love has made since the time of Homer. Virgil has begun to comprehend that feeling, with the world of emotions to which it gives birth. And if he has not painted it with all that purity and depth which was imparted to it by Christianity, he has exhibited its leading traits with a warmth and sensibility which make all the other classical delineations of passion both cold and lifeless beside that of Dido.

Horace.

Horace exhibits the singular specimen of a poet borrowing half his thoughts from the lyric writers of Greece, and making his odes a mosaic formed from the gems of other countries as well as his own, and yet imparting to the combination a high degree of unity, and a decided originality of character. Calm wisdom, shrewd penetrating observation of life, a sober enthusiasm, and most refined taste, are the qualities which most distinguish him, imparting to all his compositions extreme point, terseness, and occasionally, in themes of a higher cast, particularly those connected with the elder worthies of Rome, or the lofty position she then occupied in the eye of the world, a stately and solemn grandeur. This admirable balance of mind which distinguishes Horace, and informs all his writings with such pregnant good sense, renders him a peculiar favourite in a country like our own, whose national character is marked by not a few of those features that distinguished the mind of the poet. Hence his odes are more read and quoted, particularly by men of business and practical sagacity, than the works of any of the classic poets.

But the merits of Horace, though most conspicuous as a lyric poet, are great also as a satirist. Lucilius had indeed made the first approach to the regular form of Roman satire; but his rude and harsh effusions can no more be compared to the polished and graceful productions of Horace, than the rugged verses of Donne can be compared with the satires and epistles of Pope. In Horace all follies and lighter vices of the day (for he seemed to think satire scarcely a fit weapon when directed against the darker vices) are touched on in a strain of the most urbane ridicule, which insinuates reproof. As compared with those either of Lucilius who preceded, or of Persius and Juvenal who succeeded him, the tone of the Horatian satire is light and playful. It has been correctly observed, that these satires filled up for Roman literature exactly the department which in our times is occupied by the stage. For as the plays of Plautus and Terence truly represented Greek and not Roman manners, it was in the light form of satire that all those humorous follies and oddities of Roman society, which properly fall within the range of the comic, were displayed and exposed.

The elegiac poets.

The elegiac poets of this period, Tibullus and Propertius, wrote with purity and good taste; the former with more of tenderness, the latter with more of force and mental vigour. But in the extravagant luxuriance and frequent conceits of Ovid, we perceive the commencement of that decline of poetry, which, relieved only by the manly vigour of Juvenal's satires, goes on in rapidly-increasing progression to the extinction of the Roman empire. For the amatory and elegiac poems of Ovid little can be said; they want heart and passion as much as delicacy or propriety of sentiment. But the praise of a teeming fancy cannot be denied to him; he is a mine from which thoughts and expressions may be dug without end; and his Metamorphoses, as a graceful exposition of the finest mythological tales of antiquity, will always retain their interest for modern times.

Juvenal.

We pass over the so-called tragedies of Seneca, the works of a mere school rhetorician; and the satires of Persius, obscure and rugged, though not without a masculine energy. But the name of Juvenal must be mentioned as the last great poetical name that illustrates this period of decline.

In the finer portions of his satires, for it must be admitted they contain a good deal that is level and prosaic enough, he displays the highest talents for this species of poetry; the strength of his language, the fire of his invective, correspond with the gigantic character of the vices which he exposes. But a certain air of exaggeration mingles with and alloys the effect of his censures; we are led to think of the doubtful character of his own life, and to question the title of the moralist to raise the scourge which he applies with such severity to others. A tinge, in short, of that rhetorical and formal character which his mind appears to have contracted in the schools of declamation attaches to his poetry, and leaves an impression of hollowness and insincerity upon the mind.

Lucan.

Lucan's Pharsalia, it must be recollected, was a comparatively boyish effort; but it seems plain, from the character of his mind, that he wanted the highest of the poetical faculties, imagination. He uttered bold and striking thoughts occasionally in the happiest words. No poems afford finer specimens of single lines for quotation than Lucan. But the whole is destitute of poetical warmth; it blazes only with a phosphoric fire. Quinctilian has, in fact, hit with admirable tact the character of Lucan's mind in the remark, "Si dicam quod sentio, oratoribus magis quam poetis annumerandus."

We shall not here touch upon the remaining writers who feebly kept alive the vestal fire of poetry up to the period of the overthrow of the Roman empire of the west; Statius, Claudian, or Ausonius. Even the introduction of Christianity, much as it did towards improving morality, not only among its votaries, but amongst the Pagan nations themselves, could not re-animate to new life the worn out and enervated frame of literature. That could only be effected by sweeping away entirely the old landmarks, making a new heaven and a new earth, creating new associations in all the ideas of men, giving them new hopes, aspirations, and pursuits, and thus restoring that elastic principle of moral and mental vigour, of faith and enthusiastic feeling, out of which all high poetry must spring. From the rude but warlike and uncorrupted nations of the North. was to come that influence which was to give a new aspect to society; at first, like the descent of a deluge, sweeping the remains of cultivation before it, but ultimately depositing and carrying deep into the bosom of the soil the elements of a reviving and healthy fertility.

POETRY OF MODERN EUROPE.

From the fall of the Roman empire of the West, about the close of the fifth century after Christianity, to the appearance of the first great poet of modern Europe, Dante, an interval of seven dreary centuries elapses, a period characterized in popular language by the epithet of the dark ages. During this period the chaos resulting from the overthrow of the old Pagan constitution in religion, government, laws, and social institutions, was gradually settling into shape; the new religion was incorporating itself with and imparting a new form to social life; new laws superseding the subtile and complex jurisprudence of Rome, new languages growing out of its ruins. During the greater part of the period to which we have alluded, literature, in any high sense of the word, did not exist; but the materials of new literatures were accumulating, and the spirit which was to give them breath and vitality, when language should be sufficiently settled for the purpose, was in the course of development, though manifesting itself in other fields and departments than that of poetry. When poetry re-appeared in the thirteenth century, the influence of the intermediate changes which the human mind had undergone became visible in certain marked traits, separating by the broadest distinctive lines the character of the modern European from the ancient classical poetry. A few of these, as applicable to all the modern literatures of Europe, though with differences in degree, may be indicated before proceeding to any notice of these separate literatures.

1. The first and most important is the influence of the Christian religion on the productions of the imagination.

The Pagan religions were mere religions of the fancy; they were nothing but the poetry of humanity. They dealt only with the palpable and the material; and by the combination of the finest features of the actual, they produced an ideal which each moulded to his own fancy. The conceptions of the infinite and the immaterial they avoided. The solemn and the mournful found no place in their thoughts, or, if such ideas did intrude, they were made use of as arguments for present enjoyment. Let us eat and drink, seems the moral of paganism; let us eat and drink, for to-morrow we die.

From this materialism of the ancient mythology, and its purely imaginative character, the results were, 1*st*, great clearness in all its conceptions and its expressions, that clearness which is imparted by the absence of all that is not palpable to sense; 2*d*, a light and cheerful tone, the natural product of that mental indifference, and absence of serious reflection, which the disbelief, or as least doubt of immortality, would produce; 3*d*, the feeling of *beauty* as the object aimed at and accomplished, and the vital principle of all the classical creations.

Very different were the character and the influence of Christianity. This was a revelation, not a creation of the fancy. It spoke to the heart, to the hopes and fears of men, not merely to their imaginations. The outlines of the Christian theology were communicated in a fixed and settled form, with which fancy could not deal at will, or mould them in accordance with its notions of beauty. It excluded at once that plastic power which had formed the excellence of Greek art and literature, and banished mere *beauty* as the aim of the poet, or the principle of modern inspiration.

To the clearness, the sunny lightness of touch, the cheerful levity of tone, which distinguish the classic poetry, it was equally unfavourable. It made the mind familiar with the ideas of infinity and eternity; it accustomed it to abstract conceptions beyond the pale of sense, or the scope of distinct expression; it forced upon its consideration the immaterial and the invisible, as constantly as the Pagan theology had confined the attention of its votaries to the visible and the actual. The Pagan clearness of portraiture, and smiling lightness of tone, were incompatible with the description of regions and states of being, sights and sounds, which eye had not seen, nor ear heard, and which it had not entered into the mind of man to conceive. The Christian poet, before whom, instead of a natural and visible Olympus and Acheron, there stretched out in dim but awful vision the conception of heaven and hell, encompassed by an eternity on this side and on that,—a conception impressed by the sense of moral responsibility, and of eternal punishment or happiness, and animated by a principle of faith based upon things not seen,—could not but carry into the literature which was the expression of his thoughts, and hopes, and fears, some shadow of that solemnity and mystery with which human life was now surrounded. He left this narrow spot of earth, already in the possession of his predecessors, to open up the new and undiscovered country of the abstract and the invisible; and the principle of poetical inspiration which they sought in beauty, he found in *grandeur* and *sublimity*. Hence earnestness and profundity are the means of effect in the literature of Christianity; and elevation rather than beauty may be said to be the aim of the higher poetry of the moderns.

2. The superstitions which grew out of the corruptions of Christianity, and which assumed a systematic form after the crusades had opened to Europe a communication with the East; the belief in spectres, fairies, witchcrafts, and the di-

rect interposition of evil spirits in the affairs of men; gave a different character to the modern literature of Europe. It is true, that in the Canidia of Horace, the Erichtho of Lucan, the Thessalian scenes of enchantment in the Golden Ass of Apuleius, and occasionally in other passages of the classical writers, we have allusions to popular superstitions somewhat analogous to our own; but it is equally plain that these are not matters of serious belief, but of poetical embellishment. They could not, in fact, cohere with any consistency with the framework of the antique materialism, though they might be combined with a religion which assumed the existence of powers unknown to human sense, and of a principle of evil, which, with limited powers, was permitted to oppose the principle of good. These conceptions of immaterial beings distinct from men, but influencing their actions, assumed a reality and appearance of probability, which soon rendered the belief in their existence one of strong practical influence upon society, and of course upon literature. Hence the gloomy and superstitious character impressed upon many of the earlier productions of all nations; and which, during the fifteenth, sixteenth, and seventeenth centuries, manifested itself in such fearful action in the atrocities of the trials and executions for witchcraft.

3. Whilst the Pagan mythology affected only the imagination, Christianity appealed to the conscience, and was calculated to operate practically upon conduct. We see, accordingly, in the history of the middle ages, that religion was not, as it becomes in after ages, a mere profession. often assumed from habit, but a principle of faith, of conviction, and of serious action. We see, through this invisible but powerful agency, a spiritual throne established at Rome, to which, weak and insignificant as it appeared in physical and economical resources, the most powerful monarchs in Europe were content to bow with implicit obedience. During the middle ages, the possession of the keys of St Peter was found a more effectual instrument of supremacy than the temporal sword. We perceive the clergy looked upon as a superior race; their persons and possessions considered as sacred; the rudest and boldest nobles of the time trembling at the thought of their anathemas, courting absolution at their hands, soliciting dispensations, founding monasteries and cathedrals, undertaking penances, pilgrimages, and crusades; and we see them often, in the midst of the fierce career of warfare, as if struck by some sudden inward but irresistible impression, throwing down the sword, exchanging the helmet for the cowl, and wearing out, as is told of our own Guy of Warwick, the evening of a stormy life in the peaceful cell of the hermit. There was in all this much of error, much of impure feeling and doubtful character; but there was also much of truth, much of earnestness; and hence faith and devotion are as visibly stamped upon the literature of the middle ages, as they unquestionably were influential upon its life.

4. Apart from the influence of religion, although not unconnected with it, there were other social changes which had strongly affected the course of feeling and opinion, and could not fail to render themselves visible in literature as soon as it began to assume a regular form. The most important of these was the institution of chivalry, growing out of, and affording an imperfect remedy for, the defects and evils of feudalism; an attempt, in fact, to create a species of police or constabulary, founded upon those principles of generosity and honour which were frequently found associated in the human mind with cruelty or licentiousness, during those stormy days of feudal dominion.

It was not, however, on its warlike and serious side that chivalry exhibited any very novel features; for, as far as regarded merely its spirit of adventure, numerous parallels might be found in ancient story to the exploits of its votaries. The feats of Theseus with the Minotaur, the story of Perseus's deliverance of Andromeda, the Argonautic expedition of Jason in search of the golden fleece, the more celebrated expedition against Troy, all closely resemble the exploits which chivalry prescribed to the members of its order. The true point of view in which chivalry gave a new direction to the opinions of the age, and a new impulse to literature, was in the altered position which it gave to women. It is certain, that before chivalry was known, nay, before Christianity was introduced, a peculiar reverence for women had been shown by the Gothic nations. Tacitus, in his treatise on the manners of the Germans, adverts to this as one of their characteristic features. "Inesse iis etiam *sanctum aliquid* et providum putant." The introduction of Christianity ratified and consecrated this feeling of respect. It made woman the equal and companion, not the slave, of man. But chivalry went a step farther. It reversed the relations in which the sexes had stood during the classical times, and exalted, in theory at least, the softer sex above the stronger and the more warlike. As the best means of arming the helpless against the powerful, it surrounded them with an angelic atmosphere of sacredness, and converted love into adoration, respect into religion. Here, too, there was something affected, but much more that was genuine. This feeling, exaggerated as it seems to us, did unquestionably influence in a high degree the opinions of the age, their tastes, their modes of expression. Its effect upon modern literature has been most remarkable. It has rendered the principle of romantic love almost the mainspring of modern poetry, and of imaginative composition in general. It forms almost the sole subject of the poems of the Troubadours, the minstrels of the south of France, Spain, and Italy, with whose compositions the history of modern poetry properly commences. Dante, the father of the Italian language and poetry, finds the source of the inspiration which dictates his sonnets and canzoni, and at last the *Divina Commedia* itself, in this species of romantic adoration for a deceased mistress. Petrarch's poetry, and his deification of Laura, are one and the same thing. The lyric poets of the fifteenth and sixteenth centuries of Italy seem to have scarcely conceived that any other course than that of imitating Dante and Petrarch in this chivalrous Platonism was open to them. The principle of romantic love is carried by Pulci, Boiardo, and Ariosto to an excess which communicates to it an air of the ludicrous; a reproach, however, from which it is again redeemed by the serious and enthusiastic Jerusalem of Tasso. When in modern times the attempt was made to revive tragedy, it proved totally unsuccessful, until this principle was admitted into the drama to give it warmth and life. Of that species of composition which in its proper sense is peculiar to the moderns, viz. the novel and romance, it forms, as we all know, the moving power. In short, it influences, more or less, every department in which the imagination has exerted itself with success since the revival of literature.

5. Another point in the social institutions of the time, which affects in a considerable degree the spirit of the literature of the European nations in the outset, is the relation of feudal vassalage, the degraded condition of the mass of the people, and the subdivision of the state into so many separate baronies, within each of which its feudal lord exercised supreme authority. This subdivision annihilates that inspiration of *patriotism*, or attachment to country or state, which is very visible in the Roman literature, and more faintly in the Greek, and introduces in its stead the principle of *loyalty* or implicit obedience to the individual superior to whom fortune had given the right of disposing of the destinies of his vassal. Submission to authority under all circumstances, without remonstrance, is represented as the highest of virtues; and a violation of this principle cannot be palliated by any exhibition of courage or self-devotion. A fine illustration of this principle in the moral code

of the feudal times occurs in Schiller's fine ballad of the Fight with the Dragon, founded on a story given as authentic by Vertot, in his History of the Knights of Malta. Rhodes was laid waste by a monstrous serpent, which has already destroyed not a few of the knights of St John, who had been rash enough to engage in combat with it. The grand-master, accordingly, had strictly prohibited any of the order from engaging in the apparently hopeless attempt. One young knight, unable to witness with patience the spectacle of the misery and distress daily caused by the ravages of the monster, ventured to despise the prohibition, and, by dint of art and valour combined, delivers the island from its persecutor. He was conducted in triumph to the hall, where the knights were met in council. The grand-master received him in gloomy silence, reminded him that *obedience* under the Christian creed was the first of virtues, and banished him from the island. The knight, conscious of his error, bowed in silence, divested himself of his knightly mantle, kissed the hand of the master, and was about to go. The stern superior was softened; he called him back, and, presenting him again with his sword and mantle, informed him that his prompt submission and penitence has restored him to the rank which his disobedience had forfeited.

6. One other feature is strikingly characteristic of the earlier literature of Europe, although good taste at a later period has pretty well weeded out its traces, viz. the singular and incongruous mixture of science with poetry. The literary men of the time were learned men, familiar with theology and with the writings of the ancients, and delighted with the abstractions and refinements of a mystical theology and a scholastic logic; and that which interested them in reality, they unconsciously incorporated with their poetry. This tendency tinges the whole Italian poetry, from Dante to Ariosto. Petrarch, even while singing of love, cannot allow the subject to pass without some learned and complimentary allusions to Aristotle. The Spanish lyric poetry of Boscan, Garcilaso, and their successors, is a sort of versified Platonism. The verses of Ronsard, and the other worthies composing that poetical constellation which arrogated to itself the name of the Pleiades, are so full of learned allusions as to be absolutely unintelligible; and the influence of this somewhat pedantic exhibition of ancient literature is undeniable even in our own Milton.

Poetry during the middle ages.

Having premised these remarks on some of the characteristic features of distinction which separate the religious, reflective, warlike, and mystic poetry of modern Europe, from the airy, graceful, and transparent spirit of the classical, we may observe, that although, as we mentioned, nearly seven centuries elapsed before the appearance of any poet of permanent European reputation, poetry was not entirely idle during the intervening period; but, on the contrary, towards its close at least, in a state of high activity and fertility of production. Scarcely, indeed, had the different languages of Europe begun to arrange themselves into form, before poetry in a rude form made its appearance. Most probably in Germany the cradle of the modern poetry of Europe is to be found. By the time of Charlemagne, it is certain that country contained a vast mass of legendary poetry, which was carefully collected, committed to writing by the directions of the emperor, with a view to preservation, but of which scarcely a traditional fragment now remains. Earlier than the time of Charlemagne (A. D. 740 to 814), in all probability, were the lays of the Nibelungen and the Heldenbuch composed, though they have descended to us only in the altered form given to them when recast by Henry of Afterdingen. The former carries back its scenes to the days of Attila the Hun; and in truthful simplicity and vividness of painting, its homely and nervous verses are even yet worthy of admiration. A fund of bold and rich invention is, in like manner, displayed in the Sagas of Scandinavia, the mythology of which, at a later date, came to exert a strong influence over the poetry of Europe.

Provençal.

The Provençal language, the first-born of European tongues, in which Thebaut afterwards sung, and Cœur de Lion expressed his complaints in prison, we find moulded into form about the close of the ninth century. The Provençals had undoubtedly borrowed many things besides rhyme from the Arabian literature of the Peninsula, for an oriental spirit is visible in many of their compositions and much of their imagery. But, on the other hand, they added much from their independent stores; they widely extended the domain of poetry, gave it spirit as well as refinement; they even rendered it, as Villemain observes, a substitute for the liberty of the press; while their forms of versification, canzoni, sonnets, sestine, madrigals, &c. soon became the patterns adopted by all the southern languages of Europe. Their compositions, introduced into Germany through the Hohenstauffen emperors, instantly communicated a marked impulse to German poetry: the numerous band of the Minnesingers of the twelfth and thirteenth centuries are, in fact, the Provençals of Germany.

Trouveres.

In the north of France, again, arises, during the same period, the literature of the Trouveres; a literature of satires and legends, and tales of knavery, licentious gallantry and adventure, destined afterwards strongly to influence the direction of the genius of Boccacio, and his successors the Italian novelists, and to furnish the amplest materials for later writers of fiction. Nor during this creative period were fictions of a higher cast wanting.

Three cycles of legendary romance.

Three leading cycles of romance may indeed be pointed out, which owe their origin to this period. The first consists of the legends of Gothic, Frankish, and Burgundian heroes, during the times of the great northern emigrations, of which the Nibelungen and the Heldenbuch are the depositories; legends breathing a purely northern spirit, and generally having some foundation in history: the second, those which embody the traditions as to Charlemagne's wars against the Saracens, the achievements of his court ot Paladins, and the "dolorosa rotta" at Roncesvalles, where he is represented as perishing with all his peerage. In some of these Charlemagne is strangely represented, not as a most warlike and energetic monarch, but rather in the garb of a lazy and luxurious eastern sultan; a perversion of historical truth which, Frederick Schlegel thinks, must be accounted for by the poems which refer to the emperor having been chiefly written by Normans, who drew their notions of Charlemagne from some of those faineant monarchs of their own days, whom they saw in possession of his throne. It is certain, at all events, that the legends connected with Charlemagne soon became largely interwoven with incidents of a comic cast, and with a mass of absurd and fantastic machinery. The third class of romantic traditions then first embodied in poetry are those relating to the fabulous Arthur, "begirt with British and Armoric knights;" by far the most interesting of which is the celebrated legend of a pathetic and elegiac character, which bears the name of Tristan or Tristram. "Among all the great and epic poems of love and chivalry in the middle ages," says Frederick Schlegel, "the first place is given by all nations to Tristram; but that we may not be fatigued with uniformity of fiction, the airy and lively legend of Launcelot is placed by the side of its more grave and elegiac representations." He traces also in these legends of Arthur and the Round Table a double purpose; an allegorical character, viz. an attempt to shadow forth the ideal of a spiritual and Christian knighthood, imparting to them in general a higher character than to the corresponding traditions of Charlemagne.

The Monkish hymns.

One other class of the compositions of the middle ages may be alluded to, their monkish hymns, written in Latin, that is to say, the bastard Latin of the period, and generally in rhyme. They cannot indeed be praised for their novelty of thought, or high imagination; but their earnestness of purpose, whether in describing ideas of terror or pity, and which was the expression of one belief and one heart pervading many nations, give them a considerable hold over the mind. No one can be insensible to the awful grandeur of the *Dies iræ, dies illa,* which Roscommon, who translated it into English, is said to have died repeating; or the simple pathos of the *Stabat mater dolorosa,* which, even divested of the charms of Pergolesi's music, speaks to the heart. Of nearly equal beauty are the *Jam mœsta quiesce querela* of Prudentius; and the *Ave Maris Stella,* being an invocation to the Virgin, which may still be traced in the songs of the boatmen of the Mediterranean. The forcible impression made by these simple sacred hymns on the mind of Dante is obvious, from the manner in which lines or portions of lines from them, are here and there woven into the *terza rima* of his great poem.

It cannot therefore be said that the middle ages were an unpoetical period. On the contrary, there was then a very general diffusion of poetic feeling. But the poetry to which it gave rise was not marked by any of those works of excellence rising conspicuously above the rest, which attract attention to the names of the authors. Its productions are chiefly anonymous; its poets have died and made no sign. A great genius was still wanting to form an epoch in the annals of poetry; but that genius was found in Dante, about a century after the Tuscan dialect had assumed a predominance over the other dialects of Italy.

ITALIAN POETRY.
Dante.

The Divine Comedy of Dante (born 1265, died 1321) is the first work of distinguished and original genius which graces the literature of modern Europe; and it is in many respects a most striking and remarkable production. It is not, as the name would import, a drama; as little does it resemble an epic poem; it is an allegorical pilgrimage through heaven, hell, and paradise, which the poet has peopled with human shapes, human passions and crimes. He has made his poem an instrument through which he vents his political loves and hatreds, his vast and undigested learning, his scholastic acuteness, his mystical philosophy, his reverence for the ancients, his sympathy with the spirit of freedom, the enterprise, the enthusiasm of the moderns. It resembles, in fact, the Homeric poems in its encyclopædiac character. The poet stands, as it were, on an isthmus, from which he can cast back his glances across the tumultuous and still heaving chaos of the middle ages, into the serener regions of the past, and forward into a futurity of which he foresees and foretells the coming glories. Many, no doubt, had been the allegorical compositions which went before him; the Roman de la Rose, indeed, still survives, in the translation of which Chaucer wasted so much of his earlier powers; but all have been thrown into shade, and it may be said effaced, by the grasp, magnificence, and sombre power, combined with deep human feeling, of the great allegorical pageant of Dante. For in this last quality, quite as much as in the attributes of sublimity and grandeur, which are universally conceded to him, lies the secret of that perennial charm of freshness which still gives interest to the *Divina Commedia.* Amidst the darkest scenes of infernal punishment some soothing objects or images are constantly introduced to lighten our pilgrimage, and flowers are made to spring up beneath our feet, as if to freshen the path "over the burning marle." His wearisome metaphysics have long ceased to please; his mystic raptures, his pictures of the celestial occupations of the saints, appear almost ludicrous; his demons and his Satan grotesque rather than impressive: but the deep pathos of the story of Francesca of Rimini; the thrilling scenes in the tower of Hunger; the few simple lines which tell the story of Madonna della Pia, imbibing a slow but certain death among the swamps of the Maremma, to which she is consigned by a jealous husband; the sweet apostrophe to evening, and the fireside recollections which the sound of the vesper-bell brings along with it: these and such episodes are the passages which linger in the memories of all, and give to the poem of Dante its main hold over the heart.

The imagination, on the other hand, is singularly roused by the scenes of torture and bliss through which we are led, the burning tombs, and cities alive with flame, and valleys of the shadow of death, where serpents torture their victims, and the ever-deepening descent through the circles of hell, contrasted with the cheering light which begins to break upon us in the ascending circles of purgatory, and the refulgence of the visions which greet the wanderer on his entrance into paradise, when he exchanges the guidance of Virgil for that of Beatrice.

Distinct as the imagery in the foreground is, the prospect fades away on all sides into the illimitable, and the imagination has full room to expand itself in the sphere of the mysterious and indefinite. Dante's poem may, indeed, be well compared to that "wild and hoary wood" in which he describes himself as losing his way in the outset, with here and there a path cut through the trees, where the sunshine pours in and shows spots of verdure or still waters, but backed on all sides by dusky labyrinths, inhabited by beasts of prey, into the gloom of which the eye can hardly pierce, and the immemorial stillness of which the sound of human footsteps has never broken.

The style of Dante's poem is scarcely less remarkable than its spirit. Obscure and unyielding, as might be expected, in some parts, it has, nevertheless, a picturesqueness without parallel in modern literature. It makes every object palpable or sensible; flashing images upon the mind with the rapidity and the splendour of lightning. "They are," says Ugo Foscolo, "the bold and prominent figures of an alto-relievo, which, it seems, we might almost touch, and of which the imagination readily supplies those parts that are hidden from the view." It fixed the Italian language, so that at this moment it remains less changed since the time of Dante than any other European tongue.

Petrarch.

As Dante is the head of the Italian allegorical poetry, so Petrarch may be regarded as the founder of the lyrical; borrowing indeed his manner, and not a little of his matter also, from the Provençals, but by a refined taste acquired from the deepest study of the classic poetry, and a sensibility, the liveliness of which was quickened by a real passion, investing their strains with a character of tenderness and perfect finish, which really appear to confer on them a different character. The monotony disappears of which we are conscious in reading the compositions of the Troubadours and Minnesingers, "qui toujours d'un même ton semblent salmodier;" and a wonderful variety of emotions are seen to arise out of a theme which, in their hands, had appeared limited and barren. No one has ever drawn a finer poetical ideal of female loveliness, purity, and worth, than Petrarch has done in Laura. "Every lover," says Herder, "will find *his* Laura in that of Petrarch; he will find his own heart, with all its weakness, and that beneficent influence which the female character in its purity can exert over the disposition of the youth and the man." The verbal subtilties and plays on words which disfigure many of the lyrics of Petrarch no doubt detract from their effect, and excite surprise that one whose taste was in general so pure should have given admittance to such conceits; but, like the puns and equivoques of Shakspeare's time, they were part of the fashion of the day. Petrarch found them imbedded, as it were, in the Provençal poetry from which he drew, and he yielded, like Shakspeare, to the evil influence of the time. Upon the whole, however, the services rendered by him as an Italian poet (for we need not here allude to his great and most beneficial influence on the taste of Europe, by his exertions on behalf of classical literature) have been very great; he sensibly added to the polish, grace, and pliancy, of the Italian tongue; and of the Platonic poetry of love, a love existing rather as a lambent glow than as a flame, and living on as a sentiment after it has ceased to be a passion, Petrarch still remains the purest and the most charming representative. (See the article PETRARCH.)

The Petrarchists. It is a remarkable fact, that though the genius of Dante was unquestionably far more masculine, original, and imposing than that of Petrarch, the former left no successors, while Petrarch turned for nearly two centuries the whole current of poetry into the direction of the amatory lyric. Dante was found to be unapproachable; within the circle he had formed, none durst walk but he; but the Platonism of Petrarch, and the apparent simplicity and brevity of the medium through which his tranquil and gentle inspiration was conveyed, appear to have tempted every one into imitation of his lyrics. Hence, until the fifteenth century in Italy was well advanced, its poetry consisted of little else than imitations of Petrarch. But, in truth, though this was not perceived, all the finer essence of Petrarch's poetical character was nearly as incommunicable as that of Dante; and accordingly we find, among the latter Petrarchists, that much of the delicacy and truth of Petrarch, that *feeling* which gives a tempered warmth to his expressions, and calms without chilling the heart, disappears. The raptures of love, and that struggle of passion and reason which so constantly recurs in Petrarch's poetry, are pitched in an exaggerated and falsetto key; the conceits grow more numerous as the feeling grows less intense and real; till at last, of all which their great original had produced, little is found transplanted into their imitations, save the indestructible harmony of the versification.

The fifteenth century, which followed the death of Petrarch, is fruitful in learned men, in grammarians and philosophers, but barren in poetry. The excessive cultivation of classical literature, and the admiration excited by its great models, created a feeling of distaste for Italian composition. Traces, no doubt, of a teeming fancy appear in the unfinished stanze of Politian; and the rustic and carnivalesque songs, both of the great Lorenzo and of Machiavelli, have a merit independently of the interest attached to their authorship. Machiavelli's comedy of the Mandagola has been pronounced by a competent judge to be amongst the best specimens of the comic which the Italians possess. But till the rise of that branch of poetry which may be regarded as the peculiarly national poetry of Italy, namely, the serio-comic romance of chivalry, nothing of a marked or original character appears. We turn, therefore, at once to the dawn of that school in the rough poem of Pulci.

Serio-comic romance of chivalry. There seems little doubt that feudalism, with that attendant spirit of chivalry which was born of its union with religion, never obtained any great influence in Italy. Petrarch even speaks of the warlike fictions of romance with dislike and contempt; and indeed, from the earliest periods, we can perceive the traces of a commercial much more than a military spirit; inclining the nation, in the adoption of foreign models, to turn with far greater interest to the gay, lively, and licentious tales of the Trouveres, or the dreamy reveries of the Provençal poets, than to those tales of chivalry, the "romans de longue haleine," which formed the study and the delight of the rest of Europe.

Before the period, too, when the Italians first thought of resorting to the fictions of chivalry as the materials of poetry, the feeling of chivalry itself was generally on the decline throughout Europe, and its high-flown sentiments and extravagances in action were beginning to be looked upon as a superannuated and exploded fashion. Hence the consciousness of a certain air of ridicule attaching itself to themes of this kind must from the first have been present to the minds of the Italian poets; and accordingly the chief puzzle connected with the work of Pulci, the Morgante Maggiore, is, whether the work be of a serious nature, or an elaborate jest; or whether, as seems more probable, it be not a jumble of both.

All the Italian poets who have adopted these fabulous themes of chivalry seem, in fact, to have perceived that, in their own country at least, the taste for romance, if it ever existed, had gone by, and that a serious poem, in the style of the prose romances of chivalry, would have met merely with ridicule or neglect. Their aim, therefore, seems to have been to avail themselves merely of the fictions and machinery of romance, as affording a new source of poetical embellishment; to address no higher feeling than the principle of curiosity aroused by complicated adventure; and to anticipate, by a tone of levity, and a gaiety approaching to the comic, that ridicule with which they felt that the spirit of chivalry had begun to be associated. They wrote "as if they mocked themselves, that could be moved to *sigh* at any thing." This aim is visible in them all; they differ only in the degree of art, taste, and genius with which the result at which they aimed has been accompanied.

Pulci. In the rude poem of Luigi Pulci (born 1431, died 1487), there is no harmony whatever between the extremes of the tragic and comic. The poet appears to be in one page sincerely devout; in the next he seems a profligate and scoffer. The broadest farce in the adventures of the good-natured but stupid giant Morgante, alternates with the elevated and the pathetic in the really chivalrous enthusiasm of the battle of Roncesvalles and the death of Orlando; the dreariest platitudes are succeeded by occasional outbreakings of devotional enthusiasm or fine sentiment. The effect of the whole is disjointed and painful, and such as to excite our surprise that the accomplished companion and favourite of the great Lorenzo should have produced a work so enigmatical and unsatisfactory.

Boiardo With more invention and greater variety than Pulci (for in the construction of plots, and in sketching the outline of characters, Boiardo left little for Ariosto to perform), and with far less of that disposition to caricature in which Pulci unconsciously indulges, the *Orlando Innamorato* of Matteo Maria Boiardo (1430 to 1494) still wants that airy grace and ease of movement, that unconscious flow, like the marvellous tale of an Arabian improvisatore, without which this species of poem,—a "chartered libertine," in as far as regards the ordinary canons of criticism,—can have no permanent success. In Boiardo's hands it moves laboriously and stiffly; his verse wants harmony; his style wants pruning, polishing, and lightening. This, together with the infusion into the poem of a most peculiar species of grave humour, was the service afterwards performed for Boiardo by Berni, with such perfect success, indeed, that the *rifaccimento* has superseded and almost obliterated the recollection of the original.

Ariost It remained, however, for Ariosto (1474–1533) to hit the happy medium between the *poco meno* and *poco piu;* to blend the tragic and comic in the proper proportions suited to the serio-comic epic; to give life and natural movement to the mere machines of his predecessors; to throw over his recitals an air of simplicity and *bonhommie*, which gives probability to the wildest marvels; and to invest the whole airy tissue of romance, with a style, the peculiar charm of which, though most clearly felt, appears almost indescribable; so clear, so popular and translucent, as to charm the most uneducated; so correct and classical as to satisfy the most critical taste. To compare Ariosto to Tasso as a poet of feeling, is to compare objects absolutely disparate, and unsuited to comparison. Probably the native cheerfulness and easy temper of his mind was not consistent with strong emotion; but it is equally clear, that the expression of strong emotion was inconsistent with his plan. To have grafted the deep and serious interests and passions of men upon so gossamer a groundwork as that which he has adopted, would have been like building an edifice of marble upon the unsubstantial basis of a summer cloud. In the department he assigned to himself he has employed the most appropriate instruments with corresponding success. After Homer, he has been, on the whole, the favourite poet of Europe. Above sixty editions of the Orlando were published in the course of the sixteenth century alone. "The Orlando Furioso," says Mr Hallam, in summing up a most just and discriminating criticism of Ariosto, in his Introduction to the Literature of Europe, "as a single great poem, has been very rarely surpassed in the living records of poetry. Ariosto must yield to three, and only three, of his predecessors. He has not the force, simplicity, and truth to nature, of Homer, the exquisite style and sustained majesty of Virgil, nor the originality and boldness of Dante. The most obvious parallel is Ovid, whose Metamorphoses, however, are far excelled by the Orlando Furioso, not in fertility of invention, or variety of images and sentiments, but in purity of taste, in grace of language, and harmony of versification."

The incongruous elements of devotion and ribaldry, caricature and tragic emotion, which had been left unblended by Pulci, which Boiardo partly rejected and partly harmonized, had received from the pen of Ariosto the last graces of which such a poem was susceptible. In him there is even a gentle pathos combined with a sort of enthusiasm of valour, which gives sincerity and elevation to the fantastic. But the serious and brooding fancy of his successor Tasso (born 1544, died 1595) could not be contented to sing, like Ariosto, "le donne, i cavalier, l'arme, gli amori," in the same light, and at times half-mocking strain. He determined to present the serious side of the romantic epic, as Ariosto had done the comic. Whether the dull "Gazette in verse," by Trissino, the Italia Liberata, in any way suggested to him the idea of a historical subject, we know not. Certain it is, however, that his earnestness of purpose, his deep and at last morbid sensibilities, impelled him to the selection of a theme where reality should give steadiness and human interest to the creations of imagination; and where the spirit of the Christian religion should be the moving principle, instead of a phantasm which played round the head rather than touched the heart. This theme he sought and successfully found in the delivery of the Holy Sepulchre by the crusaders; an event more interesting to Christianity than had been the Trojan expedition to the assembled princes of Asia; and satisfying that essential condition of a good epic, that its action, whatever its importance, shall be one springing from enthusiastic feeling rather than political motives. His poem was written while the European monarchs still flattered themselves with the hope of regaining the lost conquests of Godfrey in the Holy Land, and the glorious exploits at Malta, at Rhodes, at the Goietta, and Lepanto, showed the strength of the feeling that still prevailed "against the general enemy, Ottoman;" and dealing as it did with a topic of religious interest, placed among scenes hallowed by the most affecting recollections, and presenting the finest natural features for the pencil of the poet; admitting, from the remoteness of the period to which it related, and the faith which then prevailed, the introduction of a fabulous agency, contrasting with the impressive machinery which the Christian religion afforded, it is difficult to conceive a theme uniting more features of interest, or affording a richer or more picturesque groundwork for an epic poem.

Tasso has conceived his plan in the spirit of antiquity, and in the grand and enlarged style of the classic epic; but he has executed it in the spirit of the middle ages; and perhaps the point in which Tasso has been most completely successful, is the skill with which the spirit of a religious chivalry is breathed into the classic framework; and all the incidents which he liberally borrows from Homer or Virgil, are made to harmonize with that prevailing tone of devotion, valour, and tenderness, which is spread like an atmosphere of purity over the Jerusalem Delivered.

The episodes.

Whilst the general plan of the Jerusalem, perhaps, bears too close a resemblance to that of Homer, in the retirement of Rinaldo, like Achilles, from the army, which is made the nodus of the poem, the singular beauty of its episodes has been always felt and admitted. In fact, it is by the episodes that we chiefly remember the poem. Tasso has thrown the whole tenderness of his soul into such passages as those where he describes Sofronia and Olindo at the stake, the "pastoral melancholy" of Erminia's residence with the shepherds, or Clorinda perishing by the hand of him who would willingly have died to save her. The turn of his mind, in fact, was fully more towards the lyrical than the epic, and, in passages like these, the lyrical tendency breaks forth with peculiar force and flow.

Character.

In his characters Tasso has not made any very substantial addition to the picture gallery of the ancients, though even in this respect he is superior to Ariosto, who in most cases contents himself with a few general types without distinctive traits. Tasso's male characters, with one exception, that of Tancred, are judicious adaptations of Homer's outlines of character to other times, manners, and religious creeds. Tancred, however, is an original conception; perhaps the more striking that its outline was drawn in some measure from within; for in Tancred, the brave, visionary, melancholy Tancred, the victim of a hopeless passion, we probably see a dim reflection of the poet himself.

The same broad line of distinction which divides Ariosto and Tasso as to the conception of their subjects, may be traced in the whole details of their execution. Ariosto is throughout a painter. It is with external things that he chiefly deals; with colour, arrangement, form, and grouping, rather than with their internal spirit. But Tasso cannot paint this objectively. Every image, every feeling, as it passes through his mind, receives the stamp of his own peculiar habits of thought, and issues forth impressed with the image and superscription of his own tender and loving soul.

Pastorals and pastoral dramas.

Though Tasso is best known by his great epic, his Aminta deserves notice as the finest of those pastoral dramas which were so common in Italy in the sixteenth century and the commencement of the seventeenth. It was not indeed the earliest, for the Sagrifizio of Agostino Beccari (1510–1590) had preceded it. And even Beccari's work had grown out of those pastorals, frequently in dialogue, of which the fifteenth century was so fruitful, and of which the Arcadia of Sannazzaro (1458–1530) affords the finest example. Tasso's, however, of all the Italian pastoral dramas, is the most inspired by the spirit of poetry. The Pastor Fido of Guarini (1537–1612) certainly has the advantage of a far more stirring plot; it rouses more curiosity and attention, but it wants the charm, the truly Arcadian repose, which Tasso has spread over his Aminta. Here also, as in his Tancred, the feelings of the poet gave vivacity and truth to the poem; for it is not difficult to see, that under the disguise of Amyntas, and in the form of allusions to the joys and sufferings of the pastoral life, or invectives against that influence of rank and honour by which the natural feelings of the heart are suppressed, the lover of Leonora is pleading his own cause, or his own apology.

For an account of the Italian drama, which took its rise in the Sophonisba of Trissino (born 1478, died 1550), the reader is again referred to the article DRAMA in this work.

Bernesque poetry.

One species of poetry, which is almost peculiar to Italy, distinguishes or rather disgraces this period, viz. that mass of poems entitled Capitoli, &c. which obtained the name of Bernesque from the poet who first set the example of these specimens of reckless and indecent drollery, Francesco Berni (died about 1543). His quiet, grave humour, the host of ludicrous associations which he conjures up, and frequent felicities of expression, at first render even his ribaldry amusing; but when similar themes were taken up and hunted down by Molza, Casa, Firenzuola, and their followers, it became oppressive and revolting in the highest degree.

Filicaja, Testi, and Marini.

We now approach the period of decline in Italian poetry. The sixteenth century had been its golden period: in the seventeenth we drop at once into the age of brass, or the age of tinsel. Chiabrera (born 1552, died 1637) indeed exhibits lyric fire, and, by discarding the hackneyed and outworn form of the Italian versification of the Provençal school, and approximating to the metres of the ancients, gave a character of originality to his odes. Yet, granting the boldness of his imagery, and a certain fervour and enthusiasm, which raise his lyric poetry above the slumbrous and monotonous beauty of most of his predecessors who were of the school of Petrarch, it is yet impossible to subscribe to the excessive eulogiums bestowed upon him by Tiraboschi, who almost seems to think he had combined in Italian the graces of Anacreon with the majesty of Pindar. More impressive, more affecting, though occasionally, and particularly in his sonnets, more deformed by the conceits and exaggerations which give an evil distinction to the poets of this period, whom the Italians have branded with the title of Seicentisti, are the lyrics of the senator Filicaja (born 1642, died 1707), whose religious canzoni, particularly the noble triumphal hymn on the deliverance of Vienna from the Turks by John Sobieski, are amongst the finest specimens of this class of poetry of which Italy has to boast. In his sonnets he is less pure and less natural; even his famous sonnet on Italy is, in its second quatrain, disfigured by one of the poorest and coldest of conceits. One other name must be mentioned, as preserving a pure and classic taste amidst the general corruption which, under the influence of Marini, was now pervading and perverting the whole spirit of Italian poetry. We refer to Fulvio Testi (1593–1646), the Italian Horace, as he has been called, a title certainly quite unmerited, so far as regards the power or brilliancy of his imagination, but not inappropriate, if limited to the purity and terseness of his style. The greater corrupter of this declining period of Italian literature is the once famous Marini (born 1569, died 1625), the author of the Adone, a poem which is an absolute chaos of brilliant antitheses and exaggerated language, plays of wit and ingenious imagery, but heaped together without the slightest direction of any governing judgment, and producing a tiresome and chilling, instead of an exciting effect. In his own days his writings were differently estimated. For a time, indeed, his popularity in his own country was boundless, and his influence on the literature of other countries, particularly that of Spain, as powerful as it was mischievous. But good sense and good taste shortly resumed their sway, and Rousseau, if one may judge from the frequent quotations from Marini in his Heloise, would almost appear to be the last person of any literary distinction who was familiar with the once celebrated and now completely forgotten Adone.

Tassoni.

In comic poetry, however, the seventeenth century was more successful. To this period belongs the Secchia Rapita of Tassoni (1565–1635), the first specimen of that style which was afterwards carried to perfection in the Lutrin and the Rape of the Lock. The imitations of Tassoni need not be mentioned. Instead of improving on his model, they degraded and vulgarized it.

Excepting in the drama, which was distinguished by the great and strongly contrasted genius of Metastasio and Alfieri, the eighteenth century in Italy can boast of little in poetry. Some graceful fables by Pignotti, imitations of Pope by Parini, and of Gray and Young by Pindemonte, redeem it from the charge of utter barrenness, but cannot entitle it to the praise of originality. Nor, with the exception of Manzoni, has the nineteenth century produced any poem which can justly be said to have attained a European reputation. Giovanni Niccolini (born 1786), a professor in the Academy of Fine Arts at Florence, has composed several tragedies, one of which, Antonio Foscarini, founded upon a well-known episode in Venetian history, was received with much applause. Some of the lyrics of Silvio Pellico (born 1789) display considerable beauty and elegance of diction; and the improvisations of Tommaso Sgricci, which have been taken down in short-hand and published, display a wonderful faculty and command of language, though the sense, as might naturally be expected, is generally subordinate to the sound. The works of these writers, however, are not distinguished by that force and brilliancy which mark the earlier productions of Italian literature.

SPANISH POETRY.

Of all the languages formed from the ruins of the Latin, the Spanish approaches the nearest to the Italian. The spirit of the two literatures differs extremely; but so closely do the words resemble each other, that translations have been executed by Spaniards from the Italian, as in the case of Jauregui's translation of Tasso's Aminta, where even whole lines are found to correspond with the original. The language, as it now exists, is the dialect of Castille, polished and purified, the Catalonian or Limousin having long ceased to be the language of poetry.

Its orient character.

One feature peculiarly marks the whole of the Spanish poetry with a character unknown to that of the rest of Europe, viz., the strong traces of orientalism which it exhibits, a tendency to the pompous and the exaggerated, and a strange compound of strong passion, combining with a great wantonness and luxuriance of fancy. More or less this feature is to be traced through all the changes which its poetry has undergone; subdued, no doubt, and kept down by the good taste of such men as Garcilaso or Cervantes, but re-appearing in the *estilo culto* of Calderon, and reaching its height in the ludicrous extravagances of the Spanish Marini, Gongora. Considering, indeed, the intimate connection which subsisted between Spain and Arabia from the eighth down to the close of the fourteenth century, a connection which, though one of hostility in the field, appeared to have admitted of many of the ties of friendship and mutual respect, and the natural admiration which the brilliant poetry of Arabia was likely to exercise over the minds of a ruder people, the Asiatic character of the Spanish poetical genius appears exactly what, under such relations, might have been expected.

Chronicle of the Cid

The earliest monument of the Spanish poetry is the old Chronicle of the Cid, a cycle of romantic legends, founded upon the exploits and misfortunes of that Don Rodrigo Laynez, who, after exalting the glory of the Spanish arms under Ferdinand, King of Castille, and his son Don Sancho, was treated with such ingratitude by Alfonso VI., the son of the latter, that he fled to the Moorish court, where, from 1081 to 1085, he gained many brilliant victories over the Christian arms. Again recalled to the Spanish court by Alfonso, who began to feel his value, he was a second time disgraced, and banished about 1090. The Chronicle, which, both from internal and external evidence, appears to be as old as the twelfth century, relates to this second banishment; and though its language is rude, and its rhymes most imperfect, there is a captivating freshness in the scenes which it presents, in its vivacity of movement, and in the occasional traits of poetry which seem to escape almost involuntarily from the writer, that raise it considerably above the ordinary level of such chronicles.

Ballad poetry.

From the date of the poem of the Cid to the reign of John II. (1407–1454), the only monuments of Spanish poetry, at least the only specimens possessing the slightest interest, consist in that vast mass of popular or ballad poetry in which Spain is richer than any other country in Europe. Fortunately the process of collecting and preserving these relics of an adventurous and enthusiastic period, "ere polity, sedate and sage, had quenched the fires of feudal rage," was commenced at a very early period, the first collection having appeared in 1510, under the title of the *Cancionero General*. Not only in numbers, however, but in merit, the Spanish ballad poetry appears superior to that of any other nation of Europe. Everything, in fact, united to give to this species of poetry its freest development. A national character of strong sensibility, excitable yet constant; national pride, in the feeling that they had so long formed the advanced guard of Europe against the Moors, and were daily driving backward the tide of invasion; a life of adventure and gallantry; a strong passion for music and the dance; a delicious climate; a language rich in rhymes, and admitting a species of versification (the assonance) in which "Sponte sua carmen numeros veniebat ad aptos" were here found united. The result has been a collection of ballads of all kinds, warlike, amatory, Moorish (these last chiefly composed after the conquest of Granada by Ferdinand and Isabella in 1492), and satirical, marked by a degree of taste and poetical beauty of which very few of our English or Scottish ballads have to boast. The Moorish ballads have a peculiar charm, from the richness of the colouring with which they are invested, and their style, which has hit the happy medium between the boldness of some of the old historical ballads, and the over-refinement and affectation of those which were composed after the introduction of the Italian taste into Spanish poetry. The picturesque character of the Moorish life, the natural beauties and artificial magnificence of Granada, the quarrels of the rival families of the Zegris and the Abencerrages, the tournaments, feasts of canes, and other amusements of the luxurious court of Boabdil, afford in these ballads inexhaustible materials for descriptive poetry, a tendency which is hardly to be traced in the earlier ballads. "It is wonderful," says a very eminent Spanish critic, Quintana, "with what vigour and brevity they paint scenes, personages, and feelings. In one it is the Alcayde of Molina, who enters, rousing the Moors against the Christians, who are ravaging their fields; in another, the unfortunate Aliatar, borne back with the gloom of a funeral procession through the gate from which he had issued with such gaiety the day before; now it is a simple country maiden, who, having lost the ear-rings her lover had given her, weeps at the prospect of the reproaches which await her; and now a shepherd, who, solitary and forsaken, grows indignant at the sight of two turtles cooing in a neighbouring poplar, and drives them away with a stone." Besides the ballads descriptive of incidents, these collections contain many charming little songs and lyrical snatches, vague and undefined indeed, but often pleasing us even by this very vagueness, which merely suggests a hint to the mind, and leaves the rest to be filled up by the imagination. With few exceptions, the authors of these lyrics are unknown. A few are attributed to the great Don Juan Manuel (who died in 1362), but on doubtful evidence; the writers of the others have died and made no sign.

Though the Spaniards date the rise of their classic poetry from the reign of John II., it is certain this period contains little which has any interest for foreign readers. The pedantic and tedious Labyrinth (*El Laberinto*) of Juan de Mena (1412-1456), a cold and lifeless imitation of Dante's great poem, possesses nothing of a more classical nature than the older poetry, save its form. One poem only of this period,—viz., the noble stanzas or coplas written by Don Jorge Manrique on the death of his father, and a few graceful *redondillas* by the accomplished Marquis of Santillana, afford some relief from the pretension and pedantry which generally characterize this period of Spanish poetry.

Introduction of the Italian taste.
Boscan.

A great revolution, however, was about to be effected in Spanish taste by the introduction at once of the measures and of the spirit of the Italian poetry. The close relation into which Spain was brought with Italy during the reign of Charles V. had led to a general knowledge of the treasures of Italian poetry; while many changes in the political constitution and habits of the Spaniards themselves concurred to weaken their attachment to their old and natural romantic poetry, and disposed them to adopt the more regular and polished strains of their Italian neighbours. This change was introduced by Don Juan Boscan (from about 1500 to 1544), who, though he had at first composed and published a volume of poems in the old Spanish manner, had been led, by his acquaintance with the Venetian ambassador Navagero, to the study of the Italian classics, and in consequence formed the design, in conjunction with his friend Garcilaso de la Vega (1500–1536), of introducing to his countrymen the refinements of the Italian versification, and the superior polish of the style of the Petrarchists. But with all Boscan's careful study of the Italian poets, which is evident from the perpetual imitations which his poetry contains of Petrarch, Bembo, and Sannazzaro, he never could acquire their elegance of taste, nor divest himself of the national tendency to orientalism. Something of the old leaven of impetuosity and hyperbole attaches to his poetry, producing a feeling of incoherence between the matter itself and the medium through which the ideas are conveyed.

Garcilaso.

But what Boscan attempted and imperfectly performed, Garcilaso accomplished with complete success. He was equally distinguished in the field of warfare and of literature. "One hand the sword employed, and one the pen;" and he fell at last, crowned at once with the laurels of poetry and war. In Garcilaso the Italian poets found a rival, if not a superior; for while he adopted their best points, he avoided in a great measure that subtlety of taste which had grown out of the study of the later Platonists, and introduced a metaphysical and reasoning style into those subjects where it was the most out of place. Garcilaso has written little, but that little (at least his Eclogues, for his Sonnets are not of equal merit) is of the highest class; for he has contrived so finely to temper the subtlety of the Italian poets by the more natural warmth of the Spanish, and to clothe his sentiments in words at once so simple and so classically pure, that the result is something superior to anything that is to be found in his models. In all of them, no doubt, the classic reader will recognise at every turn resemblances to the Latin poets; but these imitations are introduced with so much taste, and fitted with such art into a Spanish framework, that the knowledge that they are imitations rather increases than diminishes our sense of the talent of the poet.

Mendoza.

A third personage was associated with Boscan and Garcilaso in this poetical triumvirate, the famous "tyrant of Sienna," the accomplished warrior, statesman, historian, novelist, and poet, Diego de Mendoza (1500–1575). Mendoza's Epistles, however, betray more rudeness of manner than even the verses of Boscan; and indeed the chief feature of interest which they possess is, the singular spectacle they present of a stern and hard-hearted warrior of the school of the Duke of Alva breathing out to his friends Boscan and Zuniga the most fervent aspirations after the domestic happiness of a rural life, or longings for the enjoyment of a philosophical solitude. This feature, indeed, more or less marks the whole poetry of the period. Whilst the Spanish warriors were distinguished all over Europe for their ferocity, presenting, as Sismondi says, "to the enemy a front of iron, and to the unfortunate an iron heart," we find all their poetry marked with a dreamy, tender, and melancholy spirit. In Mendoza, Garcilaso, and Montemayor, all of whom were soldiers, and conversant with scenes little calculated to soften the affections, we observe this union of practical ferocity with theoretical innocence; nay, even the terrible Duke of Alva appears to have been inspired by the same tastes, and appears in the poetry of the time, not as the ferocious governor of the Low Countries and the organ of the Inquisition, but as the discerning critic, the lover and the patron of literature.

Montemayor.

This tendency to themes of an Arcadian cast gave rise to the Pastorals of Montemayor (1520–1561) and his successors. The Diana of Montemayor, a pastoral romance, interspersed with ballads and canzoni in the style of Sannazzaro's Arcadia, was once amongst the most popular productions of Europe. Its influence may be traced, not only in the host of Spanish pastorals which succeeded it, but in the literature of other countries, in the Astrea of D'Urfé, and in the Arcadia of our own Sir Philip Sydney. Cervantes bestows upon it a sort of qualified praise in his review of Don Quixote's library, but is disposed to give the preference to the continuation by Gil Polo over the original. Montemayor labours, in fact, under the fault of all his countrymen of the time: he cannot compress; he pours out a stream of musical language, "which runs, and, as it runs, for ever would run on;" but he gives us few ideas that are at once natural and new, and none that stir the heart or strongly awaken the imagination.

Herrera.

The works of Herrera, another poet of this period (1500–1578), on whom the Spaniards have, with questionable propriety, bestowed the title of "the Divine," are in a totally different strain. His themes are religious and warlike, such as the triumph of the Christian arms at Lepanto, or the fatal defeat of Sebastian in his expedition to Africa. Of all the Spanish poets, Herrera, whose mind was deeply imbued with the beauties of the sacred writings, possesses the loftiest style of expression; but the majesty of his diction is often obscured by strange and new creations or combinations of words, while his elevation not unfrequently explodes in palpable bombast. There is a strong resemblance between Herrera and the Italian Chiabrera, both in their beauties and their faults.

Luis de Leon.

The greatest of the Spanish lyrical writers is Luis Ponce de Leon (1527–1591). "More earnest and enthusiastic than Boscan; tender as Garcilaso, but with a soul whose tenderness was engrossed by heavenly, not earthly love; pure and high-hearted, with the nobility of genius stamped upon his brow, but with religious resignation calming his heart, he is different from his predecessors, but more complete; a man Spain only could produce, for in Spain only had religion such sovereign sway as wholly to reduce the rebel inclinations of man, and, by substituting supernal for terrestrial love, not diminish the fulness and tenderness of passion, but only give it another object."[1] The most remarkable feature of Luis de Leon's poetry is the union of a mystical and religious enthusiasm with the most perfect clearness and transparency of expression. Never was a high and soaring imagination more perfectly under the control of a cool judgment and a critical taste. Whilst a religious Platonism forms the *fond* of his odes, the style exhibits all the terseness, precision, and finish of that of Horace, of whom, notwithstanding the great differences in their poetical character, he continually reminds us, by the sententious air of his odes, and that serene moral wisdom which drops from him in common with the Epicurean poet, whatever subject he touches on. But the odes of the Spanish poet have a moral grandeur far exceeding those of Horace. The spirit of present enjoyment, or indifference to futurity, which not unnaturally pervades the latter, was revolting to the warm sympathies and devout belief of Luis de Leon. Accordingly, the ideas and images which, to the Epicurean poet, only afford inducements to devote the hours to pleasure, such as the shortness of life, the fading of flowers, or the instability of fortune, the Spanish moralist holds out as inducements to the cultivation of those higher faculties which raise the soul above this world of mutability and misfortune, and prepare it for that purer abode which he regarded as its appointed home.

Drama.

The close of the reign of Charles V. is adorned by the great name of Cervantes (1547–1616), more distinguished, however, as a prose writer than as a poet; and by the rise of the dramatic literature of Spain. For a general account of the peculiarly national and remarkable character of the Spanish theatre, which, while it is connected with our own by so many common features, has yet some striking points of distinction which render its study peculiarly interesting to the admirers of our older British theatre, we refer to the article DRAMA. Cervantes, we must admit, appears to mark its *childhood;* for the plots of his dramas are loose, disjointed, and scarcely deserving of the name, though the gloomy grandeur of the Numantia gives it a painful fascination, like the scenes in the tower of Hunger in the Inferno. Lope is identified with its boyhood; Calderon, with its maturity and perfection; Moreto, Roxas, De Solis, Mira da Mescua, Da Hoz, and others, who wrote during the reign of Philip IV., with its decline. Invention, high poetry in parts, the power of exciting and maintaining curiosity and suspense, must be accorded to the Spanish theatre. Against these must be set religious bigotry and mysticism, often painfully predominant in the plays of Calderon, particularly in those autos which the German critics have especially selected as the themes of their admiration; the affected and redundant style into which most of their poets were led by the facility of their versification, combined with the habit of working for the stage; and the practice which, upon the Spanish stage, is almost universal, of painting manners and general types of character, rather than discriminating its shades, or giving individuality to the personages represented.

We may here notice, in connection with Spanish literature, the solitary great name of which the kindred literature of Portugal has to boast, Luis de Camoëns (1524–1578), who conferred upon his countrymen that which Spain has in vain essayed to produce; for the Araucana of Ercilla certainly does not deserve the title of an epic poem. Viewed in this light, too, it must be admitted that even the Lusiadas of Camoëns is most objectionable: the action flags miserably; the mythology is ludicrous; the morality of some portions of the poem, as, for instance, the scenes on the island which Venus prepares for the refreshment of the returning Portuguese, is more than questionable; but, with all these, the work is inspired and supported by the true spirit of poetry; and its continued popularity and reputation prove how little the real charm or success of an epic depends on the mere plan or machinery of a poem. That which will always render Camoëns delightful is, the tenderness of heart which overflows in such episodes as that of Ignez de Castro; and the pride and zealous endeavour with which he labours to embody in immortal verse the spirit of those days in the annals of Portugal when learning and commerce, warlike enterprise and success, went hand in hand; when De Gama braved the terrors of the Cape, and Alvarez and Albuquerque first launched their galleys into the Atlantic.

Gongor and Qu vedo.

From the seventeenth century to the present time, the literature of Spain has been one of decline. Three names only amongst the many whose works are found quoted in Anthologies and *Parnasos* deserve notice; those of Gongora (1561–1627), Quevedo (1580–1645), and Villegas (1595–1669). The real talents and rich imagination possessed by Gongora make us lament that, like Marini (from whom, indeed, he borrowed his manner), he applied them only to corrupt and pervert the public taste. Some of his little anacreontic verses, songs, and letrillas, written at an earlier period of his life, are models of natural grace and felicity of expression, contrasting most painfully with the ridiculous jargon of language and *galimatias* of sentiment which he employed in his later days. The same evil tendency is visible in Quevedo. We have great invention, much acuteness and comic humour, but a lamentable deficiency of feeling and taste. His works have been most justly compared by Bouterwek to a massive ornament of jewellery, in which the setting of some parts is exquisitely skilful, of others extremely rude, and in which the number of false stones and of valuable gems is nearly equal.

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[1] *Literary and Scientific Men of Italy*, vol. iii., p. 70.

Villegas. A purer taste occasionally appears in Villegas, the Anacreon of Spain, though he, too, seems to labour under the mania of the day, and now and then to run into extravagances worthy of the very wildest of the Cultoristos. After Villegas there appeared no Spanish poet of any originality; for the verses and the pastoral comedy of Melendez Valdez, founded on the episode of the marriage of Camacho in Don Quixote, do not rise above mediocrity; the fables of Yriarte have merely the merit of brevity and neatness of expression; and the comedies of the younger Moratin, the last dramatic works which have attracted any attention, are merely ingenious imitations of Molière. At the present moment Spanish poetry would seem to be absolutely *effete;* nor does there appear much reason to anticipate its speedy revival. The few compositions of Martinez de la Rosa, and of Angel de Saavedra, are not of sufficient merit or importance to rescue the recent literature of their country from this reproach.

FRENCH POETRY.

The present language of France has sprung from that northern dialect which was spoken in Normandy, and known by the name of the Walloon. The earliest compositions in that dialect were romances, founded on some fabulous history, such as Brut of England, which appeared about 1155. **Romances.** To these succeeded the romances of chivalry, from about 1130 to 1190, of which, unless the Portuguese romance of Lobeira, Palmerin of England, be supposed to have appeared before this time, it would seem the Norman-French are fairly entitled to claim the invention. Taking them as a whole, there is no disputing that much fancy and ingenuity are expended upon these now-forgotten performances, though the style is invariably flat and lumbering. They are sustained merely by the high spirit which they breathe, and the happy incidents which the chronicler occasionally introduces.

Allegorical romance. The taste for the allegorical romance was of a date somewhat posterior. Of these singular compositions, the most remarkable is the once celebrated *Roman de la Rose*, begun by William de Lorris, and concluded by Jean de Meun, a poem which was received with boundless admiration, and which continued for a century strongly to influence the literature of Europe. It was at once a romantic and an allegorical poem; a new edition of the art of love, adapted to the moral and metaphysical creed of the middle ages; of dreary length, and yet enlivened here and there by allegorical portraits of imaginary personages, drawn with considerable vivacity and spirit, and by those strokes of satire, or lessons of practical philosophy, which, together with the art of narration, very early began to characterize the literature of France. The conclusion, by Jean de Meun, is inferior to the commencement; it is deformed by a ribaldry and coarseness which justifies the term "niedrige polissonerie," or low blackguardism, applied to it by Bouterwek.

The Fabliaux. But by far the most striking and characteristic part of the early French literature consists in that vast collection of short tales entitled Fabliaux, which were almost exclusively the production of the French provinces lying to the north of the Loire, and which are well deserving of attention, whether their own merits and originality be regarded, or their general influence on fiction. The period of their appearance extends from the last half of the twelfth through the whole of the thirteenth and part of the fourteenth century, but the greater number are supposed to have been written during the reign of St Louis (1226 to 1270). The compositions of these ministrels differ extremely in character from those of their Provençal brethren of the south of France. The poets of Provence were generally knights and nobles; their themes love or war, or mystical allegoric dreams; and, with much monotony, their poetry certainly presents an elevated and imposing exterior. The Trouvères were generally men of an inferior grade, sprung from the lower ranks of life; in fact, literally wandering minstrels. Yet the position they occupied in society was particularly favourable to the promotion of those habits of satirical observation and comic description which constitute the chief attraction of the Fabliaux. Men in general of acute and vigorous minds, though destitute of learning and delicacy, and too often of principle; welcome guests in all society from their powers of amusing, yet respected in none; experiencing every extreme of life, and making themselves at home in all; sometimes helping to dispel the ennui of baronial castles, at others courting the society of the humblest vassals, they rambled over the world, harp in hand, as it were, picking up everywhere the materials of their art, and thus painting, with a truth and freshness otherwise unattainable, the full-length portrait of French manners during the thirteenth and fourteenth centuries. These light and joyous compositions turn chiefly on subjects of a familiar nature, and consist of stories of knavery and intrigue, and occasionally of those Asiatic legends with which the Crusades had by this time rendered Europe familiar. Except, therefore, in invention of ingenious incidents and comic imbroglios, and in a certain tinge of humour and vivacity which breathes of the sunny skies and vine-covered hills of France, they have little pretensions to poetry. And yet this opinion must be taken with exceptions, for they have occasionally shown that they could excel in themes of a higher kind; and the beautiful and well-known fabliau of Aucassin and Nicollette, by its tender and natural spirit, combined with the deep interest of its situations, throws into the shade the greater part of the more ambitious and elaborate chivalrous romances. We perceive in it all the romantic spirit and deep feeling of the old Spanish ballads, heightened by the graceful naïveté peculiar to the early French poetry.

The period from the commencement of the fifteenth to the sixteenth century is regarded by the French as the transition period of their poetry from infancy to maturity; and the three leading names of the period are Marot, Ronsard, and Malherbe.

Marot. Clement Marot (born 1495, died 1544) is the creator of that school of naïve poetry which was afterwards carried to its perfection by La Fontaine and Voltaire. With a playful, unambitious grace, he gives a happy turn to every subject, and delights to put the world in good humour with itself. It is justly observed by a French critic, Nisard, that the naïveté of Marot differs from that of any previous poet. In the older strains of the Trouvères and their successors what we call naïveté often arises merely from the imperfection of the language, and not from any peculiarity in their turn of mind. But Marot wears this air of unconsciousness even in giving expression to ideas the most subtle and recherché; his naïveté seems independent of the language, independent almost of the ideas; it is an emanation of the peculiar genius and idiosyncracy of the man.

Ronsard. It is amusing to contrast the fame of Ronsard during his life (1524–1585) with his reputation at the present moment. His own age elevated him to honours almost divine: in the present how many are acquainted even with a single page of his poems? He was considered the presiding luminary of that constellation of genius which arrogated to itself the title of the French Pleiad, whose great object it was to transplant into French the form and the manner of the lyrics of antiquity; but who succeeded only, as Boileau says, in making a jumble of everything (*brouiller tout*), a patchwork, in short, of Greek and Latin ideas with Italian subtlety of thought and French naïveté of expression.

Malherbe. "Enfin Malherbe vint," says Boileau (1558–1628), like Ronsard a classicist, but endeavouring, and not without success, to seize rather the spirit of the ancients than their forms. Of the higher inspiration of the ode he had little; his march is stately enough, but it is measured and slow; he has little or no enthusiasm, but in all that regarded the judicious treatment of a subject, or the minutiæ of language or versification, he was well fitted to be the legislator of that new and more sober school of composition which superseded in France the extravagances of Ronsard and his satellites. The three pieces of Malherbe which appear to indicate the highest talent, approaching indeed to genius, are the Ode to Henri IV. on the taking of Sedan, the Ode to the Queen-Mother, and the beautiful verses addressed to the Councillor Duperier on the sudden death of his daughter.

Age of Louis XIV. We now arrive at the period which is, or rather was, considered by the French as the golden age of their poetical literature, the long reign of Louis XIV. Everything at this time concurred to impress on poetry that stamp of stateliness, polish, and courtier-like adoration of monarchy which then pervaded French society, and which exerted so powerful an influence on the general tastes of Europe. The French monarchy had now been consolidated by the firm hand of Richelieu, who, whilst he unrelentingly pursued his design of lowering the aristocracy and exalting the throne, was not insensible to the claims or the importance of literature, and had been the first to give it the support which a corporate character appeared likely to afford, by the formation of the celebrated Academy. The troubles of the Fronde were over. The heats and animosities of rival religions had been appeased by the edict of Nantes. The personal character of Louis was well suited to effect his main object, which was to render his court a model for the imitation of the world. Of limited abilities, without talent either for warfare or diplomacy, he possessed tact enough to perceive at once his deficiencies and his advantages; and, endowed with many of the most attractive outward graces and accomplishments of a king, he played the part of a dignified monarch with much discretion and ability. Thus wielding, without opposition, the energies of a powerful kingdom, and collecting around him at his court all that France contained of intellectual ability, a tone of courtly polish and extreme refinement was imparted to society which soon impressed its traces upon literature, partly for good, and partly for evil. The influence exercised by French manners and French literature upon other countries became paramount and unprecedented, superseding the most inveterate usages, overturning the strongest national prejudices, and establishing a despotism more universal than had been known in literature since the downfall of Greece and Rome.

The most imposing shape in which poetry appears during this supposed Augustan period of French literature is in that of the drama, which, commencing with the rude plays of Jodelle (who died in 1560), reached its perfection during the close of the reign of Louis XIII. and the reign of Louis XIV., in the tragedies of Corneille and Racine, and the exquisite comedies of Molière. (For a full account of the French stage, we refer to the article Drama.)

It cannot be said that, in any other department of poetry except that of the drama, the age of Louis XIV. was pre-eminently distinguished; for the artificial and hollow refinement of the time seemed unfavourable to that vigorous and natural feeling which should speak in poetry, with a corresponding strength and originality of expression. Yet two names impress themselves, by their strongly discriminated traits, upon the memory,—La Fontaine (1621–1695) as the reviver of the old naïve style of Marot, though with a degree of polish and grace of which Marot had no conception; and Boileau, as the representative of that school of terse morality, sound sense, and wit, mingled with and heightened by fancy, of which Pope is the best example in English poetry.

La Fontaine. With all the levity and licentiousness which deform the Contes, there is no denying to La Fontaine many of the best qualities of the poet; knowledge of the world, which yet does not impair his bonhommie and kindness of heart; a humour playful, gentle, continuous, never pushed to excess, combined with tenderness, with a disposition to reverie and pensiveness; a strong sensibility to the beauties of the country, of which his descriptions, though short, are always striking, and marked by that just selection of points and clear local portraiture which we find in Crabbe, and which show that he made his studies for them on the spot; the whole heightened and set off by a style apparently simplicity itself, but which must have been, as we know it was, the result of the most laborious polishing and elimination: all these give an extreme charm to the Contes, and perhaps still more to the Fables, of La Fontaine; for the Contes, though their licentious gaiety has made them more generally known, display to less advantage the peculiar qualities of La Fontaine's genius.

Boileau. Boileau, again (1636–1711), pleases and must always please, although by qualities the most opposite to those of La Fontaine; namely, by awakening a calm emotion of intellectual satisfaction, rather than by any excitement of the imagination or the feelings. As Racine represents the tender and voluptuous side of French manners and character during the age of Louis XIV.; as La Fontaine embodies in his tales and fables its easy tone of moral indifference and *malice*, masking itself under the disguise of simplicity; so in Boileau we find, arrayed in a dignified and philosophical dress, its better points, its good sense and sagacity, its lively perception of the eccentric and ridiculous, its love of external decency, order, and propriety, both in morality and in literature.

In his Lutrin he even displays a considerable degree of invention, though chiefly of a comic kind; for, though not destitute of a sense and feeling of high poetry, he was essentially deficient in any actual power of dealing with such themes; and, with that tact and judgment which distinguished him, he has rarely, save in his most unfortunate Ode on the taking of Namur, which has been so justly but so unmercifully parodied by Prior, ventured within this province of poetry. Within his proper field of moral censorship, or of the mock heroic, arrayed in all the graces of elegant diction and classic allusion,—or the poetical abridgment, in the most condensed and pointed form, of the approved critical canons of the time,—he is assuredly without a rival in French poetry, and, with the exception of Pope, in European literature.

Eighteent century. Rousseau. The literature of the eighteenth century in France is more distinguished by its prose than its poetry. Prior to Voltaire, at least, in whom great and versatile powers of mind, approaching if not attaining to high genius, must be admitted, it added nothing of substantial value to the contributions of the age of Louis XIV. At one time, indeed, the odes of J. B. Rousseau (1669–1741) were extolled to the skies, as models of lyric poetry; and Voltaire certainly speaks of them in terms of extravagant praise. To any one now perusing them, with the recollection of the great models of antiquity before him, or even testing them by the simpler process of his own feelings, they will assuredly appear totally deficient in genuine inspiration. The enthusiasm is imitative and factitious; the imitation dexterous, no doubt, but yet palpable to every one who possesses any real poetical sensibility; the thought is often propped up by the words, not the words elevated and quickened unconsciously by the vital grandeur of the thought. What true lyric enthusiasm, indeed, could reside in a mind which busied itself alternately in the composition of rapturous religious odes and epigrams of disgusting obscenity?

Chaulieu and Gresset.

Much more of real poetry, because accompanied by nature and simplicity, is to be found in Chaulieu's pastoral lyrics; in some of the little romances of Moncrif, such as Alexis and Alix, which abounds with lines that by their truth and simplicity of expression have become proverbial; or in Gresset's pleasing stanzas on the golden age, or even in his lively tale of Vert-Vert.

Voltaire.

The reputation of Voltaire (1694–1778) at the present day rests more upon his witty and amusing prose than upon his poetry. The didactic tendency which was the spirit of the age, that attempt to make all the creations of poetry subservient to inculcating certain philosophical opinions, appears in all the poetry of Voltaire; it speaks even in Mahomet and in Zane, as much as in his graceful occasional verses, his tales in the manner of La Fontaine, or his epistles. "Les François n'ont pas la tête Epique," was his own expression; and the Henriade certainly went far to prove the fact. It is the mere *simulacrum* of an epic,—hard, laboured, soulless. It is most unfortunate for Voltaire that the poem in which his versatile abilities have been displayed to the greatest advantage is one which its indecencies and impieties have in a great measure banished beyond the pale of literature.

About 1770 may be noticed the rise of the descriptive school of poetry, in the poems of St Lambert and Delille; an importation in all probability from England, where a similar taste had been introduced by the success of the Seasons of Thomson. From 1730 to the commencement of the present century numerous attempts were also made to confer on France something that should merit the title of an epic poem; but without the slightest success.

During the despotism of Napoleon poetry appeared to be almost silent. With the restoration of the Bourbons appears the rise of that romantic school, the growth of the fermentation of the revolution, and of that removal of the old landmarks both in polity and opinions which it caused; a school which, both in theory and practice, repudiates the principles of the old French classicists, and has certainly effected a complete revolution in the literary tastes of the time.

Hugo, Delavigne.

With regard to the quality of the poetry so produced there may be, and has been, much diversity of opinion. Those who admire the formal manner and stilted versification of the old French writers will probably not be disposed to allow much merit to the vehement odes and fiery utterances of Victor Hugo and Casimir Delavigne; nevertheless their innate vigour has gained for them not only the applause of their countrymen, but the favourable opinion of some competent critics on this side of the Channel. It must be allowed that the writings of Victor Hugo are very unequal in their merit. Sometimes he is extravagant even to the verge of bombast; at other times bizarre; but occasionally he rises with his subject, and exhibits a rare mastery of language and much poetical imagination. Few short poems in any modern European tongue can be advantageously compared with his Chant de Fête de Néron. His dramas are of a mixed character. Perhaps the best of these are his Marion Delorme and his Le Roi s'amuse; the first fulfilling nearly all the conditions of a high tragedy; the second resembling in manner and power some of the best compositions of the elder English dramatists. The genius of Delavigne derived its inspiration from patriotic sentiments, and has found vent in many noble lyrics. Of these, Parthénope and Le Chien du Louvre may be cited as notable examples. Alfred de Vigny, a poet somewhat less known to English readers than the others whose names we have just cited, has gained much popularity in Paris; and not undeservedly, for in his poem entitled La Frégate la Sérieuse he has exhibited a pathetic earnestness rarely found among the writers of his school. Auguste Barbier also deserves mention on account of his energy and descriptive power. But the names which are most conspicuous in modern French poetry, and which will hereafter be most intimately associated with the literature of the first half of the nineteenth century, are those of Lamartine and Beranger.

Lamartine.

It has been the fortune or destiny of Lamartine to occupy a conspicuous position in two characters usually thought to be irreconcilable,—first, as a poet, and secondly, as a politician. His disastrous failure in the latter capacity leads us to regret that he had not devoted himself exclusively to the cultivation of his literary talent, which was, beyond all doubt, of a rare and distinguished order. In his poetry there is a stateliness, a sustained gravity, at times almost reaching to the sublime, which we look for in vain not only in the writings of his contemporaries, but of his predecessors. Very melodious in his expression, he has succeeded in producing harmonies of which the French language seemed scarcely capable; thus furnishing a new and convincing proof that it is possible, by care and dexterity, to render flexible the most difficult speech, and to make it subservient to the highest purposes of art. The French language, admirably adapted for conversational purposes, for brilliant repartee, witty turns, and all the lighter graces of diction, was supposed to be unfitted for oratorical use, until Bossuet and Massillon, by their magnificent discourses, upon which the utmost elaboration was bestowed, dispelled that illusion. In like manner, Lamartine has shown us that it is possible so to wield that language as in poetry to reach the sublime. He does not, however, possess the power, certainly not the imagination, to sustain him through a Miltonic flight. Much more aptly may he be compared with Wordsworth, to whom, indeed, in quality and tone of mind he exhibits a marked resemblance. The solidity, magniloquence, and reflective tendencies of the English poet, are conspicuous in the writing of his French brother; but so also are his occasional tediousness, egotism, and pomposity. Lamartine never has divorced his subject from himself; possibly, from his mental conformation, it was impossible for him to have done so. Hence, after a time, we rather experience a feeling of fatigue in the perusal of his poetry, finding the same cast of thought monotonously repeated. We admire the man; we appreciate his sentiments; but we cannot help wishing that he would sometimes forget himself so far as to free us from the consciousness of his perpetual presence; just as, when we are contemplating a beautiful diorama, we feel annoyed at the platitudes of the showman. But, notwithstanding this, Lamartine has won, and will deservedly maintain, a very high rank in the poetical literature of his country.

Beranger.

A greater however is behind. We shall close this short notice of French poetry with the name of one who, though partaking of all the modern influences of his time, was yet within his own department, that of song, a genuine classic. In this department of the lyric France has always been distinguished. In that country not only has it constituted, as elsewhere, the amusement of the lower classes, but it has long attained the dignity of a powerful political agent; its monarchy was justly described by Champfort as a despotism tempered by songs. Of all the modes in which poetry can be made subservient to purposes like these, song is the most effective, universal, and immediate in its operation. It speaks not to a particular class, but to all; its brevity fixes it in the memory; the creature of the moment, it avails itself of every allusion, every passion, every prejudice of the day; while its outward form appears so trivial and harmless that even despotic governments are deterred, by the fear of ridicule, from attempting to interfere with it. Beranger, while he has selected the simplest, the most universal feelings, the most familiar sentiments and images, provided they are true, unforced, and natural, yet, by the tact and skill which he has employed in their treatment, and the felicity of their expression, has invested them with quite an original character. The oftener a thought has occurred to others, so much the better with him; for it is an evidence of its truth, and of its power of affecting the heart. What remained for him, and what he has performed, was to impart to this thought, so familiar to all, though perhaps vaguely and indefinitely, form, colour, expression; so that when presented by him to our notice, it is felt at once to be an old acquaintance, and yet awakens all the curiosity and interest with which we regard a new one. His originality, in short, lies entirely in his application of the idea, and the point and compactness with which the image is brought out by his hands. Few poets in this department have ever gained greater success. What Burns was to Scotland, Beranger is to France. He seized upon the popular feeling, treated it as it ought to be treated, by giving it that garb and expression which genius alone can bestow. Strong in his Napoleonic tendencies and faith, he kept alive among the people of France the grand memories of the empire; and to his ballads and soul-stirring ditties, more than to any other cause, may be attributed the re-establishment of the Corsican dynasty. No other poet since the beginning of the world has exercised such a power over the destiny of a nation.

GERMAN POETRY.

We have noticed the early development of German heroic song in the Nibelungen and the Heldenbuch; and the introduction of the Provençal taste under the Suabian emperors in the poetry of the Minnesingers. In all its leading features the poetry of this period (1138 to 1346) corresponds with that of the French Troubadours, with this unfavourable distinction, that the poetry of the Minnesingers (love-singers) is much more exclusively devoted to amatory themes than that of the Provençals, which blended with these, warlike and patriotic or satirical effusions. Hence their monotony of effect, when we peruse any of these collections at once, is undeniable. Schiller has accordingly, in a passage of unusual severity, denounced their poverty of ideas, and says that if the sparrows were to compose an "almanack of love and friendship," it would probably bear a close resemblance to these cloying strains of the Minnesingers. But against this sarcastic remark must be placed the observations of Frederick Schlegel: "The impression of uniformity arises from our seeing these poems bound together into large collections, a fate which was probably neither the design nor the hope of those who composed them. But, in truth, not only love-songs, but all lyrical poems, if they are really true to nature, and aim at nothing more than the expression of individual feelings, must necessarily be confined within a very narrow range both of thought and sentiment. The truth is, that great variety in lyrical poetry is never to be found, except in those ages of imitation when men are fond of treating of all manner of subjects in all manner of forms. Then, indeed, we often find the tone and taste of twenty different ages and nations brought together within the same collection, and observe that the popularity of the poet is increased exactly in proportion as he descends from his proper dignity, when simplicity is sacrificed to conceits and epigrams, and the ode sinks into an occasional copy of verses."

The opening of German poetry, then, had been on the whole brilliant and promising; but the confusion, insecurity, and violence which followed the death of Frederick II. in 1250, seemed fatal to the progress of improvement. After Rudolph of Hapsburg, we perceive in its poetry a visible decline. The Minnesingers were succeeded by the Mastersingers, personages who seemed to think poetry was to be acquired like any other trade, and to be supported and kept alive by guilds and corporations. It is difficult, perhaps, to point out at what precise period the former school of poetry ends and the latter begins; they melt into each other like the colours of the rainbow. But the character of the two schools, taken in the mass, is very different; for, in place of the tender, thrilling, amatory spirit of the Minnesingers, the great object of the poetical craftsmen who succeeded them was to give a didactic and philosophical air to their compositions, and to substitute for fancy and feeling commonplace truisms and moral aphorisms. One work only of this period deserves notice, not indeed on account of its high poetry, but of its shrewdness, its effective satire, and its invention, the comic epic, as it may be called, of Reynard the Fox, the groundwork of which no doubt existed before in other countries; but the novelty of the treatment of the subject by the German or Frisiac writer, and the great superiority of its execution, entitle it to the character of an original work.

From the close of the fifteenth to the middle of the eighteenth century, a dreary blank intervenes in the poetical annals of Germany. Bouterwek has indeed devoted more than a volume of his valuable work to this period; but, whatever interest the minute detail of second-rate names may have for Germans, there is certainly little or nothing calculated to awaken the least interest in the foreign reader. The effects of the Thirty Years' War were felt in Germany, paralysing science, general culture, and the spirit of poetry, up to the time of the peace of Westphalia. Opitz and Flemming are the only poets who rise above the dead-level of the mediocrity of the time. Opitz was a great importer from other countries, many of his poetical consignments being derived from Holland. Yet, though not a man of original mind, his strong good sense, a sincere honesty of mind, and a patriotic inspiration, render his poetry even now readable; though probably few are disposed to concur with F. Schlegel in preferring his style to that of Klopstock. Flemming is an inferior poet to Opitz, and yet perhaps his poetry is more interesting, precisely because it is more personal; because it lets us into the secret of his feelings, his friendships, and attachments. Hoffmanswaldau and Lohenstein enjoy the evil distinction of having corrupted, by the most false and fantastic taste, that poetry which was already but too destitute of any great pretensions. We ought, however, to make an exception in favour of Paul Gerhard (1606–1676), whose religious poetry is of a very high order of merit. Deeply pious and enthusiastic, the spirit of adoration breathes throughout his hymns, which are still most popular, and are justly regarded as masterpieces of their kind. The period from 1648 to nearly 1750 is characterized by Schlegel as the age of barbarism,—a chaotic interregnum in the history of German literature. Poetry existed in no other shape than that of feeble imitations of the French, profuse of mythology, penurious of feeling, destitute of nationality. "Apollo," says Menzel, "sat on the German Parnassus in a full-bottomed peruke, and, with fiddle in hand, led the concert of the well-powdered Muses."

Klopstock.

When at last the German Muse began to arouse herself from her torpor, and to "awake a louder and a loftier strain," she received no countenance from royal patronage. The great Frederick despised and disliked the literature of his countrymen, and seemed to think there was no hope for poetry save in a slavish adherence to the spirit and the rules of the French. If Klopstock (1708–1803) had done nothing more than awaken the feeling of nationality by his poetry, and teach his countrymen that, in the free and independent cultivation of their own genius, and the selection of their own themes, lay their only chance of redeeming Germany from the state of torpor into which its poetry had fallen, he would have conferred an inestimable service on its literature. With the Messiah, Schlegel thinks the modern poetry of Germany may be said to have begun, so great have been the benefits which it has conferred in regard to style and expression, as well as in the spirit of nationality and religious feeling which it imparted to the poetry by which it was succeeded. The plan, indeed, labours under great and insuperable defects. The mind of Klopstock was but ill suited to the epic; it was eminently lyrical and elegiac. Nor can it be denied that there is a degree of rhetorical pomp and long-windedness about his style, which becomes frequently oppressive, and communicates an air of pedantry to his poem. Still, Klopstock has exercised an important and beneficent influence upon German literature; he taught his country its own strength, and freed it at once and for ever from the leading strings of foreign authority.

Wieland.

Wieland (1733–1813) is more French in character than Klopstock, or rather he blends the luxurious and somewhat licentious spirit of the Italian romantic poets with that tone of gay and heartless philosophy which the example of Voltaire had introduced into French literature; and yet, withal, he is no mere imitator, but possesses a decided individuality in his later and better works, and even a truly German spirit. The tendency towards the imitation of the French appears, however, chiefly in the earlier productions of his romantic muse, such as the Idris and Zenide, the New Amadis, and others, in which he has assailed with such persevering satire the Platonism of love. As he advanced in life, he began to entertain better views; he grew dissatisfied with that epicurism which he had inculcated as the basis of conduct, and that licentious gaiety which he had made the mainspring of his poetry; and in his Oberon he endeavoured to make amends for the levity with which he had treated the better feelings of the heart, by those charming pictures of conjugal love, true constancy, and chivalrous heroism, which, combined with the beauty of the descriptions, and the pure and simple flow of the style, have rendered the Oberon the only successful effort in later times to revive the tones of that Italian harp which has slumbered since the days of Ariosto.

Gessner.

Gessner (1783-1788) belongs to this period. His Eclogues at one time enjoyed great popularity; and he has certainly in some of them, such as the First Navigation, displayed fancy and invention. But he deals in a species of poetry too remote from actual life; and there is a sort of sheepish modesty about his shepherds, and French coquetry about his nymphs and shepherdesses, which communicate something of a ludicrous character to his Arcadia.

Lossing.

The fame of Lessing (1721-1781) must rest more upon his vigorous, transparent, logical, and delightful prose style, than upon his poetry. His dramas, with the exception of Nathan the Wise, are written in prose; and the style of Nathan scarcely rises above the conversational pitch, though its Brahmin-like simplicity of tone, and the air of mild and tolerant wisdom which pervades it, leave a pleasing impression on the memory.

Schiller, Goethe.

The two greatest names in German literature succeed,—namely, Schiller (1759-1805) and Goethe (1749-1832). Of their dramas we have spoken elsewhere. Schiller, however, though greatest as a dramatist, is entitled to nearly equal eminence as a lyric poet. His odes, his short poems, mingling so much philosophy with so much feeling; his charming ballads, pitched on every key, from the simplicity of the Toggenburg and the Fridolin to the rude force of the Diver; the fine chivalrous and devotional tone of the fight with the dragon, and the classic finish of the complaint of Ceres or the cranes of Ibycus; would alone have been sufficient to place him second only to Goethe, had he never written William Tell, or the Maid of Orleans, or Wallenstein. In one particular he must rank far higher than Goethe: in the elevated aim which he always had in view; the attainment of noble ends by noble means; the rendering poetry what it always ought to be, not a mere specimen of plastic ingenuity, but something by which the soul feels itself refined and the heart made better. His enthusiasm—impetuous, and yet tender and affectionate—clothed all the universe, moral and material, with forms of grandeur, and gave to all he uttered the stamp of purity and truth. "His greatest faculty," says the most eloquent of his biographers, "was a half poetical, half philosophical imagination, a faculty teeming with magnificence and brilliancy; now adorning or aiding to erect a stately pyramid of scientific speculation, now brooding over the abysses of thought and feeling, till thoughts and feelings else unutterable were embodied in expressive forms, and palaces and landscapes, glowing in ethereal beauty, rose like exhalations from the bosom of the deep."

Of Goethe we have already so very fully expressed our opinion that we shall not again enter upon the subject. (See GOETHE.)

Tieck.

Uhland.

Koerner.

Grillpar

Müller.

Ruckert, Auersperg.

Ludwig Tieck is entitled to rank next to Schiller and Goethe. He may be considered as the head of the modern romantic in opposition to the classical school, delighting to let his imagination wander through the regions of mediæval fable and legend, and out of the material so gathered constructing edifices, airy indeed, and unsubstantial, but glowing like the clouds at sunset. His Genoveva and Fortunatus are splendid specimens of what has been termed the dramatic romance; and in some of the shorter pieces contained in his Phantasus there is much sprightliness and genial humour. As a translator of Shakspeare, he has won a high reputation both in his own country and in England. Ludwig Uhland (born 1787) has cultivated ballad poetry with more success than any recent author of Germany, and may be regarded as the most notable instance of the modern minstrel. It is true that he seldom or never rises to the heroic pitch, being somewhat deficient in energy. He cannot imitate the sound of battle or the clash of arms; but in the expression of the softer emotions he is eminently successful, and the flow of his versification is exceedingly graceful and melodious. The early fate of Theodore Koerner (1791-1813) has invested his writings with perhaps more interest than they intrinsically deserve. Yet it must be acknowledged that some of his lyrics exhibit much fire and enthusiasm, though the diction is occasionally extravagant. Franz Grillparzer, a Viennese poet, has composed some admirable dramatic pieces, the finest of which undoubtedly is King Ottocar, a noble historical tragedy, which may rank after the Wallenstein of Schiller. Wilhelm Müller's Songs of the Greeks are among the finest efforts of German poetry. Instinct with the true fire of enthusiasm, they are boldly conceived, and expressed with a nerve and energy strongly contrasting with the more feeble note and subdued diction of the recent poets, none of whom, if we except Ferdinand Freiligrath, seem to possess that inspiration without which verse is monotonous and tame. Ruckert and Count von Auersperg, better known by the poetical pseudonym of Anastasius Grün, have achieved considerable reputations, but they are only to be regarded as minor poets; and it is questionable whether their writings will maintain more than a temporary celebrity. From this sketch it would be wrong to exclude Adam Oehlenschläger the Dane, whose beautiful dramas of Coreggio and Aladdin are familiar to the English reader through the spirited translations of Mr Theodore Martin.

ENGLISH POETRY.

It is not our intention to enter into any minute details as to English poetry, with which we shall conclude the present sketch. Since we have already noticed, under separate heads, most of the individuals by whom it was adorned, we shall merely attempt to indicate generally the directions taken by poetical taste at different periods of our annals.

Even prior to the Norman conquest, we know from William of Malmesbury that England, like all the Gothic nations, had been possessed by a large mass of ballads, written in Anglo-Saxon, though, as no fragments of these remain, we know nothing of their poetical merit. This earlier minstrelsy must soon have sunk into discredit, or been entirely suppressed by the Norman conquest.

The English language, as it now exists, grew out of the mixture of the Anglo-Saxon with the Norman, and seems to have acquired a complete form by the middle of the thirteenth century. In 1297 we have the Rhyming Chronicle of Robert of Gloucester, the first undoubted composition in the English tongue.

From the Norman conquest to the time of Edward III., the literature and poetry of England consists of little else than translations from, or imitations of, the Norman romances and chronicles; and, judging from the ridicule with which they have been assailed by Chaucer in his Rhyme of Sir Thopas, they must have been of slender merit, since they are represented as shocking the taste, of course not particularly refined, of the host of the Tabard. The distance, at all events, which separates all our English versifiers of this period from Chaucer (born 1328, died 1406) is such as justly to entitle him to the honour of being the first of English poets, the sun that "flames in the forehead of the modern sky," throwing out a splendour that showed at once his own lustre and the dreary wastes that spread far and wide towards the literary horizon.

Chaucer.

Much of Chaucer's time, however, was wasted in the school of those French allegorical poets, whose romances were at one time so influential in Europe. In fact nearly half his life, as Mr Campbell remarks, was passed amongst the dreams, emblems, flower-worshippings, and courts and parliaments of love, of that visionary and tiresome school. He was fifty-four years of age before he commenced the Canterbury Tales, in which alone the peculiarities of his genius, its originality, and its extent, can be said to be completely manifested. This late discovery of the true bent of his powers is singular; for Chaucer appears peculiarly marked out as the poet, not of mysticism and allegory, but of clear observation of life and of practical aims. In the Canterbury Tales, which were obviously suggested by the influence of Boccacio's Decameron, he first found full scope for the display of the various qualities of his mind, and of that mass of real knowledge of life with which his experience of society in all its aspects, high and low, from the palace to the cottage, at home and abroad, had supplied his mind. His clear observation, and corresponding power of clear painting, giving the most vivid picturesqueness to all his delineations; his quiet and unobtrusive humour; his satirical power, at once forcible and delicate (a combination peculiarly rare in that stage of struggling and imperfect civilization); his imagination sufficiently elevated, yet always regulated by good sense; a cheerful contented tone of feeling, which makes him impartial towards all the world; a power either of creating character, or of so artfully and harmoniously putting together the result of his actual studies of men as to give to these all the free and natural effect of a creation; all these qualities found fit scope for their exercise in the broad varied canvas he selected, which, by means of its ingenious framework of a pilgrimage embracing persons of both sexes and of all ranks, and enlivened by tales told to relieve the tedium of the way, admitted equally of the comic and the tragic, the high and low; themes of chivalry and mythology, like the Knight's Tale; tales of wonder, blending oriental marvels with the romance of the West, like the Squire's; or stories of English low life, like the Miller's or the Reve's. The versatility of talent, indeed, displayed in the Canterbury Tales is astonishing; and, as in the case of his Italian rival Boccacio, it is difficult to say whether it is in the comic or the tragic that Chaucer most excels.

In invention, so far as regards incident, the English poet and the Italian novelist may be placed nearly on a par. The woodland freshness and beauty of Chaucer's forest scenes may be equalled by the charming country landscapes in which Boccacio places his interlocutors; but in power of characteristic delineation, particularly by those minute strokes of Dutch painting which present the exterior of objects, or those happily-selected traits which at once mark the individual, Boccacio cannot sustain the least comparison with the father of English poetry. He has many faults, but they are the faults of his age,—the faults of coarseness of taste and manners, of inartificial plans, of prolixity of style,—the natural errors to which the infancy of poetry, destitute of models, and struggling with an unformed language, was exposed. Against these must be placed the advantages of a vocabulary in which words are pictures, of subjects of description, unhackneyed, and bright with all their primitive freshness; the wisdom or grave humour of the philosophic observer blending most cunningly with the bonhommie and the garrulous graces of the narrator; an easy abandon, both as to matter and manner, which has its charm, however little reconcilable with the more artificial treatment which criticism would suggest; nature painted without exaggeration, as without disguise; and withal that feeling of unity imparted to the whole which makes the most discordant elements unite in kindly harmony, and which is never found except in the productions of the highest minds.

The appearance of Chaucer in English poetry has been well compared by Warton to the early appearance of a bright and genial day in an English spring; exciting the brighter hopes of a speedy and balmy summer,—hopes which are almost immediately blasted by the return of frost and tempest, and the settling down of winter, as bleak and blighting as before. In English poetry that effect was produced by the disastrous period of the wars of the Roses.

From the time of Chaucer, almost to that of Spenser, certainly no progress is made; or rather, if the language in some degree advances, the spirit of poetry retrogrades. Gower was his contemporary; Lydgate followed immediately after him; but they belong, so far as regards poetical genius, nay even poetical dexterity, to a previous century. In truth, the first introduction of learning into England appears to have been unfavourable to poetry, giving rise to pedantic imitation in place of independent efforts of genius,—a tendency which, indeed, to some extent, is visible even in the finest poetry of the Elizabethan period. Strangely enough, the hiatus which here occurs in English poetry was supplied by the nascent genius of Scottish writers, several of whom displayed no ordinary degree of accomplishment. The first of these in rank and time was James I. of Scotland, who, during his imprisonment in Windsor, is supposed to have studied and profited by the works of Chaucer. His principal poem, the King's Quhair, is composed in a dialect more refined than that spoken by his subjects, and contains many passages of real merit. His worthy successor was Robert Henryson, a moral and didactic poet, whose descriptions from nature are eminently beautiful. After him came Dunbar, who, in humour and power of character-painting, greatly surpasses Gower, and approaches to Chaucer. The poems of Surrey, and Wyatt, and Sackville, who followed during the reign of Henry VIII., can be regarded only as proofs that the love of poetry had not ceased to exist, and that in some shape, however rude, its voice was struggling to make itself heard in that calmer and more settled state of the political atmosphere which had followed the union of the rival houses in the persons of Henry VII. and Elizabeth of York.

Age of Elizabeth.

But when Spenser arose to enrich English literature with another great work of original genius, many causes, which had probably at first acted unfavourably for the progress of poetry, were beginning to exercise a more salutary operation. The Reformation, which had at first produced tumult, bloodshed, and wide-extended distress, by the suppression of those great hospitals, the monasteries, was now beginning to bring forth its better fruits, in the shape of a free and inquiring spirit, carried into all departments of thought and imagination. That acquaintance with the treasures of ancient learning, or the classic poetry of modern Italy, which had at first tended to overpower and confuse the national mind, was now turned to better account; it had insensibly refined the taste, and made the purest models of preceding times familiar to the poet and the scholar. The spirit of chivalry, still lingering in the English character, had been aroused into new and active existence by the triumphs which had attended the national arms during the reign of Elizabeth. A love of adventure had been generated by the frequent expeditions into remote countries and climes, as to which, in that imperfect state of geographical and physical knowledge, marvels were believed as incredible as any that figure in the pages of Sir John Mandeville. There was, in short, at this period, a remarkable union in the English character of the sober qualities of strong intellect with deep convictions and high imagination,—a character which manifests itself in every department both of poetry and literature.

Spenser.

Born in this happy period, and educated under such influences, Spenser (1510–1598) produced his great poem of the Fairy Queen. Familiar with Italian literature, as well as with the best learning of antiquity, it was from the works of Ariosto and Tasso that he had derived his bent towards chivalrous poetry. But the deeper earnestness of his character prevented him from treating his subject with the levity of Ariosto. Chivalry was to him a principle of faith, a part of religion, not the mere fantastic framework in which successive pageants of love and war, or luxurious description, were to be inclosed. In England it had not assumed that outworn and almost comic air which it wore when Ariosto first took up the entangled threads of Boiardo. It had still a vital influence on society, and ran like a thread of silver tissue through the coarser web of life. Nay, even the religious spirit in which Tasso had conceived the Jerusalem scarcely satisfied the mind of Spenser. He would render every incident which he described a step in some high argument or moral demonstration; every character the embodied representation of some virtue and vice; all the visions of imagination subservient to the cause of religion. He would enlist all the restless and excursive intellect and adventurous feelings of an ardent and romantic age under the banner of purity and goodness:—

> "That with the glory of so goodly sight,
> The hearts of men that fondly here desire
> Faire seeming shews, and feed on vain delight,
> Transported with celestial desire
> Of those fair forms, may lift themselves up higher,
> And learn to love, with zealous humble duty,
> Th' eternal fountain of that heavenly beauty."

And so deeply does this principle pervade his poems that, whilst wandering among the scenes of enchantment with which he surrounds us in that spiritual region to which he gives the name of Fairy Land, we can never forget that they have a spell beyond their first outward significance, nor be insensible to that still small voice of piety and wisdom which speaks through all those creations of his genius, and whispers that the place whereon we are standing is holy ground.

It must be admitted, however, that if this under-current of allegory gives a degree of solemnity and moral grandeur to Spenser's poem, its effects in other respects are unfavourable. It does occasionally interfere with the natural movements of the imagination, gives a formal and metaphysical air to the conceptions of the poet, and, by rendering the characters abstractions of moral qualities, impairs their individuality as human beings. So far, the injurious effect of Spenser's allegorical plan can hardly be denied; but it is absurd to speak of the allegory in Spenser being so obtrusive and continuous as altogether to destroy the interest of the poem as a representation of romantic life. The fact is quite different. Occasionally, no doubt, in the personifications of Envy or Pride, or the siege of the Castle of Temperance, in which the barriers of hearing, sense, smell, taste, and touch are represented as successively assailed by troops of monsters from without, the allegory is too prominent; but assuredly it sinks entirely out of view, and is perceived only on subsequent reflection, in the deep human interest of all the finer passages of the poem, such as the remorse of the Red Cross Knight; his temptation by Despair; the wanderings of Una, with her angel face "making a sunshine in the shady place;" Guyon's visit to the cave of Mammon, and his trial in the gardens of Acrasia; the combat of Cambel with the three brothers; or the many other passages which must be impressed upon the memory of every reader.

An extreme sensibility, almost amounting to a luxurious love of beauty, a flush of colour in his descriptions, which has led Mr Campbell to compare him to Rubens, and a fancy of the most remarkable exuberance, are the leading qualities of Spenser's mind. In this prodigality of fancy, indeed, lies at once the strength and the weakness of Spenser; for while it infuses life into all his pictures, making the plumes of Prince Arthur wave like the almond-tree on the top of Selinis; or the face of Britomart, when she raises her vizor, like the moon breaking forth in darksome night from behind the noisome cloud in which she was enveloped; so, on the other hand, it leads him occasionally to revel in images and traits which are painful, or even physically revolting, such as the portrait of Gluttony, the loathsome vomit of Envy, or the minute description of the operation of Diet and Appetite, Concoction and Digestion, with some other inmates of Castle Temperance. His fancy may indeed be compared to the Nile in its overflow, disdaining the confinement of banks, and spreading around a luxuriance of soil, alike productive of the flower and the weed.

In the portraiture of the allegorical beings introduced, Spenser is admitted to be without a rival. In his hand they almost cease to be mere abstractions of good and evil qualities, so life-like is the form in which they are presented, so picturesque the garb and accompaniments with which they are invested, so natural the gestures, actions, and occupations attributed to them. They appear the natural inhabitants of this realm of enchantment, raised as it is many degrees above the level of reality, bright in the near ground, with the sunniest tints of fancy, and fading away in the distance into the most aërial and heavenly hues.

The language of Spenser seems to be steeped in music; he is the greatest master of the difficult art of employing alliteration with success; his versification unites in the highest degree melody with majesty. It is formed on the principle of the Italian *ottava rima;* but, by the addition of the Alexandrine, it possesses a sonorous grandeur in the close which the Italian stanza wants. "It has not," says Mr Hazlitt, "the bold dramatic transitions of Shakspeare's blank verse, nor the high varied tone of Milton's; but it is the perfection of harmony, dissolving the soul in pleasure, or holding it captive in the chains of suspense. Spenser is the poet of our waking dreams; and he invented not only a language, but a music of his own for them. The modulations are infinite, like those of the waves of the sea; but the effect is still the same, lulling the senses into a deep oblivion of all the jarring noises of the world."

In the hands of Spenser, the allegorical form appears invested with all the brightest colours of the fancy. In the works of most of his contemporaries it appears lifeless and pedantic. No stronger instance can be shown of the tendency of imitators to copy the faults rather than the excellences of their master than is exhibited in the Purple Island of Phineas Fletcher. That poem, avowedly composed on the model of the Fairy Queen, with good diction and some choice imagery, is utterly intolerable from the absurdity of its allegorical conception. It is neither more nor less than an attempt to etherealize anatomy, and to strew the flowers of fancy over the grim realities of the dissecting-table. A disagreeable mixture of stilted expression and false learning blends with and alloys most of the poetry of the time. It deforms the otherwise noble lines of Sir John Davies, and renders Silvester unreadable. Shakspeare is not free from it; for it was deeply inwoven with the national taste of the time, and showed itself in the language of ordinary conversation no less than in poetry. Yet it is delightful to find the greatest dramatist also the greatest lyrical poet of his age; for, after Spenser, what work of that time will bear the least comparison with Shakspeare's sonnets? Sonnets they are not, in the strict sense; but for condensation of imagery, for natural thoughts, clothing themselves in the aptest expressions either of majesty or melody, without any redundance of expletives, or rank luxuriance of epithets, they leave Petrarch and his imitators at a distance. A singular grace, and even dreamy beauty, surprises us in the masques of Ben Jonson, because it contrasts so strangely with the otherwise hard and saturnine turn of his mind. A few gems, amidst much that is coarse or quaint or indifferent, may be gleaned from the pages of Herrick; power and vigour, mixed with sectarian gloom, and deformed by extreme ruggedness of versification, are visible in Quarles. The rise of satire appears in the works of Hall and Donne, of pastoral in Brown; while sacred poetry finds no unworthy representatives in Giles Fletcher and Crawshaw. A lighter and gayer taste, a more level but natural expression, shows itself in the compositions of the cavalier poets of the court of Charles I., in the graceful little airs and verses of Carew, Lovelace, Davenant, and Suckling. In particular, to them we are indebted for some of the best of the few good songs we possess in English,—witness the "He that loves a rosy cheek" of Carew, and the song written by Lovelace during his confinement in Westminster, "When love with unconfined wings hovers within my gates." To Denham and Waller, particularly the latter, have been ascribed by Johnson the glory of improving our English numbers. It would be more just to say that they had the good sense to perceive the importance of this element of poetry, as Spenser had done, while their contemporaries too much neglected it. Almost all the poets above mentioned have been classed by Johnson under the title of the metaphysical poets,—a title of doubtful application as to any of them, but which, if it be applicable to Cowley, whom he considers their chief, can scarcely be very accurate when applied to Suckling and Waller. Cowley is simply a poet in whom the fancy, while it is teeming and fertile, is seldom warmed by passion or directed by judgment; whose miscellaneous learning oppresses and buries his taste; and who therefore wearies us even at the moment he impresses us with the consciousness of his great resources and his mental powers.

Change produced by the civil war.

A great change in the character and spirit of poetry followed the convulsions which closed abruptly the reign of the first Charles. The poetry of that court leant towards the elegant, the romantic, the fanciful, the brilliant, and witty; but the stronger passions which had been awakened, the deeper interests which had been put in hazard, by the civil war, had soon impressed a character of solemnity on all literature, and made poetry itself, following the fashion of the time, assume a polemical, ascetic, sometimes mystical, yet grand and enthusiastic character. In those whose tastes were formed only after the change, this polemical character, and this proscription of certain subjects or associations to which Puritanism led, would probably have damped the wing and narrowed the flight of imagination; and, accordingly, no great poet appears to have been reared in that rigid and prosaic school. But the tastes of Milton, the great poet of this period, had all been formed in an age and a school more favourable to the exercise of the imaginative powers; his exquisite lyrics, and his Comus, had already been written before he visited Italy in 1638, at the very time when Carew, and Suckling, and Davenant were in the height of their popularity and reputation. Ere his great epic poem appeared, he had witnessed and deeply shared in the agitating struggle which had ended in the temporary subversion of the monarchy, and the stern but imposing despotism of Cromwell; and thus educated in the former period, and as yet witnessing the best bloom and flush of the latter, he united the chivalrous recollections of the Elizabethan age, and the classic associations with which his early education had filled his mind, with the enthusiasm of principle and intensity of will which characterized the men of the Parliament. Milton represents more vividly than any other the wide sweep and overpowering force of those political and religious sentiments which agitated the age; for all his earlier leanings were visibly directed towards the romantic and gorgeous associations of the past, towards the pride and pomp of chivalry, the well-trod stage, the throngs of knights and barons bold, the stateliness of feudal castles, the solemnity of minsters, the pomp of tournaments, the peal of organs, and the dim religious light of painted windows. Such was the poet of Lycidas, of Comus, of the Allegro, and the Penseroso, the two most perfect gems of contemplative lyric poetry of which Britain has to boast; and yet we see these tastes abandoned or repressed as he advances in life and in party spirit, till at last he views them only as unnatural corruptions of primitive liberty and simplicity. Still, with Milton, though a taint of bigotry pervades his views, everything is pure, high-minded and disinterested. "Nought he does in hate, but all in honour." He stands at an immense distance from the sect to whom he had allied himself, but with whom, after all, he had little in common. In no one does poetry more conspicuously appear a part of religion. He regards it as a sacred trust, not to be sacrificed on the altar of vanity, not to be purchased for a price, not to be applied to any unworthy or even trifling end:—

> "Driving far off each thing of sin and guilt,
> And in clear dream and solemn vision
> Telling of things which no gross ear can hear;
> Till oft converse with heavenly habitants
> Begin to cast a beam on the outer shape,
> The unpolluted temple of the mind,
> And turn it by degrees to the soul's essence,
> Till all be made immortal."

It would be absurd, at the present day, to enter on any formal criticism of his great work of Paradise Lost, the most original, if not the most successful, of modern epics. About no poem perhaps are opinions more agreed; every one feels its sustained loftiness, combined with so much of tenderness, in the scenes of Eden, but always suggesting the idea of effort and labour,—the wonderful art with which learning itself is rendered poetical in his hands; for even the visions of mythology and the fantastical traditions of chivalry are made to heighten the effect of a sacred poem dealing with the mystery of the fall of man; and, lastly, the consummate artifice of the versification, which, as Hazlitt remarks, seems to float up and down, as if on wings.

Butler. Milton represents the more imposing side of the Puritans, and he is almost the solitary poet of whom they can boast. The other side of their character, their hypocrisy, and their narrow and coarse tastes, are exposed in the merciless and consummately clever Hudibras of Butler. That poem is now, no doubt, in a great measure obsolete, like every application of poetry to the exposure of the peculiarities or vices of a particular age; yet its masculine vigour, its condensation of thought, and its wit, entitle Butler to a very high rank among the broad humourists of poetry.

Dryden. From the oppressive wit and subtlety of Cowley and his fellows it is delightful to turn to the manliness, the common-sense, the "long-resounding march and energy divine," of Dryden, who marks the point of transition from the metaphysical poetry to the critical. He had himself in youth been strongly influenced by the prevailing taste for conceits; and it must be admitted that in the greater part of his dramatic writings this taint clings to him to the last. As a dramatist, indeed, we can admire in him nothing but the nerve and vigour of his dialogue, and that power of reasoning in verse in which he so much excelled. But in his other works, such as the Absalom and Achitophel, he threw aside this rage for conceits; he was natural, transparent, vigorous; his illustrations, instead of being sought for, as in the case of Cowley, on account of their remoteness and apparent inaptitude, are such as at once adorn and elucidate, and are felt to be close and familiar without being common. High imagination he did not possess, and for his purpose it was scarcely needed. He has, in fact, scarcely written a line which is pathetic, and few that can be considered sublime. Yet in fancy he was not deficient, for it supplies him with inexhaustible imagery; his Ode shows that he could be raised at times into a true lyrical enthusiasm, whilst his judgment rarely fails him except indeed in those bombastic plays which he had framed by jumbling together an imbroglio of two inconsistent models—the French school, from which he borrowed his rhymes and his affectation of sentiment, and the Spanish, to which he was indebted for the exaggeration of his passionate scenes and the complexity of his plots. Had he known nothing of these, and been left to form himself on the model of Spenser, and Milton, and Shakspeare, and in a less artificial state of society, he might at least have avoided the gross want of nature evinced in these rhyming plays, though we can hardly persuade ourselves that, by any process of tuition, he could ever have become a great dramatist. "The general soundness and healthfulness of his mental constitution, his information, of vast superficies though of small volume; his wit, scarcely inferior to that of the most distinguished followers of Donne; his eloquence, grave, deliberative, and commanding, could not save him from disgraceful failure as a rival of Shakspeare, but raised him far above the level of Boileau. His command of language was immense. With him died the secret of the old poetical diction of England, the art of producing rich effects by familiar words. In the following century it was as completely lost as the Gothic method of painting glass, and was but poorly supplied by the laborious and tesselated imitations of Mason and Gray. On the other hand, he was the first writer under whose skilful management the scientific vocabulary fell into natural and pleasing verse. In this department he succeeded as completely as his contemporary Gibbons succeeded in the similar enterprise of carving the most delicate flowers from heart of oak. The toughest and most knotty parts of language became ductile at his touch. His versification, in the same manner, while it gave the first model of that neatness and precision which the following generation esteemed so highly, exhibited at the same time the last examples of nobleness, freedom, variety of pause, and cadence."[1]

Pope Pope is the last great writer of that school of poetry, the poetry of the intellect, or rather of the intellect mingled with the fancy, which occupies the period from the Restoration to the close of the eighteenth century. In Dryden's satires and miscellaneous poems we perceive the reasoning poetry brought to its perfection, as far as regards vigour of conception and force of expression. In these respects nothing remained to be added. But Pope possessed that quick tact and intuitive discernment, both of the range and limit of his own powers, and also of the taste of the age, which showed him the solitary direction in which, so far as regarded this philosophic and critical school of poetry, there yet remained an opening for himself. He felt that the qualities of his mind did not fit him to surpass, and scarcely to contend on equal terms, with Dryden, so far as regarded grasp or force; but he conceived that, in the way of polish, refinement, grace, and choice of expression, something yet remained to be done, and that something he was able to afford. Selecting, by a natural preference, themes of a moral and didactic rather than passionate character, adopting the idea, that everything should be polished to the highest pitch, and that artifice was the fundamental principle of poetry, that artifice, he thought, could hardly be carried too far; and, accordingly, with Pope we find habitual that attention to words which is only occasional with Dryden. If in Dryden we perceive a tendency to substitute logic and reflection for feeling, to exhibit pictures of conventional and artificial rather than of general nature, and to borrow his illustrations much oftener from science and art than from natural objects, this tendency appears still more decided and uniform in Pope, who is pre-eminently the poet of a period of high intellectual culture and limited poetical sensibilities,—the poet who wrought to its last perfection the pure but limited vein which this contemplative and preceptive style of poetry afforded. After Dryden nothing new could have been achieved for this style of poetry save what has been done by Pope; and what he attempted he perfected.

It is indeed impossible to award to him a rank in poetry of the same kind with that which had been occupied by our Miltons, Spensers, and Shakspeares. In the highest departments of poetry, the epic and dramatic, he has attempted nothing. In the lyrical he has failed. In translation his example has tended to corrupt the national taste, and to substitute a glittering, false, and metaphrastical version for a true translation. His forte is essentially the didactic and satirical; moral instruction or censure enforced with all the charms or all the point of which such subjects are susceptible. Within that range he has never yet found his equal; for to the logical and reasoning power and condensation of Dryden and of Boileau, he adds at times, as in his Rape of the Lock, an excursiveness and brilliancy of fancy—a compact strength with perfect harmony—a quiet, graceful, continuous humour, altogether without parallel. Yet, whilst speaking of the harmony of his versification, it must be added that he carried this principle to excess; that his system of terminating the sense invariably with the line, and his pauses, placed almost always on the fourth or sixth syllable, led to a monotony the most painful when contrasted with the varied pauses and lines flowing into each other, which were so happily employed by our elder writers; and that, finally, in regard to rhymes, Pope, though he was singularly limited as to range, was even within that range far from correct.

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[1] *Edinburgh Review.*

Prior.

"The best," says an eminent critic, "of what we copied from the continental school is copied in the lighter pieces of Prior. That tone of polite raillery, that airy, rapid, picturesque narrative, mixed up of wit and naïveté, that style, in short, of good conversation, concentrated into flowing and polished verses, was not within the vein of our native poets, and probably never would have been known among us, if we had been left to our own resources. It is lamentable that this, which alone was worth borrowing, is the only thing which has not been retained. The tales and little apologues of Prior are still the only examples of this style in our language."

As we advance through the eighteenth century, we perceive that the critical school of poetry had evidently attained its perfection in Pope, and was destined, at no distant period, to sink into mere prose, disguised under the appearance of verse. At least, after Pope, there is a visible decline, until the appearance of the first germs of a new taste, with which the intellect had less to do, whilst the feelings obtained a more decided supremacy.

Addison, Swift.

Addison's poetry is so flat, and cold, and destitute of imagination, that, but for the exquisite grace and refined taste of his prose works, it would not now be mentioned; and Swift, though a most clever versifier, and endowed with no ordinary talents for libel in the shape of epigram or satire, can hardly, by any stretch of favour, be regarded as a poet.

Thomson.

The first symptoms of the change which had been gradually going on appears in the return to a taste for simple instead of artificial nature; for as yet the revival of strong feeling or passion would have met with no sympathetic feeling on the part of the public. In Thomson are to be traced the first symptoms of the reviving taste for the "simple-natural." True it is, his field is limited. When he attempts narrative, when he indulges in properly didactic poetry, his style appears cumbrous, and his ideas commonplace enough. "*Liberty*," says Dr Johnson, "when it first appeared, I tried to read, and soon desisted." Few at the present day will even make the trial. But when he comes to deal with the matters which lie within his proper sphere, and are congenial to his quiet, contemplative, and indolent turn of mind, he is an original and a striking poet. We must never forget, in speaking of Thomson at the present day, that his poem was the first of its kind, and even yet, like Milton's Eve, it is the fairest of its daughters. Even now we must admire the painter-like skill with which, in his rural descriptions, he selects his point of view, the art with which he seizes the characteristic, and drops the less marked features of the landscape; the infinite variety of little circumstances connected with animate and inanimate nature, unnoticed by his predecessors, but which his quick tact detects and sets before our eyes; the soft, bland, Claude-like glow which he spreads over all he touches; the spirit of love and benevolence, and philanthropy, which he awakens; qualities which give to his Seasons a fascination which, though felt most strongly in childhood, is yet not materially abated by the judgment of cooler years. His faults are cumbrousness of diction and occasional vulgarity of taste.

Goldsmith.

The same sweet and natural tastes, though of a more refined kind, the same philanthropical spirit, and the same gentle inspiration of poetry are visible in Goldsmith. He has not indeed Thomson's sympathy with the sublime and terrible in nature; his mind habitually turned towards its milder and more smiling aspects, the fertility and richness of cultivation, the tranquillizing tone of village life, "the short and simple annals of the poor." "He is refined," says Mr Campbell, "without false delicacy, and correct without insipidity. Perhaps there is an intellectual composure in his manner, which may in some passages be said to approach to the reserved and prosaic; but he unbends from this grave strain of reflection to tenderness, and even to playfulness, with a peculiar grace, and connects extensive and philosophic views of the happiness and interests of society with pictures of life that touch the heart by their homeliness and familiarity. . . . His whole manner has a still depth of feeling and reflection which gives back the image of nature unruffled, and minutely. He has no redundant thoughts or false transports, but seems on every occasion to have weighed the impulse to which he surrendered himself; and whatever ardour or casual felicities he may have thus sacrificed, he gained a high degree of purity and self-possession."

Blair, Ramsay.

The names of Blair and Ramsay deserve notice, the first as the author of a poem, gloomy and homely, but with a decided character, and a picturesqueness of imagery, which redeem it from vulgarity, and which have been justly compared to the powerful expression of a countenance without regular beauty; the latter as a writer of a true pastoral drama, in a style totally different from the hackneyed mythological models on the subject, and delineating the natural and simple manners of the peasantry of Scotland, with a truth, a comic archness and tenderness, which entitle the author of the Gentle Shepherd to an honourable rank in British poetry.

Savage, Chatterton.

A mournful interest attaches itself to the names of Savage and Chatterton, both the victims of misfortunes caused, in some degree, by their irregularities of conduct or deficiency of principle. In the latter, in particular, the seeds of a mind of considerable power are evidently discernible, choked indeed with many rank weeds of evil tendency, but which, pruned and weeded by years and experience, might have rendered him an ornament to the literature of the eighteenth century.

Collins.

Collins wrote but little, yet that little was of first-rate merit. His Oriental Eclogues may be regarded as only a boyish production; but the rest of his lyrics suffer only by comparison with those of Milton, and that chiefly through a certain obscurity of diction, into which he was led by endeavouring to avoid the commonplaces of expression. In proportion to the neglect which they encountered on their first appearance has been their popularity since. The Ode to the Passions, in particular, has become a universal favourite, by its admirable personations, the flush of beautiful colouring with which it is invested, and the richness of the versification, which adapts itself with such art to the themes of sadness and gaiety, or deep gloom, which alternate throughout the poem.

Churchill, Akenside, Dyer, Armstrong, Shenstone, Falconer, Glover.

There is strength and nerve, but nothing more, in the ferocious satires of the dissipated Churchill; an undeniable, though very often turgid and unsubstantial grandeur about Akenside's Pleasures of the Imagination; but there is also perfect truth in Johnson's remark, that the words are multiplied till the sense is hardly perceived, and that attention deserts the mind and settles on the ear. Some pleasing pictures in Dyer and Armstrong, and a natural grace in Shenstone (which, however, sometimes borders on childishness), will preserve a certain popularity to Grongar Hill, the Art of Preserving Health, and the School-Mistress. The merits of Falconer's Shipwreck have, we think, been overrated. Its technicalities frequently appear tedious, and few poets have dealt more in needless expletives and mere commonplaces of description. Of Glover, whose Leonidas was once compared to Milton's Paradise Lost, the world now remembers nothing except his clever ballad of Hozier's Ghost.

Young.

Young is a poet of more fire, and of a decided though perverted ingenuity. He exhibits a curious mixture of the style of Queen Anne's day with the more pensive and meditative cast of our own. Few poems could be pointed out in which so much point, rare wit, and brilliancy, have been employed with so little effect. The whole poem is a long epigram, a string of hyperboles. It is precisely such a work, indeed, as we should expect to be produced by a person, naturally of a cheerful turn of mind, putting on, for the sake of effect, the garb of melancholy, and misanthropy, and weariness of existence; and composing, as he is said to have done, by the light of a candle stuck into a human skull. It has the worst points of Lord Byron's manner, without the earnestness and verity of that feeling of weariness of the world which speaks throughout Childe Harold.

Gray, in the delicacy, the classical neatness, and polish of his verses, is closely associated with the writers of the age of Anne. There is no doubt a certain want of ease and spontaneity about Gray; his inspiration seems to flow slowly; he rises with compulsion and laborious flight. His poetical fire seems often cold and phosphorescent; but he has a fine sensibility to the beautiful and sublime, a mind richly stored with the beauties of the classical and Italian poets, and he has combined his ideas of invention and recollection in a mosaic of singular delicacy and compactness.

Beattie.

In the Minstrel of Beattie some of the features of modern poetry become discernible, in its stronger sympathy with nature; nay, even in the general idea of the poem, which describes the solitary growth of a romantic and poetical spirit, and which possesses high merits as a sweet picture of still life, and a vehicle of unobtrusive morality.

Cowper.

But the complete transition from the artificial style of the writers of Queen Anne to that which characterized the poetry of the opening of the present century, first appears visible in Cowper; who, throwing aside the trammels of artificial refinement, and the imaginary requisites of a conventional poetical diction and classical imagery, ventured to write as he thought, with the force and freedom of an older and a better time. In no poet of the last century did a more vigorous and original cast of mind present itself; and to no poet are we more indebted for awakening that freer and more forcible spirit, that poetry of the heart rather than the head, which has formed the marking feature of our own times. His satirical and didactic poems, though abounding with wit, and animated by the eloquence of conviction, are indeed deformed by many defects, both of indifferent poetry and bigotry of opinion; but in his descriptive poetry, in his charming pictures of in-door life, his summer and winter landscapes (so different from Thomson's, by their minute detail), in those bursts of inspiration which occasionally escape the poet, as in that where he addresses the stars in the fifth book of the Task, he has left us some of the most touching and spirit-stirring passages of which the eighteenth century has to boast.

Burns.

The same spirit appears, in Scotland, in the deep tenderness of the lyrics of Burns. Much of his poetry, doubtless, can only be remembered with regret, as the effusion of a reckless and ungoverned spirit, mistaking coarseness for force, and confounding genius with extravagance and irregularity. But he has left behind him a few strains which are of a higher mood, nay, of the very highest order; familiar and yet noble, tender and yet manly; such as a peasant only could have written, but a peasant who was one of nature's nobles. "Scotland," says an American critic, "owes a large debt of gratitude to Burns; for he invested the feelings and sentiments of its peasantry, their joys and sorrows, with dignity and beauty; he redeemed their language from neglect, if not from contempt; he made the heart of every true Scot burn within him as he thought of the hills and valleys of his native land; he first guided the footstep of the pilgrim to the scenes of her traditionary glories, and he sung those glories in strains so simple, yet sublime, that the world stood still to listen."

Although in the poetry of Burns there are abundant traces of that stern force and strong passion with which we have been of late rather too familiar, the general tone of the poetry of the eighteenth century may be described as quiet and contemplative. But the great and terrible events which darkened its close, exciting the minds of men throughout Europe, introduced into the literature of all nations a spirit of restlessness and doubt, a love of strong agitation and stimulus, which either manifested themselves in a longing retrospection and veneration for the past, or in wild discontent with the present, and delusive visions of the future. This tendency appears in the publication of our ancient ballads, and the enthusiastic admiration which their rough vigour, their simple pathos, and their spirit-stirring pictures of love or war awakened; in the undiscriminating republication and study of our older dramatists of the school of Shakspeare, and our lyrical poets of the period which immediately followed; in the popularity and influence which the works of Goethe and Schiller, stamped with the character of the time, immediately obtained, when introduced to us through the means of wretched translations; and in that mixture of scepticism, moody discontent, and wild enthusiasm which had been painted in such gloomy and forcible colours in the Werther, the Faust, and the Robbers.

Scott.

But waters, however turbid, soon run themselves clear; and it is to the credit of the English poets who adorned the first half of the nineteenth century that they did not, through imitation, or from a wild craving after originality, rush headlong into extravagance. Original they undoubtedly were. At no other era of our literature do we find so many eminent poets pursuing separate paths, and professing different theories of art with so much individual success. Indeed it may be said that the practical examples of the last fifty years have done much to shake the public faith in the infallibility of all literary canons as applied to poetry, so various, nay, so discordant, have been the means employed by the great masters in achieving their renown. The first poetical name in point of date, perhaps also in point of merit, is that of Sir Walter Scott. No doubt his claim to pre-eminence will be disputed by those who prefer poetry of a reflective kind to that which is purely objective, by those who regard careful and polished versification as an absolute essential, and by those who seek for excitement rather in the portraiture and anatomy of morbid passion than in scenes of stirring action. The warmest admirers of Scott must admit that he is neither didactic in his tone, nor elaborate in his verse, nor a subtle delineator of shades of mental difference. His characters are broadly sketched, but that breadth makes them, in our opinion, particularly well fitted for practical use in poetry such as his, the characteristic of which is action. By refining or over-minuteness in these respects, he certainly would have lessened the effect which he produces through rapidity of motion; for his narrative may be aptly likened to a stream so impetuous that the characters are borne away with it, affording us but occasional glimpses as they rise or sink with the current. With Scott the narrative is all in all. We think little and care less about William of Deloraine, as we accompany him in his headlong ride from Branksome to Melrose Abbey; we are bent on the progress of the tale. Marmion is less the hero of the poem than the ideal spectator, through whom or with whom we listen to the legend of the elfin knight who haunts the deserted camp, or survey the Scottish army encamped on the Borough Muir, or mingle in the revelries of Holyrood, or plunge into the fight at Flodden. Action and descriptive power, which latter quality he possessed to a great though not superlative degree, are Scott's grand excellences; but these surely must be ranked among the highest of poetical attributes; and if lasting popularity is to be taken as the test of merit, Scott is entitled to the first place among his contemporaries: indeed it is doubtful whether his poetical reputation has not been somewhat obscured by his greater fame as a writer of romance, in which department he stands, by universal acclamation, without a rival.

Byron.

Next we shall notice Lord Byron, gifted with a greater versatility than any modern author, not even excepting Goethe. But his temperament was uncertain, his mind ill-regulated, his judgment vacillating, and his passions uncontrolled. Wanting in self-respect, and setting opinion at defiance, he attempted, nevertheless, by a *coup-de-main*, to storm the heights of fame; and he did so successfully, though without effecting a permanent occupation. He was like a comet, which, while it flares in the midnight sky, attracts more attention than the planets, but which, after reaching its perihelion, declines in splendour and in glory. And yet few poets, limited to so short a life, have done so much. We are inclined to think that his error lay in attempting so much without that concentration and thought which is necessary to make perfect the efforts of genius. His main object was to astonish the public of the day, not to produce real works of art; and, in default of inspiration, which every true poet ought to feel, he trusted to his natural gifts, which, great as they were, could not bear him successfully through so many different experiments. But his worst fault was the frequent obtrusion of a scoffing and irreverent spirit, a parade of sarcastic mockery which jars upon the feelings, and too often neutralizes, or rather destroys, the effect of passages which otherwise were calculated to charm or delight. Even while acknowledging his genius, we are compelled to deplore its abuse. Hence the reputation of Byron since his death has visibly decreased. We are no longer dazzled with its fulness. As the ebb of the tide reveals rocks, and shoals, and quicksands, so have the many faults and imperfections of Byron become apparent to the eyes of the new generation. Still, beyond these and afar off, they behold the clear water, with the sunlight playing on its surface.

Wordsworth.

The poetry of William Wordsworth has given rise to much literary discussion. Popular it never was, in the extended sense of the word, but it found many and ardent admirers; and men of high intellect and critical acumen were vehement in its praise. Others, who maintained the contrary, were almost as vehement in their censure. When such a controversy occurs, we may very safely conclude that there has been exaggeration on either side, and that the poet is neither entitled to the high rank claimed for him by his adherents, nor properly to be placed in the low grade which his detractors would grudgingly assign to him. The poetry of Wordsworth is widely different in its kind from that of Scott and Byron. It is essentially contemplative and philosophical. Never, perhaps, did any writer show himself so averse to action. In one only of his longer poems, the White Doe of Rylstone, has he attempted anything like a narrative, and there the story moves as painfully and slowly as a paralytic cripple upon crutches. His chief poem of the Excursion certainly does contain some noble passages of a reflective cast; but it is, as a whole, intolerably tedious, not possessing sufficient interest to carry the reader along, and being interspersed with platitudes in heavy verse, from which it is impossible to derive either instruction or pleasure. Upon his minor poems, his odes, and sonnets, his real fame must rest; and many of these are of rare merit, some deserving to be ranked as masterpieces. His Laodamia and Ode on the Immortality of the Soul are amongst the finest productions of the English language; and some of his ballads, though always deficient in spirit, are, from their tenderness and simplicity, very touching. One remarkable feature in the mental conformation of Wordsworth was the total absence of the sense of humour. Nothing ever appeared to him to be ludicrous. Associations which might have forced Heraclitus to laugh, could not extract from him a smile. This dulness of perception, for such it was, led him in some instances to disfigure his compositions by the introduction of images and objects so very mean as to be unfit for poetical use, thus exciting the risibility of the reader, and in some degree lowering the respect which otherwise would have been accorded to the bard. In our opinion, sufficient allowance has not been made for this defect, which was the real cause of much hostile criticism. Wordsworth, however, was not singular in that respect; for other poets of a high grade, among whom we may specify Milton, were deficient in the sense of humour. We must also remark that Wordsworth's habits of composition were such as, in a great measure, to justify the censure of his critics. He was essentially an egotist, with a firm and unshaken belief in his own powers at all times and at all seasons. He had no idea of waiting for afflatus, impulse, or inspiration. He conceived that in his ordinary mood he could at any time compose verses worthy of being received by the public with as much reverence as the ancient utterances of the Sibyl; and accordingly he spun out a certain daily number with the unflagging industry of the silk-worm. However laudable such diligence may be in ordinary literary manufacture, it is quite plain that it is not applicable to the production of poetry, which, as we have said in the commencement of this article, attains its end by the use of language natural in an excited state of the imagination and the feelings. It is necessary, therefore, to make a distinction between Wordsworth the versifier and Wordsworth the poet. In one capacity he has been excelled by many: in the other he has been equalled by few. But the bulk of his verse as compared with the bulk of his poetry is enormous.

Southey, Coleridge, Campbell, Moore, Crabbe, Shelley.

Robert Southey, the most industrious writer of his age, had very large poetical capabilities, but he also wrote too rapidly; and being somewhat of a theorist, was too much addicted to making experiments in verse. His longer epics have already ceased to attract much of the public attention; but we venture to predict that one of them, The Thalaba, will hereafter be greatly prized. It is a magnificent oriental tale, expressed in beautiful and glowing language, most wonderful in the harmony of its verse, and abounding in pictures so vivid that the art of the painter could hardly heighten their effect. The fame of Coleridge, challenged during his lifetime, is now universally admitted. The weird Rhyme of the Ancient Mariner, Geneviève, the Hymn in the Valley of Chamouni, and his noble translation of Schiller's Wallenstein, are too widely known and appreciated to require commendation. Of Campbell we have already spoken in the article specially dedicated to his biography. Thomas Moore, the poetic jeweller of the period, whose skill in the manufacture of glittering gewgaws was unrivalled, will probably remain a favourite with readers of that class and age who have a decided propensity for *bijouterie*. We ought earlier to have noticed Crabbe, the poet of humble life, who belonged as much to the past as to the present century, his first work having been revised by Samuel Johnson, though he died in the same year (1832) as Sir Walter Scott. Strong nervous power and clear delineation of character, with almost microscopic minuteness, were his distinguishing characteristics. Percy B. Shelley was a phenomenon, of whom we may not see the like again. He was a pure heathen, much resembling Lucretius in character and genius, without faith in revelation, blind in the midst of light, yet, like the *clairvoyants*, claiming an occult faculty of vision. His versification is most melodious; and his thoughts, usually tinged with melancholy, are, when not applied to interdicted themes, remarkably attractive. Some of his lyrical pieces are certainly destined to endure.

Keats. We close this necessarily brief notice of the more recent English poets with the name of John Keats, a poet who, during his short life, was most unjustly assailed, but whose reputation has gradually but securely risen. His first poem, the Endymeon, was full of faults. It was crude, unequal, and in some parts even prurient; nevertheless, it is impossible to peruse it without feeling that it was the production of a genuine poet. Scholars sneered at it, as something quite alien from the spirit of mythology; and so perhaps it was; but Keats had studied in the school of Chapman and Shakspeare, and, with the natural audacity of youth, thought himself qualified to tread upon any ground however sanctified by ancient consecration. The rebuke which he received was certainly too severe for the offence. But he afterwards gave to the world several poems regarding which there can be no doubt or cavil. The Eve of Saint Agnes is a gem of pure lustre and exquisite workmanship; and Hyperion, though only a fragment, is a splendid specimen of versification, and indicates an epic power, which, though it possibly might have failed in a sustained flight, as the pinions of Icarus melted under the influence of the sun, must ever be regarded as a noble effort cut short by the hand of death.

Wilson, Hogg, Hemans, Cunningham. Other poets there were who, had they flourished in the last century, would have acquired more fame than is likely to be accorded to them in a period when so many great reputations were jostling each other. John Wilson, the renowned Christopher North, whose prose writings are imbued with the noblest spirit of poetry, has, in his City of the Plague, and Isle of Palms, left traces of true genius. James Hogg, better known as the Ettrick Shepherd, was a poet of no mean capacity; indeed his Kilmeny stands by itself as a rare and wondrous poem: Felicia Hemans, in point of sweetness and delicacy of sentiment, has rarely been equalled by any of her sex; whilst to Allan Cunningham we must accord the praise of a lyrical power not much inferior to that displayed by Burns. We might greatly extend the catalogue; but, like Tarquinius Superbus, we can only deal with the taller poppies. With regard to living poets, any praise or censure of ours would be irrelevant and unbecoming. (G. M—R.) (W. E. A.)

POGGIO. See BRACCIOLINI.

POILLY, FRANÇOIS, a very eminent French engraver, was born at Abbeville in 1622. His enthusiasm for his art was very great. After receiving the first principles of engraving from his father, he applied himself for three years under Daret at Paris. Then repairing to Rome, he laboured assiduously for seven years, improving his design and executing several plates after the great Italian masters. No less was his assiduity when he had settled in the French capital with the reputation of being one of the best engravers of his native country. He continued to handle his burin at once with care and dexterity, and to superintend the labours of several pupils; so that at his death in 1693 his prints amounted to about 400. A list of the principal plates of Poilly is given in Bryan's *Dictionary of Painters and Engravers*. The most popular of these are "San Carlo Barromeo administering the Communion to the Persons infected with the Plague," after Mignard; "The Holy Family," after Raphael; and "The Flight into Egypt," after Guido. Poilly's younger brother Nicholas, and his nephew Jean Baptiste, were also distinguished engravers.

POINT. See PUNCTUATION, GEOMETRY, ASTRONOMY.

POINT-A-PITRE. See GUADALOUPE.

POINT DE GALLE, a fortified seaport-town of Ceylon, stands on a peninsula on the S. coast of the island, 70 miles S.S.E. of Colombo. Its appearance from the sea is very striking and picturesque. At the eastern extremity the solid old fortifications rise from the edge of the surf-beaten rock. At the other end is the quay, with numerous canoes always about it; and not far off are the white houses of the natives, overshadowed with trees. Most of the Europeans live in the fort. Behind the town, at the distance of 700 yards, rises a chain of hills covered with verdure and trees to their summits. Point de Galle has a mosque, several churches and schools, a lighthouse, and a large cinnamon garden. The inner harbour gives shelter to large vessels quite close to the town; and it is commanded by the fort. There is also a large roadstead in the bay. An active trade is carried on in cotton, coffee, cinnamon, ivory, &c. The mail steamers from Aden to Calcutta and China call at Point de Galle.

POIRINO, a town of the kingdom of Sardinia, in the division of Turin, on the left bank of the Bonna, 14 miles S.S.E. of Turin. It contains two old castles, several churches, a court-house, school, convent, and hospital. Pop. 5668.

POISON, any substance which, acting on living bodies in small quantities, occasions serious disturbance of their functions, and may cause death. The science which treats of poisons is termed toxicology.

Poisons have been known from remote antiquity; but the notions entertained of their effects were generally fanciful and vague, so that it is often impossible now to discover what the poisons of the ancients really were. In modern times a great addition has been made to our knowledge of them, both as regards their number and their action; and it is only within the last forty years that the nature and the varieties of their action have been studied scientifically and with success.

The number of poisonous substances now known is very great; and there can be no doubt that very many still remain to be discovered, equally in the mineral, the animal, and the vegetable world, but more especially among vegetables. Numerous, however, as they are, they present many remarkable agreements in their effects or actions, so as to admit of convenient classification.

Action. Some poisons produce no other effects besides what depend on the local injury they give rise to. Of these, some produce by their chemical properties absolute destruction of the textures to which they are applied; and the result depends in part on the nature and degree of the injury, but as much on the importance of the injured texture, and its sympathetic connection with other parts of the body. The mineral acids, such as sulphuric and nitric acid, and the mineral alkalis, potash or soda, are the best examples of this kind. Others, again, of those which act locally alone, produce inflammation, but not chemical destruction, where they are applied; and all the ordinary effects of inflammation may ensue; of which gamboge and colocynth are good illustrations. The action of the former description of local poisons does not differ essentially from that of mechanical injuries of the same textures; the action of the latter is almost identical with that of the natural causes of inflammation. A third description of local poisons merely produces a peculiar impression on the nerves of the part to which they are applied, without either destroying or inflaming its texture. But there is no pure instance of the kind yet known; all such poisons likewise act otherwise than locally. Opium and prussic acid are examples.

Other poisons, and these by far the most numerous, act upon remote organs and textures,—on parts to which they are not, nay, cannot be, directly applied; and effects of this kind are often developed without any appreciable signs of a direct local action. There is scarcely an important organ in the body which may not be brought thus under the influence of some poison or another. The brain is very often so affected, as by opium, belladonna, prussic acid, and charcoal fumes. The stomach and intestines are also frequently affected indirectly, as by arsenic. The spine is affected by nux-vomica, the kidneys and bladder by cantharides, the lungs by tartar-emetic, the heart by oxalic acid, the liver by manganese, the salivary organs by mercury, and many of the glands by iodine. Many poisons possess the property of acting on a great number of organs in this remote or indirect way, of which arsenic and mercury are the most remarkable instances. Arsenic introduced by the skin has been known to act on the stomach, intestines, kidneys, heart, the lining membrane of the eyes, nose, windpipe, and vagina, the nerves of voluntary motion, and the skin at a distance from its place of application. Physiologists are still in some doubt through what channel these remote effects are produced,—some believing that the poison is carried in substance with the blood from the organ to which it is applied into the parts on which it acts; others, that the operations are merely nervous, and consist of the transmission of certain local impressions along the nerves which communicate between one organ and another; and others, that both modes of action may exist, even for the same, and still more for different, poisons. The first of these views is the one most generally held. Two facts, however, are clearly established, whatever theoretical deductions may be drawn from them:—1*st*, That very many poisons do enter the blood, and may be detected there; and 2*d*, That these never enter except in minute proportion, so that, unless very delicate tests are known for them, they may readily escape detection. It seems not improbable that some poisons are deposited by a species of election in particular organs; but of course their presence in the blood will give them access more or less almost everywhere, since there are few organs not traversed by blood-vessels, and minutely injected with blood.

The greater number of poisons produce their peculiar effects through whatever texture they are introduced into the body. The effects of local poisons greatly depend, as was already stated, on the texture to which they are applied; but the far more numerous denomination of poisons which act remotely exert that action to whatever part they are applied, provided they fairly enter the body. They enter the sound skin with extreme difficulty, but most easily in the form of gas or vapour, or with the aid of friction. But they act energetically through the surface of the true skin stripped of its cuticle, through the cellular texture under the skin, through the soft mucous membrane which lines the mouth, nose, ears, stomach, intestines, windpipe, and organs of generation, through the firm serous membranes which line the interior of the belly and chest, and also when introduced directly into the blood-vessels, more especially into the veins. They generally act with greatest energy when injected into the blood directly, or when introduced into the serous cavity of the chest or belly; but if they operate in very minute doses, their effects are scarcely less prompt when simply thrust into a fresh wound, or under the skin; and there is no way in which they exert their action with more swiftness and energy than when inhaled into the lungs, provided they assume the form of gas or vapour. For the most part their activity is greatest when applied to organs and textures where absorption is most prompt.

The action of poisons is greatly modified by an infinite variety of collateral circumstances, without a thorough knowledge of which toxicology cannot be well understood, either as a branch of physiological science, or in its practical bearings on medical practice, as well as medical jurisprudence. These modifying circumstances cannot be accurately laid down here; but the most important are the following:—Quantity or dose, chemical or mechanical form, the texture directly acted on, habit, and peculiarity of constitution, either natural or induced by disease. By all of these causes the effects of poisons may not merely be altered in degree, but likewise even modified in kind, or entirely neutralized. 1. Most substances which are poisonous in moderate doses are innocuous in small quantity; but some are amazingly energetic even in very minute quantities,—such as prussic acid or strychnia, the active principle of nux-vomica, either of which may prove fatal to a man in favourable circumstances in the dose of one grain; or still more, the poisonous secretion of venomous snakes, or the secretions of the human body in some diseased states, which will prove fatal in quantities inappreciably small if introduced into a wound. 2. As to mechanical form, poisons must be, or must become, either gaseous or liquid before they act. Mixture and dilution weaken their activity, though there are exceptions to this rule; and some, which are rather insoluble, such as arsenic, are rendered nearly inert when mixed with insoluble powders of great tenuity, such as charcoal, magnesia, and the like. 3. Chemical changes materially affect their actions; many corrosives becoming innocuous by neutralization, purely local irritants being thereby much enfeebled, and all of them being rendered more feeble, or even inert, if they are converted into substances insoluble in the secretions of the textures to which they are applied. Poisons that act through the blood on remote organs are little influenced by chemical changes, except in so far as their solubility is affected,—a very important general principle, which ought never to be overlooked in the search for antidotes. Arsenic, mercury, prussic acid, opium, and numberless other poisons, are almost equally active in all their chemical combinations, provided they continue soluble. 4. The effect of the texture acted on in modifying the influence of poisons has been already adverted to. As examples of this, it may be mentioned that prussic acid has little or no effect through the sound skin, nor snake-poison when swallowed; and that strychnia, the active principle of nux-vomica, has no effect through the skin, while one or two grains might prove fatal if swallowed, and a third of a grain would probably kill a man in a few minutes if injected in a state of solution into a wound, into the cavity of the chest, or into a vein. 5. Habit weakens the effects of many poisons, as in the familiar instances of opium and ardent spirits, of which ten or twenty times what is sufficient to prove fatal in ordinary circumstances may be taken with impunity by those who have long used them. Mineral poisons are less under the influence of this modifying circumstance than vegetable poisons; and of the latter those are most influenced which act chiefly upon the brain. It is very difficult to account for the varying effect of habit on the energy of vegetable poisons. Strychnia, for example, the active principle of nux-vomica, seems altogether excluded from the modifying effect of habit; while another principle, analogous in elementary composition and in chemical properties, morphia, the active principle of opium, may, through habit, be taken without injury in a dose fifteen times as great as what might in ordinary cases prove fatal. 6. Peculiarity of constitution commonly operates in rendering the body more than usually sensible to the action of poisons, as in the case of opium, mercury, and cantharides, medicinal doses of which act with poisonous violence on some. In a few instances original peculiarity deadens the activity of certain poisons; and this is observed still more remarkably during the constitutional state of certain diseases, such as hydrophobia, locked jaw, mania, delirium tremens, and excessive loss of blood. In some constitutions substances not injurious to mankind generally produce all the phenomena of poisoning. Thus there is scarcely any article of food or drink, except the great staple commodities, beef, mutton, and the simple kinds of bread, which are not at times observed to act poisonously on some people. But the most remarkable substances of the kind are red fish, shell-fish, mushrooms, bitter almonds in small quantity, and eggs.

Classification.

It has been stated that poisons are exceedingly numerous, but that they possess only a limited number of actions. As these actions consist of derangement of the functions of certain organs and textures of the body, it follows that the outward signs of these derangements must be circumscribed within certain bounds, and that many poisons must agree with one another in producing the same, or nearly the same, outward signs. This general fact constitutes the basis of the most approved classification. Formerly physiologists endeavoured to arrange poisons according to certain theoretical notions of their nature, or according to certain mysterious properties imputed to them; and subsequently most were content with distributing them in three classes, according to the kingdom of nature whence they happen to be derived. Every classification, however, should have some practical bearing; and as the most important objects in the present instance are the decision of the question of poisoning in a general sense, the discovery of the particular poison, and the treatment of its effects, these points ought to be invariably kept in view. With this understanding, the best classification is obviously that which is founded on the external signs of poisoning, that is, the grouping of the symptoms produced by each. Such is the basis of all the most esteemed modern arrangements.

The whole wonderful multiplicity of poisons, when thus viewed, may be considered as either exciting irritation in particular organs, or disordering the functions of the brain and spinal marrow, or as uniting both these properties. The first are called *irritants*, the second *narcotics*, the third narcotico-irritants, or more usually *narcotico-acrids*. The irritants comprise chiefly the free acids and free alkalis, with many of their compound salts, several earths with their salts, many compounds of the metals, acrid vegetables, and acrid animal substances. These all agree in producing, as their principal phenomenon, destruction or inflammation, sometimes of the part to which they are applied, such as the skin, mouth, throat, intestines, and so forth,—and at other times of organs at a distance from their place of application, such as the stomach, intestines, kidneys, bladder, lungs. And the symptoms they produce are those incidental to inflammation, generally, grouped, however, in so peculiar a manner, either in order, kind, or complexity, as in many instances to distinguish the cause which occasions them from any natural cause of inflammation. Many substances arranged among irritants produce effects which would also associate them with the class of narcotics; but still inflammation and irritation are their leading consequences. The narcotics comprise principally opium, prussic acid, the volatile oils of bitter almond, cherry-laurel, and other drupaceous plants; henbane, thorn-apple, deadly nightshade, and certain poisonous gases, such as carbonic acid, carbonic oxide, carburetted hydrogen, cyanogen, sulphuretted hydrogen. These agree in acting either upon the brain or upon the spinal marrow, or upon both these parts of the nervous system at once. The symptoms thus arising are stupor and coma, delirium, convulsions, paralysis, with a great variety of less important yet often very significant phenomena. When coma is the chief result, the brain is considered to be chiefly acted on; when convulsions or paralysis occur without stupor or coma, the spinal marrow must alone suffer; and where both sets of phenomena present themselves, it is probable that the whole nervous system partakes more or less of the injury. The narcotico-acrids comprehend hemlock and other deleterious plants of the family Umbelliferæ, black and white hellebore, meadow-saffron, fox-glove, ipecacuan, nux-vomica, *Cocculus indicus*, camphor, poisonous fungi, and all ethereal and alcoholic fluids, besides many others of less note, or not so familiar. It is difficult sometimes to separate the individuals of this class from the narcotics on the one hand and the irritants on the other. But for the most part they produce in different circumstances either narcotism or inflammation alone, or both conjunctly, and that either simultaneously or in succession.

Examples of their several kinds.

It may be well to illustrate these statements by a brief sketch of the effects of a few familiar or interesting species belonging to each class.

The purest examples of irritant poisons are the *strong mineral acids* and *alkalis*, namely, sulphuric, nitric, and muriatic acids, and potash and soda. These, when applied to the external parts of the body for a sufficient length of time, cause corrosion and consequent destruction; and life may be thus brought into imminent danger, either from the extent of the injury and the consequent sympathetic derangement of the vital functions, or from a variety of less direct or incidental disorders. Of such a course of things the public in this country had, some years ago, too many illustrations, resulting from the execrable crime of throwing sulphuric acid over the person. When swallowed, the strong mineral acids and alkalis sometimes act in a great measure on the throat and gullet, more frequently on the stomach and intestines. In the former case there is instant and horrible sense of burning in the mouth, throat, and neck, eructation of acid matter, often bloody, or mixed with dark masses, excessive tenderness of the injured parts, incapability of swallowing, difficult, husky breathing; and the sufferer may either die suffocated, or from the depressing sympathetic impression produced on the heart; or he may survive for a length of time, perishing, however, miserably in the end, from stricture of the gullet and starvation, or he may recover after the discharge of more or less of the lining membrane of the throat, and a tedious and precarious convalescence. Where the stomach and intestines are acted on by the acids or alkalis there is in general violent vomiting, often of blood, and, especially after swallowing anything, burning pain in the pit of the stomach, extending over the belly, with excessive tenderness and eventually swelling, frequently profuse purging and gripes, and extraordinary prostration of the pulse and of the strength; and the issue may be either recovery, more or less prompt, or far more generally death, at times from the sympathetic depression of the heart and general system, more rarely from gradual exhaustion, occasioned partly by constant irritation, partly by inanition, on account of extensive injury of the internal membrane of the stomach,—on which digestion probably in a great measure depends for its integrity. These phenomena are purely the results of local corrosion and irritation. No remote phenomena arise except exhaustion of the heart, from sympathy with the local injury; in particular, there is no disturbance of the function of the brain, spine, or nerves, except what arises simply from exhaustion of the circulation. The most remarkable of all the irritants for subtlety and variety of action conjoined is *arsenic*. It is not, however, an absolutely pure irritant; for, though irritation of a multifarious nature is its most prominent result, it also disturbs the functions of the nervous system. When applied for some time to the surface of the body, denuded of the scarf-skin, it kills the part to some depth; at least a portion is thrown off by the process of sloughing, showing either that the part had been killed, or that inflammation is produced of a kind which leads to its death. Both in this manner, and with much greater certainty if it is applied to a fresh wound, or introduced into any of the external openings of the body, or injected in solution into the cavity of the chest or belly, it excites irritation and inflammation, not merely where it touches, but likewise in various distant organs. The stomach and intestines suffer the most invariably, giving rise to violent vomiting, especially of all articles swallowed, burning pain in the bowels, tenderness, griping, purging, and excoriation of the anus. The kidneys, bladder, and organs of generation are also often affected, causing strangury, suppression of urine, pains in the loins, tenderness in the lower belly, &c. The lining membrane of the air-passages likewise frequently partakes in the injury, as is indicated by hoarseness, cough, difficult breathing, expectoration, and deep-seated pain in the chest. Not unfrequently the investing membrane of the nostrils and mouth presents signs of derangement, such as redness, aphthæ, and constant discharge. These symptoms are also generally attended with extraordinary depression of the action of the heart, which is the most frequent cause of death; and this sometimes forms the only prominent effect, the sufferer dying in a few hours, with scarcely any other symptom but mortal faintness. Recovery may take place even though the complicated effects which have been described may have been developed. But after these primary disorders have disappeared, there are important secondary risks to be encountered, such as dropsy, gradual emaciation from constant disturbance of digestion, and, above all, epilepsy, palsy, and other affections characteristic of an action upon the nervous system. Of the symptoms thus indicating a narcotic action, the most pointed and most remarkable are epileptic convulsions and local partial palsy. To these illustrations of the phenomena of internal poisoning produced by the irritants, it may be well to add a short sketch of the very striking effects produced by many of them as external poisons, when they have been introduced into the substance of the skin, or its subjacent cellular tissue, through a wound. Of poisons of the kind now alluded to, the most familiar are *snake-poison*, and the *fluids of the dead human body* after certain diseases or in some peculiar unknown state; but similar effects are also produced by many acrid vegetables. The affection produced is diffuse inflammation of the cellular tissue, so called because it diffuses itself rapidly along that texture, without any tendency to become circumscribed, as in ordinary inflammation similarly seated. It is attended with some puffy elevation and tenderness of the skin over the inflamed part, but not always with redness—with pain, not always acute, usually of that kind called burning pain—and with excessive depression of the action of the heart; and death may ensue, either in a few hours from the derangement of the function of the heart, or more slowly from extensive injury of the cellular tissue, which is apt to terminate in gangrene.

Of the phenomena produced by the narcotics, the purest and most familiar example is to be found in the effects of *opium*. This drug produces a great variety of interesting nervous phenomena when taken in small medicinal doses. When taken in a poisonous dose, it first occasions languor, giddiness, weakness, and drowsiness; afterwards deep sleep, attended in general with complete repose, soft, slow breathing, and highly contracted pupils; and then profound coma, or insensibility, which cannot be dispelled by any stimulants, and which usually proves fatal if it be allowed to be fully formed. In particular cases these symptoms are varied with delirium in the early stage, and convulsions in the advanced stage; but such deviations from the ordinary rule are rare. *Belladonna*, or *deadly nightshade*, is another narcotic which produces effects somewhat different. Its berries, which are sometimes eaten by mistake by children and other ignorant people, occasion in the first instance a singular state of very active delirium, in which the individual performs a series of incoherent and extravagant acts with much vivacity, or falls into the condition of somnambulism; and after some hours this is succeeded by a state of deep sopor or coma, as from opium, though more frequently intermingled with convulsions than in the case of that drug. Death is sometimes the result, and would be more frequent were it not that the precursory stage of active delirium often leads to the discovery of the offending cause, and its removal by fit treatment. *Prussic acid*, another pure narcotic, which is now almost as familiar as opium among poisons, rivals them all in subtlety and rapidity of action. Small animals, such as rabbits, have been killed with it in the brief space of four seconds. A single drop has killed a cat in half a minute, and one grain, or about four drops, has repeatedly proved fatal to man within three-quarters of an hour. These statements apply to the pure acid, which is seldom seen; but the common acid of the shops, which is used in medicine, is equally energetic in large doses; and so are the distilled waters and essential oils of the bitter almond, peach-kernels, cherry-laurel leaves, rowan-tree root, and apple-seeds, which all owe their poisonous qualities to the same cause. The effects produced by all these poisons are immediate: dreadful alarm, giddiness, and hurried breathing, speedily followed by convulsions, insensibility, one or two fits of deep convulsive respiration, and death. The *narcotic gases* act very much in the same manner with opium, as is well exemplified by the fumes of burning charcoal, and other forms of carbonic acid. When in a pure or concentrated state, carbonic acid extinguishes life immediately, in part by suffocation, on account of the exclusion of respirable air, and partly by its narcotic operation. But when breathed in a diluted state, as in an ill-ventilated mine, or in a confined chamber heated by charcoal, it induces giddiness, fulness of the features, ringing in the ears, gradually-increasing stupor, and at length profound insensibility, commonly attended with lividity of the face, glistening of the eyes, and occasional convulsions, which often prove fatal, and always, if not speedily relieved by fresh air and other suitable treatment.

The narcotico-acrids may be exemplified by a great variety of well-known and powerful poisons. *Hemlock*, which is believed to have been a familiar poison for more than 2000 years, but whose effects are generally misunderstood, ought scarcely to be arranged in this class, where it is commonly placed. Its irritant properties are very ill defined. But it is a powerful and very remarkable narcotic, and its active principle, named *conia*, is scarcely inferior to prussic acid in celerity of operation, or in the smallness of its dose. It seems to act by paralysing the muscles of voluntary motion and of respiration, without affecting the brain; and the symptoms are weakness of the limbs, gradually pervading the rest of the body, and terminating in loss of the power of motion, while at the same time the respiration, at first laborious, gradually becomes more and more circumscribed and slower, till at length it ceases, the heart all the while acting vigorously, and the sensation continuing unaffected. A better instance of a narcotico-acrid poison is *nux-vomica*, and its principle, *strychnia*. These are counterparts in action to hemlock and conia. They powerfully stimulate the spinal marrow, producing violent convulsions, like those which attend locked jaw or tetanus, and without impairing the sensibility. The first symptoms are restlessness, undefinable uneasiness, and alarm, speedily followed by fits of stiffness of the jaw and neck, and then by violent paroxysms of muscular contraction, in which the limbs and arms are extended, the features hideously distorted, and the head, body, and legs bent backward forcibly; and the third or fourth fit commonly proves fatal. Strychnia, the source of these dreadful effects, is on a par with prussic acid and conia in energy; for the third of a grain will kill a wild boar in ten minutes, and one grain properly administered would certainly kill a man in half that time. So far this genus of poisons acts like the narcotics; but in frequent instances, where the narcotic symptoms pass away, they are succeeded by the signs of inflammation in the stomach and intestines, namely, pain, vomiting, purging, and swelling of the belly, which affection, too, may prove fatal. Such irritant effects, however, are rare, perhaps because in the great majority of cases death is brought about in the early stage by the action on the nervous system. A better example still of a narcotico-acrid is *foxglove.* A most valuable and safe medicine in small doses, this plant nevertheless acts as a very dangerous poison in large doses; and it sometimes produces in the same case both deep coma with convulsions, and likewise profuse diarrhœa, with tormina and tenderness of the abdomen, while at the same time it occasions suppression of urine and extreme depression of the action of the heart. By far the most characteristic illustrations, however, of the narcotico-acrid poisons are to be found in the *deleterious fungi*, or poisonous mushrooms, as they are sometimes called. These differ from most other poisons in their effects being often put off (though to this rule exceptions exist) for several hours, apparently because time must be allowed for the digestion of substances on the whole difficult to digest. The effects are singularly various; for it has been often observed that, among a number of persons who have partaken of the same poisonous stew, some had only giddiness, confusion, delirium, stupor, coma, and convulsions; while others suffered only from vomiting and purging, distension of the belly, tenderness, and griping; and a third party were seized at first with the former class of symptoms, and on these passing partially off, were attacked severely with the latter.

Besides the irritant narcotic and narcotico-acrid poisons, some writers on the subject admit a fourth class, under the name of *morbid poisons*, comprising those poisonous secretions which are engendered in the body by disease, and possess the property of reproducing by contact or inoculation the same disease to which they owed their own production. The most important of these are hydrophobia, the venereal disease, small-pox, and cow-pox. Authors on toxicology, however, whether physiological or practical, have now generally agreed in discarding these from the toxicological system, and in arranging the phenomena of their action where they are more philosophically placed, namely, among natural diseases.

In a work like the present it is not easy to decide how much ought to be introduced of a subject so comprehensive as toxicology, or the science of poisons. The sketch given above will convey some idea of the objects of which it treats, more especially as a branch of physiology. Further details on the subject at large seem uncalled for. But there are two departments which may be enlarged on with some advantage, namely, the *evidence* of poisoning, and the *treatment* of the effects of poisons. Poisoning, both criminal and accidental, has become so common and so notorious in recent times, that there are probably few persons who have not turned their thoughts to these two branches of the subject; and it is desirable for many reasons that correct views should be entertained of them, even by unprofessional persons,—more correct views, at least, than what generally prevail.

Evidence.

Till a recent date, most erroneous notions were entertained, alike by the vulgar as by scientific men, of the evidence of poisoning. Proofs of the most unsubstantial kind were considered infallible tests of death by poison; and, under the authority of grievous professional error, we now know that courts of law must have sanctioned many a judicial murder. It is not uninteresting to trace these dogmas of antiquity, abandoned as they now are by the scientific, still obstinately adhered to by the unprofessional world as articles of popular belief, and leading, as of old, to constant blunders, which it is now the business and glory of the toxicologist to check, whilst it was formerly his fate to foster and give effect to them.

The evidence of poisoning cannot be thoroughly understood in all its bearings without a minute knowledge of the multifarious phenomena produced by all ordinary poisons; and, in judicial cases, it is in the end viewed commonly in reference to the supposed administration of a particular substance. It would be out of place to attempt embracing this wide field here. All which can be ventured on is, a view of the evidence of poisoning in a general sense, that is, without reference to any special poison,—a topic of great interest in relation to the first suspicions and earliest investigation of supposed cases of poisoning, whether criminal or accidental. The evidence of poisoning in this comprehensive sense is derived from symptoms, from appearances in the dead body, from experiments on animals, from certain moral circumstances, and from chemical analysis.

1. The *symptoms* are naturally the first particulars to attract attention and excite suspicion. They were once thought adequate to decide singly any question of poisoning. Now we know that natural diseases imitate so closely the phenomena of poisoning that the symptoms will rarely yield more than presumptive, and only in rare and very peculiar circumstances, absolute evidence. There is nothing in the kind of symptoms, taken generally, which will distinguish poisoning from certain natural diseases. The natural diseases, indeed, which imitate the effects of one great class of poisons,—namely, the irritants,—are on the whole rare; yet they are scarcely less a source of fallacy, at least in judicial cases, where certainty, or something like it, must be aimed at. But there are a number of collateral circumstances connected with the symptoms, which, if taken together, will often supply a very powerful criterion in supposed cases. Thus, in the instance of by far the greater number of poisons, and of almost all which are used for a homicidal or suicidal purpose, the symptoms begin soon after food, drink, or medicine has been taken, commonly within an hour, often much sooner; and in respect of not a few common poisons, such as the mineral acids, mineral alkalis, hartshorn, prussic acid, oxalic acid, they must commence immediately. In general, too, the symptoms begin suddenly, advance quickly, and prove speedily fatal. For the most part they are steady in their progress, exclusive of the influence of treatment. They are upon the whole uniform in their nature. And they appear in the great majority of cases abruptly during a state of good health. The consideration of these characters will not unfrequently enable the man of experience to pronounce that suspicions which have prevailed of poisoning are wholly unfounded; but taken singly, they will never justify, on the other hand, more than a presumption in favour of poisoning. It must at the same time be observed, that when these general characters are all applicable, and concur with a certain complicated grouping of the symptoms in particular cases, the presumption becomes very strong; and when other articles of general evidence are added, the proof may be all but complete, nay, absolutely so. Such is clearly the state of the case in not a few instances of poisoning with the mineral acids and alkalis, with arsenic, corrosive sublimate, nux-vomica, oxalic acid, prussic acid, alcoholic fluids. 2. The same confident reliance was long placed in the *appearances of the body after death* as in the symptoms, and with even less reason. The discovery of certain morbid appearances may prove poisoning to have been impossible; and yet even here an opinion should not be formed without reserve, because the discovery of the effects of natural disease in the body, even in an advanced stage, is no absolute proof of death from that disease. Poison, as in many authentic cases, may have been nevertheless administered, and have proved the real occasion of death. But there is never any-

thing in the appearances after death which will bear out a general charge of poisoning, as was once universally thought. It should be particularly known that the vulgar prejudice, which discovers poison wherever the skin becomes unusually livid after death, or wherever the body undergoes prompt decomposition, is utterly without support from scientific experience. Nay, in regard to the latter character, evidence has been proved in recent times to be deducible from the very opposite condition, or the unusual preservation of the body from decay, which is now well known to occur in many cases of poisoning with arsenic. There are certain morbid appearances in the dead body, especially upon the skin, and in the throat, gullet, and stomach, which will furnish the strongest presumption,—nay, according to good authorities, almost absolute proof,—of poisoning with certain substances; for example, the mineral acids; but the details cannot be entered upon here, because a full enumeration and much professional skill are required for appreciating precisely their import. 3. *Experiments on domestic animals*, made with suspected articles, were once supposed to furnish the best of all evidence; and this was probably the best evidence to be had in the days when chemistry and chemical analysis were all but unknown. Now, however, such experiments are not admitted, either by medical or legal authorities, to be of any weight, except under particular circumstances. They are admissible, and indeed clearly indispensable, for deciding questions in toxicological physiology which may arise during trials. They ought also to be allowed some weight when they have been observed accidentally, as, for example, when the remains of suspected articles have been devoured incidentally by domestic animals, especially by a number of them, and above all by the dog or cat, with the effect of producing in them symptoms and appearances after death similar to what were witnessed in the suspected case in the human subject. The objection drawn against such evidence, that the effects of many poisons on the brute creation are different from their effects on man, though fundamentally sound, has been allowed to operate far too sweepingly in modern times. The differences in respect to many common poisons are by no means so great as was thought not very long ago; and upon two animals, the dog and cat, the effects of most poisons are almost identical with those observed in man, due attention being paid to differences in dose, and to the singular facility with which these animals discharge poisons by powerful early vomiting. But the objection here stated may be allowed sufficient force to put an end to experiments made expressly on animals with suspected articles. There is, however, a more urgent objection to such experiments,—that they involve, for doubtful evidence, the consumption of materials from which decisive evidence may be obtained by other means; for if there is poison enough left to affect sensibly the lower animals, there is amply sufficient for detection by chemical analysis. Accordingly, express experiments with remains of suspected food, drink, or medicine, are now abandoned as a general rule by all good authorities in toxicology. In a limited class of cases, however, such experiments are still admissible, and ought to have great weight,—viz., when the poison is not of a kind to be satisfactorily detected by chemical characters, but is such as produces characteristic symptoms. 4. There are certain *moral circumstances* which may also be often taken into account in the evidence of poisoning in a general sense, when viewed as a scientific question, because they cannot be correctly appreciated except by a scientific man, and consequently they belong in some measure to the scientific or toxicological proof. The chief particulars are as follows:—It may be proved that poison has been purchased of a kind which may produce the symptoms observed. A suspicious article may be proved to have been administered, either from its taste, or from its having been recommended for properties either absurd in nature, or such as the pretended article is not thought even by unprofessional people to possess, or from a comparative analysis of the materials for making the suspected article, showing that something injurious must have been added at a particular time, and by a particular person. It may be proved that exacerbations of the symptoms have repeatedly occurred soon after articles were given in a suspicious manner. It may be proved that the person poisoned, or a second party under suspicion, exhibited by words or deeds an intention to administer poison, as by assigning impossible properties to what is administered, or by manifestly changing medicine which has been prescribed. A highly important circumstance is the simultaneous and similar illness of several individuals who have partaken of the same meal, coupled perhaps with the degree of their illnesses concurring with their respective shares, and probably also united with the escape of others of the same company who did not partake of the meal, or of particular dishes or liquors. Many other moral circumstances might be here alluded to, by which the question of poisoning in a general sense may be often materially cleared; but as they do not belong to the scientific view of the question, either directly or indirectly, they may be passed over. 5. The *chemical evidence* is justly considered the best of all the departments of proof; for it not only establishes poisoning in a general sense, but likewise points out the particular poison. There is no department of toxicology which has made such amazing progress in recent times as that of toxicological analysis. A century ago, the search for the remains of poison in suspected dishes, or in the dead body, was scarcely ever attempted, and, owing to the ignorance of the chemical properties of poisons, could not have been successful. Even no more than forty years ago, the method of analysis was in all cases crude and unsatisfactory, and for many poisons good processes continued unknown; so that it was no uncommon thing for charges of poisoning to break down, solely on account of the dubious quality of the chemical evidence. But at present the proof of poisoning is seldom defective in the chemical branch; the evidence of death by poison is usually complete; and how can it fail to be so in competent hands, when the analyst can detect in the most complex mixtures the minute quantity of a twentieth or fiftieth of a grain of the common poisons, and when many years of interment frequently cannot withdraw the crime of the poisoner from the keenness of the chemist's search? It has been proved by careful experiments that the mineral acids, arsenic, corrosive sublimate, blue vitriol, opium and its principle morphia, strychnia (the principle of nux-vomica), cantharides, and other less familiar substances, may be discovered in the body of animals poisoned with them, though buried for nine months; and instances have occurred of the detection of arsenic in man after interment for two, four, and even seven years. It does not absolutely follow that death has been occasioned by poison because poison is found within the body after death; for it may have been feloniously introduced afterwards, for the purpose of falsely imputing poison; or though poison has been swallowed, death may nevertheless have arisen either from natural disease, or some other kind of violence. Instances of such extraordinary occurrences are actually not uncommon; sufficiently so at least to require being kept always in view. The determination of them involves too refined an inquiry to be considered here. On the other hand, the non-discovery of poison after death is still further from being evidence that death was not occasioned by poison. For some poisons are still undiscoverable by any method of analysis; others are soon decomposed within the body after death, such as prussic acid; others are quickly absorbed from the stomach during life, so as to prove fatal without leaving any remains behind, as in many instances of poisoning with opium; others may be expelled by vomiting, and nevertheless have, in the first instance, occasioned injury enough to prove fatal, as sometimes happens in the case of arsenic, and very commonly in poisoning with mineral acids. It has, however, been made a subject of question, whether the evidence of poisoning can ever be considered as complete, so as to involve a conviction in a criminal case, unless poison be found either in the body or in the remains of a suspected article which has been swallowed. It appears absurd, however, to insist on the absolute necessity of such evidence. For were the poisoner to choose his means skilfully, and avoid over-doses, he would, on such principles, frequently escape. And the best scientific authorities, in the most recent times, seem inclined to allow that the general evidence from the various sources detailed above may be often so strong as to leave scarcely any scientific doubt of the occurrence of poisoning; and the conjunction of the circumstances of ordinary evidence may, in a legal sense, entirely remove what little doubt may have existed of a scientific nature. Accordingly there have been instances of condemnation, in this and other countries, where poison could not be discovered. It may be right to add, that it is most singular how effectually and how quickly poisons are sometimes removed beyond the reach of analysis by incidental causes, even those poisons which may be detected in other circumstances in extremely minute quantities, and where the methods of analysis are well understood. Prussic acid is seldom to be detected if life be prolonged for half an hour, while in the ordinary cases of death in a few minutes it may be discovered with ease. Arsenic, which in the great majority of cases adheres obstinately to the stomach, and may in consequence be detected there though life has been prolonged under frequent vomiting for two days and upwards, has been known to be removed from the stomach in the short space of five hours. It is of moment to observe, however, that, by reason of the improvements made in chemical analysis in recent times, some poisons, such as arsenic, though they may cease to be discoverable in the stomach, will be discovered in the blood, in the liver, and other fleshy organs, and also in the urine.

Treatment. The *treatment* of poisoning, like all other branches of toxicology, has, within a few years, been prodigiously improved. It may be said, indeed, to have been understood only within the last forty years. In ancient times the notions entertained of the treatment were not less crude than those formed of the nature and action of poisons. Among other errors, it was strangely supposed that certain counter-poisons existed, which not only possessed the property of curing the effects of all poisons indifferently, but which likewise, when taken for a length of time, had the faculty of impregnating the constitution, and rendering it proof against the influence of any poison. Princes and others often lived thus for years under the care of their physicians, or protected against their treachery, by being charged with conservative antidotes. After these notions were exploded, other erroneous practices came into vogue; and in particular it was believed to be established on the basis of observation, that certain antidotes, such as vinegar, milk, oils, and the like, which are really not amiss in some forms of poisoning, were equally efficacious in all. These illusions have been dispelled, even among professional people, only within very few years; and among the unprofessional they still have currency. The clearing away of the mists of error has been attended with the discovery of many real and most valuable remedies. The improvement which has thus taken place has been owing partly to the improvements made in chemistry; but in this way nothing could have been ultimately effected without the aid of physiological experiment, and more especially of experiments on animals; a method of inquiry, nevertheless, which it has been too much the practice of an ignorant or spurious humanity to decry.

The treatment of poisoning is directed to three objects,—the removal of the poison, the administration of an antidote, and the cure of the disorders which have been produced.

I. The first object in every instance is the prompt removal of what may remain of the poison. If it had been applied outwardly to a sore or wound, it must be carefully wiped or washed away. When introduced deep into or under the skin by a puncture, it is to be withdrawn by suction with the mouth, and, still better, with a cupping-glass, the efficacy of which is insured, as in the case of snake-poison, by a bandage being applied above the wound, so as to obstruct the return of blood from the veins to the heart, but without compressing the arteries. Another plan, which has been found effectual in the like circumstances, is simply to apply the bandage above the wound, and then to open a vein between the wound and bandage, so that the poison is drawn from the wound with the blood, and discharged outwardly from the orifice in the vein. Sometimes it is useful to make deep scarifications before applying the cupping-glass; yet in this way the bottom of the wound may be missed; and, on the whole, if incisions are to be made at all, it seems better to calculate the probable depth of the wound, and to remove a portion of the texture with the knife all around it. The bleeding which follows commonly effects the discharge of the remaining poison; but some afterwards add the use of an incandescent iron for cauterizing the whole adjacent parts. The removal of the poison, when taken internally, may be variously managed. But, first, care must be taken not to attempt its removal when nature may have already looked after this step in the treatment, as in the case of profuse, and frequent, and full vomiting. All that is necessary in such circumstances is to give occasional draughts of lukewarm water, or milk and water, to render vomiting easy, and to aid in washing out the stomach. When vomiting does not occur, or is not free, an emetic ought to be promptly given. Whatever is nearest should be first tried,—mustard, for example; but the most effectual is white vitriol, in the quantity of a scruple or half a drachm dissolved in a large wine-glassful of water, to be repeated in fifteen minutes if necessary. Where the symptoms indicate narcotic poisoning,—for instance, with opium,—it is essential to keep the person roused after giving the emetic, otherwise it will hardly act. Emetics, when they do operate, are greatly preferable to the stomach-pump, which has been of late currently substituted for them. The stomach-pump, however, is one of the most important additions which have been made to the healing art in modern times. In very many instances of narcotic poisoning emetics will not operate; and all such cases, till of late, inevitably perished when the quantity of poison was considerable. The stomach-pump insures the prompt removal of almost all poisons; so that when used in time recovery is next to certain, where formerly a large majority of cases proved fatal. 2. By all such means, however, the poison is often but partially removed. Some of it pervades the system; more of it impregnates the tissues with which it was in contact, and is ready for absorption; much of it often passes down into the intestines; occasionally it adheres with obstinacy to the inner membrane of the stomach, and cannot be dislodged either by emetics or by washing through means of the stomach-pump. The second object, then, is to administer an antidote. Antidotes have usually been conceived to be of two kinds. Some, by changing the chemical form of poisons, render them inert, and are called *chemical* antidotes. Others are thought to subdue the morbid action of poisons by exciting a counter-action, and are termed *constitutional* antidotes. In ancient times, and likewise until the recent improvements in toxicology, scarcely any other antidotes were known except what belonged to the constitutional class. But it is now thought that in correct language scarcely any such antidote exists. European physiologists are not acquainted with any decided constitutional antidote for any of the numberless multitude and variety of poisons now familiar to the scientific. It is very generally believed, however, that savages in all quarters of the world are in possession of remedies of this nature, more especially for the effects of snake-poison. Apparently authentic accounts have been published of a considerable variety of antidotes known to the natives in different parts of North and South America for the bite of venomous snakes. But none of these supposed antidotes have been found to stand the test of scientific investigation; natives who put trust in them have been seen to perish in the usual way; there is no difficulty in accounting for their apparent occasional success; and those who give faith to the marvels of travellers on the subject ought to consider how very extraordinary it would be if, in every part of the globe where there are savages, discoveries of this kind should be made in regard to their poisons, while, with all the advantages of science to aid them in the search, no civilized people have yet contrived to stumble on a similar discovery in relation to any of the innumerable poisons with which they have long been familiar. If constitutional antidotes are still much wanted, there is no want of excellent antidotes of the chemical class. Some of these act by neutralizing the chemical qualities on which the properties of the poison depend, others by simply rendering the poison insoluble. Thus sulphuric acid is rendered inert by magnesia, because it becomes thereby a neutral salt,—soluble, indeed, but no longer capable of corroding the animal textures, or of exciting violent irritation. In like manner, potash is rendered inert, or nearly so, by lemon-juice or vinegar, or, though less easily, by oil, because it is converted into neutral salts, which are feebly irritant and not at all corrosive. On the other hand, oxalic acid is rendered inert by magnesia, partly because its corrosive qualities are neutralized by chemical neutralization, but chiefly because these, in common with its not less formidable effects on the nervous system through absorption, are prevented by a substance resulting which is insoluble. So, too, arsenic becomes inert when brought thoroughly in contact with the hydrated peroxide of iron, because an insoluble compound is formed, the arseniate of iron. In using and searching for antidotes of the chemical kind, several important general rules should be attended to. For, first, where a poison is a pure local irritant, destitute of action through the blood or remote organs, it is usually sufficient that it be neutralized; because the resulting compound is commonly but a feeble irritant, although soluble. One condition, however, must be observed, namely, that the antidote shall be itself innocuous, otherwise harm may be done by the antidote before it comes in contact with the poison, or because it is given in excess. Thus the mineral acids are unfit antidotes for neutralizing the mineral alkalis, and the latter for neutralizing the former. But, secondly, when the poison is of a kind which acts on remote organs through the medium of absorption, it is not enough that it be chemically neutralized. For all such poisons act as such throughout their soluble compounds; their compounds act on the whole in proportion to their solubility; and those only are inert which are insoluble, and insoluble not merely in water, but likewise in the animal fluids of the stomach. Hence oxalic acid and arsenious acid (common arsenic) are not neutralized in their physiological actions by being neutralized with potash; prussic acid similarly treated remains as energetic as ever; and the powerful vegetable alkaloids,—morphia, strychnia, conia, and the like,—instead of becoming inert by neutralization with acids, are rendered positively more active, because they are made more soluble. In the case of every poison, then, it is advantageous, and in very many it is indispensable, that the chemical change effected shall be such as to impart to the compound insolubility; and care should be taken that this insolubility shall exist in regard to the natural juices of the stomach, which are commonly acidulous. But, thirdly, the antidotal tendency of such chemical remedies, even when of undoubted virtue, is often counteracted when the poison is a fine, rather insoluble, powder; for it adheres forcibly to the inner coat of the stomach, irritates it to throw out tough mucus, which covers the powder, and defends it against the approach of the neutralizing agent. Frequent instances of such a course of things occur in the case of poisoning with arsenic. 3. The last object of the treatment of poisoning is the cure of the disorders which the poison has produced. These disorders, since they are substantially natural diseases, must be treated as such. But there are certain circumstances which render them in some measure peculiar, and consequently modify the treatment. These are chiefly as follows:—Treatment will obviously be of little use for such disorders, until what remains of the poison be removed or rendered inert; and as this object is often unattainable, ultimate success is frequently beyond reach. Evacuation of the poison is in this point of view of primary importance, as well as for its own sake. In the case of poisoning with the irritants, the treatment is often exceedingly embarrassing, because it must be simultaneously directed towards two opposite ends,—the suppression of inflammation by evacuating, and consequently debilitating measures, and the removal of depression of the heart and general system by stimulating remedies. These two contrary and incompatible objects are often the cause why the best treatment proves inefficacious. The treatment of narcotic poisoning is somewhat differently circumstanced. The remains of the poison being removed, there is only the induced disorder to combat. These disorders are in the great majority of cases functional only,—that is, no structural injury has been occasioned. Hence, the offending cause having been withdrawn, there may be expected to prevail in the constitution a natural tendency to throw off the functional disorder,—a tendency towards recovery. Experience shows that such is actually the fact. If in narcotic poisoning the remains of the poison can be removed, and life can be preserved for a moderate length of time, success is highly probable in a great majority of cases. Thus very few die of poisoning with opium, and perhaps still fewer ought to die in skilful hands, who survive for eighteen hours; and few die of the effects of prussic acid who survive them for three-quarters of an hour. In narcotic poisoning, then, the treatment for subduing the disorders induced consists mainly in employing, in some instances, sedatives for subduing irritation of the nervous system, but much more commonly stimulants, for the purpose of keeping the person roused, and in applying various means for supporting artificial respiration when the natural breathing fails. Excellent methods for accomplishing the first object are now in familiar use,—such as loud talking, agitation of the body, injecting water into the ears, tickling the nostrils, dashing cold water over the head and shoulders, applying sinapisms to the calves, blistering the head with boiling water, and internally ammonia, ether, and spirits. But the best method of supporting artificial respiration has not yet been discovered; there are practical objections to all the methods yet devised; and it is only when these shall be perfected that the treatment of narcotic poisoning will be rendered substantially superior to what it is at present. It is not unlikely that galvanism will be found a material part of the most efficacious method,—applied, however, not continuously, as is often practised, but interruptedly, so as not to disturb the alternate contractions and relaxations of the respiratory muscles.

Actions o vegetable

In the preceding observations on the effects and treatment of poisoning, poisons have been regarded solely in their operation on the animal body. But they were defined at the outset as acting on living bodies generally; and upon vegetables their action is not less remarkable than upon animals. This branch of the subject has been hitherto little studied; but what is already known of it seems full of interest both in a physiological and in a practical point of view. It appears that in a general sense there is a close analogy between the actions exerted by poisons on both divisions of the living world. As there are two leading effects produced in animals, so are there two great classes of phenomena developed in vegetables,—those of irritation and those of narcotism, or at least of an action closely analogous. The apparent phenomena of both kinds are indeed much simpler in vegetable than in animal beings, partly because the organs and functions of the former are more simple than those of the latter, partly because physiologists have not yet ascertained with precision the special changes that are induced. Still, however, it is easy to trace in vegetables the leading effects produced by irritants and by narcotics respectively upon animals. The former occasion partial or general disorganization or death of the organs of plants to which they are directly applied, and the plant may eventually either recover or perish, according to the extent of the injury or the importance of the organ injured. The latter seem to act upon the vitality of the plant, without in general producing any marked change of a local nature, or such as may be referred to a direct impression, at least until the first signs of vital depression appear; and it is commonly observed that so soon as such signs of depression do make their appearance, however slight they may be, they quickly pervade the whole plant, which in consequence perishes irrevocably. The irritants appear to act topically, and from without inwards; the narcotics act more diffusively, and from within outwards, being probably first absorbed.

Poisons act upon vegetables, through whatever channel they are introduced, and to whatever organ they are applied, provided the texture be such as to admit of their passage to those parts which are more or less directly connected with life. The organs through which they act with greatest energy are the leaves and the roots. Liquid poisons act with most energy through the roots; gaseous poisons are probably most energetic when applied to the leaves. Partial action is sometimes produced by the topical application of a general or narcotic poison; thus arsenic introduced into the axilla of a leaf of the *Dipsacus fullonum* kills the whole superior part of the plant on the side corresponding with the leaf. Vegetable poisons are not less energetic than mineral poisons. Nay, however extraordinary it may appear, there seems no question that plants may be promptly killed by their own poisons,—that the poison produced by a particular species may kill that species as readily as it will others, if applied to the root so as to be absorbed into the nutritive juices. This singular phenomenon may depend on the poison being secreted and confined in particular receptacles in the ordinary state of the plant. But another and more intelligible explanation, in regard to certain poisons, may be drawn from the well-ascertained fact, that some vegetable poisons, and probably more of them than the physiologist may at present be inclined to admit, do not exist ready formed in the plants whence they are obtained, but are produced only when certain principles, existing naturally apart in distinct receptacles, are brought in contact by mechanical force or chemical manipulations. A remarkable instance in point is the essential oil of the bitter almond kernel or cherry-laurel leaf, which does not exist ready formed, otherwise it would be betrayed, like other essential oils, by its powerful odour, but is formed only when certain principles, named *amygdalin* and *emulsin*, are brought in contact with each other and with water.

No poisons are better fitted for illustrating the phenomena of poisoning in vegetables, or better deserve the attention of physiologists and practical men, than those which are gaseous in their nature. Most of them seem to act in excessively minute quantities and proportions. A tenth part of a cubic inch of muriatic acid gas, which is equivalent to the twenty-fifth part of a grain by weight, will in no long time destroy a small plant, although the gas be diluted with twenty thousand times its volume of air; and the devastating effects produced on surrounding vegetation by all manufactories where this acid is thrown abundantly into the atmosphere, as in the manufacture of black-ash and soda from sea-salt, abundantly show that far less proportions will prove equally deleterious when applied continuously. Sulphurous acid gas acts with nearly as great intensity. The effect of either of these poisons is simply to shrivel and wither the leaves and buds, like the action of frost in spring; and the plant will eventually recover if removed in time from the influence of the noxious agent, but, with the loss of its foliage. Other gases, such as sulphuretted hydrogen and cyanogen, produce no visible change until the leaves begin to bend and droop; after which the drooping quickly extends, till at length the whole plant becomes flaccid, so as to present exactly the same appearance as when deprived of moisture; and it perishes inevitably.

Some substances which are poisonous to animals are not poisonous to vegetables. The experiments which have been made on this subject are neither sufficiently extensive nor sufficiently exact to warrant any general deductions. A very remarkable instance is carbonic acid gas, a small proportion of which in the atmosphere will speedily extinguish animal life, but which is innocuous to vegetables in almost any proportion, nay, on the contrary, supplies them with aliment.

Uses.

Poisons are by no means without their uses in the economy of nature. It is, in the first place, not improbable that vegetable poisons serve some purpose in the economy of the plants which produce them. On this point we are still much in the dark, in consequence of the little advancement which has been hitherto made in vegetable physiology. But one purpose of the kind seems to be the perpetuation and extension of such plants by rendering them unfit for the food of herbivorous animals and frugivorous birds, which by instinct commonly avoid them. In the case of certain poisons of the animal kingdom, their purpose is obviously to preserve the animals which are endowed with them, by enabling them to destroy their prey and their enemies. Another important use to which poisons from every kingdom may be applied, is for the treatment of diseases. A very close connection subsists between medicinal and poisonous action. This is sufficiently shown perhaps by the undoubted fact, that, with very few exceptions, our best medicines are active poisons; and conversely, that there are few active poisons which have not been turned to account as useful medicines. Besides, in the greater number of instances, the two properties, medicinal virtue and poisonous influence, are plainly nothing else than manifestations of the same action, differing merely somewhat in degree, which is well exemplified by most purgatives and emetics, by opium, henbane, prussic acid, and other anodynes, and by counter-irritants, or substances employed for irritating the skin. In other instances, again, where the poisonous and medicinal actions are to appearance different and unconnected, the existence of some relationship between them seems to be pointed out by the activity of the substances as drugs being proportioned to their energy as poisons. Another purpose to which some poisons are applied is for the destruction of the lower animals for the use of man. In most parts of the world, where the primitive habits of mankind have not been materially modified by civilization, poisons of great energy are familiarly employed for the destruction of game, and in some countries also for killing beasts and birds of prey. In civilized countries they have hitherto been used chiefly for the more ignoble purpose of getting rid of vermin. But they are susceptible of far more important applications of the same nature, which, however, have been as yet entirely overlooked. (R. C.)

POISSON, Simon Denis. (See Dissertation Sixth.)

POITIERS, a town of France, capital of the department of Vienne, on the Clain, an affluent of the Vienne, 58 miles S.S.W. of Tours, and 78 N.E. of Rochelle. It stands on the rounded extremity of a chain of hills surrounded on all sides but the S.W. by narrow ravines, through which flow the Clain and its affluent the Boivre. The ancient walls, which skirted the banks of the rivers, are now almost entirely removed; and that part of them which crossed the high ground on the landward side is now a public walk, commanding a fine view of the rivers as they wind through their deep valleys. The town covers a very large space of ground, but it includes within its circuit gardens and fields, as well as houses, streets, and squares. The streets are generally steep, narrow, and crooked, lined with mean-looking houses, and the town in general has a dull and desolate appearance, were it not for the market-place, which is crowded and bustling. Many fine old buildings, especially churches, combine with the natural beauty of its position in giving Poitiers a very picturesque aspect. Some remains of a vast Roman amphitheatre still exist at Poitiers: the oval interior, now converted into a garden, and the tiers of seats for the spectators, replaced in some places by modern houses. Some of the vaults and corridors, and portions of the solid regular masonry, are still entire. Another very ancient building is now used as a museum, but was formerly a church, and seems to have been originally a baptistery. It is probably as old as the sixth or seventh century. The cathedral, said to have been founded by Henry II. of England, has two low and unequal towers, and is very elegant in the interior. The other churches are of much interest to the antiquary and the architect. On the highest part of the town stand the prefecture and court-house. Poitiers has an episcopal palace, a public library with 25,000 volumes and numerous MSS., a theatre, barracks, university academy, faculty of law, school of medicine, botanic garden, various scientific societies, &c. The manufactures comprise coarse woollen cloth, blankets, hosiery, lace, leather, playing-cards, vinegar, &c. Some trade is carried on in these articles, as well as in agricultural produce of various kinds. Poitiers is one of the most ancient towns in France. It existed, under the name of *Limonum*, in the time of the Romans, but it afterwards took the name of its inhabitants, the *Pictavi* or *Pictones*. After the fall of the Roman empire, it was possessed successively by the Vandals, Visigoths, and Franks. The last of these nations gained possession of it in consequence of the defeat of the Visigoths under Alaric by Clovis, in 507, not far from the town. In 732 Poitiers was the scene of another great battle, in which Charles Martel defeated the Saracens; and in 1356 the English, under the Black Prince, gained a victory over the French under John II., who was taken prisoner. It was the capital of the province of Poitou, which came into the possession of England by the marriage of Henry Plantagenet, afterwards Henry II., to Eleanor of Guienne in 1153; but it was taken from them by Philip II. in 1204. It was again in the possession of the English from 1360 to 1372. During the civil wars Poitiers, which was at first held by the Huguenots, was taken by the Catholics, and Coligny in vain attempted to recover it. Pop. (1856) 26,233.

POITOU, an ancient province of France, bounded on the N. by the provinces of Bretagne, Anjou, and Touraine; E. by those of Berri and Marche; S. by those of Angoumois, Saintonge, and Aunis; and W. by the Bay of Biscay. It was divided into Upper and Lower Poitou, and now forms the department of Vendée, the greater part of those of Vienne and Deux-Sèvres, and small portions of Haute-Vienne, Creuse, Charente, Charente-Inférieure, and Indre-et-Loire.

POKHURN, a town of India, in the Rajpoot state of Jodhpoor, 66 miles E. of Jessulmere, and 134 S.W. of Nagore. It is surrounded by a good stone wall; and the most conspicuous building is a temple, which stands in a deserted town quite close to the modern one. A considerable transit trade is carried on here, as the town stands on one of the great highways between Sinde and Eastern Rajpootana. Pop. about 15,000.

POKUR, a town of British India, in the district of Ajmere, N.W. Provinces, stands in a low swampy valley, on the S. shore of a lake, which is considered by the Brahmins the most sacred in India, 5 miles N.W. of Ajmere. Round the town stand many shrines and monuments of the princes and great men of India; and among these the most conspicuous is the shrine of Brahma. Flights of stone stairs descend from the temple to the sacred lake, to which, at full moon, great numbers of pilgrims resort. The town has many good houses, and beautiful gardens and vineyards. A fair is held here for horses, cattle, and other merchandise, at the full moon in October, when the concourse of pilgrims is much the greatest.

POL DE LEON, St, a town of France, in the department of Finistère, on the slope of a hill near the sea, 10 miles N.N.W. of Morlaix. It reminds the visitor of St Andrews in Scotland, being, like it, an ancient ecclesiastical but now almost deserted town, with grass-grown streets, and a very melancholy aspect. It contains two fine churches. The cathedral, built partly in the thirteenth and partly in the sixteenth century, has two beautiful towers surmounted with spires. The church of Kreizker, *i.e.*, middle of the town, is chiefly remarkable for its lofty spire of open work in granite, rising from a richly-ornamented square tower to the height of 404 feet above the ground, being second only to Strasburg among the spires of France. The manufacture of linen is carried on; and many of the inhabitants are employed in fishing. It has some trade through the suburb of Penpoull, on the sea-shore. Pop. 7059.

POLAND.

Poland, a name which once designated one of the most extensive and powerful of the kingdoms of Europe, but now indicates only a small integral portion of the Russian empire. In the fifteenth and sixteenth centuries its area is said to have exceeded 390,000 square miles, or more than that of France and Spain together; and even at the period of the first partition, in 1772, though by that time its limits had been much circumscribed, it had an area exceeding that of France, or about 283,000 square miles, and a population estimated at 13,000,000, probably more than that of the British Islands or of the Spanish peninsula at that period. It extended from Livonia and the Baltic on the N., to the Ukraine, Moldavia, and the Carpathians on the S.; from the Dwina and the Dnieper on the E., to Pomerania, Brandenburg, Bohemia, and Silesia on the W.

The Poles belong to the great family of the Slavonians, who, when the Goths and Vandals possessed themselves of Gaul, Spain, and Italy, left their ancient habitations E. of the Vistula, and gradually spread themselves to the S. and W. Though they frequently, like the other barbarians, disturbed the Roman Empire, yet they were generally peaceful in their character. They settled on the lands that other nations had relinquished, employing themselves as husbandmen and shepherds, in the domestic arts or in trade. They were characterized by their hospitality and honesty; and from their peaceful habits, were often deeply wronged by their more warlike neighbours. The name *Pole* came to be given to a portion of this race from a Slavonic word signifying "a plain," as the country which they inhabited was almost one uninterrupted level plain.

The first prince of Poland is said to have been Lech, who flourished in the middle of the sixth century. He founded the first city Gnesna, so naming it from *Gniazdo*, signifying "a nest,"—as an eagle's nest was found there; and hence the arms of Poland were a spread eagle. The descendants of Lech reigned in Poland for about 100 years, when the race being extinct, twelve palatines, or *woivodes*, were chosen, and the country divided into twelve parts. The people soon became dissatisfied with this government, and chose one of the twelve, Cracus, to be their sovereign. He reigned for about 30 years, and was much esteemed by the people. He founded Cracow, and removed the seat of his government from Gnesna to that city. He left three children, the eldest of whom, Cracus, succeeded him, but he was soon after murdered by his brother Lech. The latter did not long profit by his fratricide, for the crime having been discovered, he was deposed and banished by his subjects, and his sister Venda elected in his stead. She was celebrated for her beauty; and having refused the hand of a German prince named Rüdiger, he marched against her with a large army. According to some accounts she was defeated, and to save herself from falling into his hands she drowned herself in the Vistula; according to others, Rüdiger's forces having abandoned him without striking a blow, he killed himself in despair, and she was so much concerned at his death that she drowned herself. The race of Cracus being thus extinct, twelve woivodes were again appointed, but they soon fell out among themselves, and the country was invaded by the Hungarians and Moravians. One Prezimislas, a common soldier, having by stratagem overthrown the invaders, was raised to the dukedom under the title of Lesko I. After a long and prosperous reign, he died without leaving issue, and again the country was thrown into a state of anarchy. Several candidates appeared for the crown, and the Poles determined to elect him who should outstrip all the others in a horse-race. A certain nobleman, in order to secure the victory, caused the race-course to be strewn with iron spikes, and had the feet of his own horse protected by iron plates. The artifice took effect; but when he was about to be proclaimed victor, a peasant who had found out the deceit, opposed the ceremony, and exposed the fraud. The nobleman was immediately torn to pieces by the people, and the ducal authority conferred on the peasant. The new sovereign, Lesko II. conducted himself with great wisdom and moderation, and was distinguished both in war and peace. He is said to have at length fallen in a war with Charlemagne. He was succeeded by his son Lesko III., who inherited all his father's virtues. He concluded a peace with Charlemagne, and encouraged among his subjects the cultivation of the arts of peace. He was succeeded by his legitimate son Popiel I., but he left also a number of illegitimate sons, to whom he gave fiefs which were held of the crown. Popiel was a monster of cruelty and debauchery, and his son Popiel II. was, if possible, still worse. He found means to poison all his uncles (the illegitimate sons of Lesko III.), at an entertainment; but it is said that the vengeance of heaven soon overtook him, and he perished miserably with all his house. The nation now became a prey to civil discord; and at length a diet was assembled at Kruswick to choose a king. They could not, however, come to any agreement, and their presence soon brought on a famine in the town. A citizen named Piast liberally opened his stores for their use, and this act brought him the kingdom. He was proclaimed duke about 830, and his reign was long and peaceful. He engaged in no foreign wars, and was harassed with no domestic commotions. His son Ziemowitz, who succeeded him, was of a more warlike disposition than his father, and was the first to introduce regular discipline among the Polish troops. He was victorious in all his battles, and greatly enlarged his dominions. Lesko IV. succeeded him in 892. This prince was of a quiet and peaceful disposition, and contented himself with preserving what his father had left, without seeking to enlarge his dominions. He died in 913, and was succeeded by his son Ziemovistus. He, too, had a peaceful reign, which extended over 51 years, and was succeeded by his son Miecislas.

The above, with a sufficient admixture of the marvellous and fabulous, is the account given by the earlier Polish historians of the first period of their history. There can be little doubt, however, that their origin as a nation is fixed at too early a date; and Polish writers of our own time, Lelewel, Niemcewitz, Golembrowski, Zielinski, and others, are content to proclaim Miecislas I. as the true founder of the Polish monarchy.

Miecislas I.

Miecislas I., who attained the ducal authority in 964, was born blind, and remained so for seven years; but he afterwards obtained his sight without any assignable cause; and hence it was ascribed to a miracle. He became enamoured with Dombrowka, daughter of the Duke of Bohemia; but that lady refused to accept his suit unless he should suffer himself to be baptised. The ceremony took place on 5th March 965; and this is the date usually assigned for the introduction of Christianity into Poland, but it seems more probable that the Christian religion had reached the country before that time, though it had not come into public notice. The religion which the duke had thus been led to adopt he afterwards propagated with the greatest zeal. He founded the archbishoprics of Gnesna and Cracow, and appointed St Adelbert, who had been sent by the Pontiff to propagate Christianity in Poland, primate of the whole kingdom. He also enjoined that, when any part of the gospel was read, the hearers should half-draw their swords, in token of their readiness to defend its truths. **Boleslas I.** On his death in 999, he was succeeded by his son Boleslas I., surnamed the Brand, who was even more zealous than his father in extirpating the remains of paganism. He obtained the remains of St Adelbert, who had been murdered in Prussia, and deposited them with great pomp at Gnesna. Otho III., Emperor of Germany, having made a pilgrimage to the tomb of this saint, was so kindly entertained by Boleslas that in return he invested him with regal dignity; an act which was confirmed by the Pope. The elevation of Boleslas excited the envy of the Duke of Bohemia, who had vainly solicited that honour for himself; and his jealousy was further excited by the marriage of Miecislas Boleslas' son, with Rixa, the emperor's niece. He accordingly entered Poland at the head of a numerous army, and committed the most wanton and barbarous outrages. On the approach of the Polish army, however, he retreated with precipitation; and Boleslas, at the head of a formidable army, entered Bohemia. The Bohemians had not the courage to venture a battle; and after a siege of two years, Prague, the capital, was taken, and most of the other fortresses in the country speedily fell into the hands of the conqueror. He did not, however, rest satisfied with this, but followed up his advantages, resolved to obtain possession of the duke, which he at length did, and to satisfy his resentment, put out his eyes. From Bohemia he marched against Moravia, which submitted without striking a blow. He afterwards turned his attention to Russia, and found an excuse for invading that country in a civil war that was then raging between the children of the famous Vladimir. The chief competitors were Jarislas and Swiantopelk. Boleslas sided with the latter, and defeated Jarislas with great slaughter on the banks of the Bug. He took Kiow, the most celebrated and opulent city in that part of Europe, and became master of the greater part of Russia. He placed Swiantopelk on the throne, but he soon found in him a more dangerous enemy than his brother. This Russian prince had no sooner obtained the crown than he formed a conspiracy, which had for its object nothing less than the destruction of Boleslas and his whole army. The massacre was already begun, when Boleslas received intelligence of the scheme. He immediately mounted his horse, and having with the utmost haste assembled part of his army, fell upon the traitors with such fury that they were obliged to betake themselves to flight; and Boleslas got safe back to Poland. He now turned his arms against the Saxons, and extended his conquests to the Elbe. The inhabitants of the country to the north of Poland he also reduced to obedience. In 1018 the Russians, under Jarislas, attempted to invade Poland, but were defeated with great slaughter. By this victory Boleslas acquired a considerable tract of country, and the Russians were besides obliged to pay him a tribute. **Miecislas II.** This monarch died in 1025, and was succeeded by his son Miecislas, who possessed none of the great qualities of his father. In the beginning of his reign the Russians, Bohemians, and Moravians revolted; but as the spirit and discipline of the Polish troops still remained, Miecislas found no difficulty in reducing them to obedience, after which he devoted himself entirely to voluptuousness, and, at length worn out by his debauched course of life, he died in 1034. **Casimir I.** His queen Rixa was elected regent during the minority of his heir Casimir; but she proved tyrannical, and so partial to her countrymen the Germans, that a rebellion ensued, and she was forced to flee to Germany. Her son Casimir was also driven out of the kingdom, and a great many claimants started up for the vacant throne. This produced a civil war; and to add to their distress, the Bohemians and Russians invaded the kingdom in different places. At length it was resolved to recall the young prince, but as five years had already elapsed, no one knew where he was to be found. By interceding with his mother, however, they succeeded in obtaining the wished-for intelligence. He had at first retired into France, where he applied himself closely to study at the university of Paris; he afterwards went to Italy, where, after suffering great distress, he entered a monastery and assumed the religious habit; and subsequently he returned to France, where he obtained some preferment in the abbey of Cluny. It was here that he was found, but his vow presented an obstacle to his now accepting the crown. At length, however, the Pope consented to grant a dispensation of this tie, on condition that the nation should become subject to the tax called "Peter's pence;" that they should all shave their heads like monks, and wear white surplices at festivals. Casimir was welcomed with the greatest joy by all ranks of the people, and was crowned at Gnesna with more than usual solemnity. He proved himself worthy of the confidence of his people, and equal to the difficulties of his situation. He exerted his influence to repair the evils that had so long afflicted the country, restored the dominion of the laws, and subdued the banditti by which the country was infested. He secured peace with Russia by marrying the princess Mary, sister of the duke; and by his wise and peaceful reign he did more to strengthen and stablish the kingdom than could have been done by many victories.

Boleslas II.

He died after a reign of sixteen years, and was succeeded by his son Boleslas II., an enterprising and valiant prince, who soon rendered himself so famous that three unfortunate princes took refuge at his court, having been expelled from their dominions. These were Jaromir, brother of Wratislas, Duke of Bohemia; Bela, brother of the King of Hungary; and Zaslaf, Duke of Kiow, and cousin to the King of Poland. The Duke of Bohemia, dreading the consequences of his brother's escape, assembled an army, desolated Silesia, and laid waste with fire and sword the frontiers of Poland. Boleslas marched against him, and surprised him in the narrow passes of a forest. The duke being reduced to the greatest distress, proposed terms of peace, which, however, were rejected. In this extremity he resolved to attempt an escape during night, and, if discovered, to cut his way through the Polish army, or perish in the attempt. Ordering fires to be kindled in his camp, he drew off his forces with the utmost secrecy, and had advanced several leagues before Boleslas was aware of his retreat. The king pursued the fugitive, but in vain; and after ravaging the frontiers of Moravia, he returned to his own dominions. The next year he entered Bohemia with a numerous army, and the duke, unwilling to encounter so formidable an adversary, submitted to terms of peace, which contained conditions in favour of Jaromir. He now turned his attention towards Hungary, and entered that kingdom at the head of a numerous army. The Hungarian king, supported by a large body of Bohemians, prepared to meet him; and a battle was at length fought, in the heat of which the Hungarian portion of the troops went over to the enemy, and the auxiliaries were killed almost to a man. The king himself was taken prisoner, and treated with such cruelty that he died soon after of a broken heart; and Bela was placed on the throne without further opposition. He next, at the head of a numerous and well-disciplined army, marched into Russia, ravaged the territories composing two palatinates, reduced the strong city of Wolyn, and transported the booty to Poland. The campaign was finished by a battle, which proved so bloody that, though Boleslas was victorious, his army was so weakened that he could not pursue his conquests. In the winter he made numerous levies, and returning in the spring to Kiow, reduced it by famine. On this occasion he treated the inhabitants with kindness, commending their valour, and distributing provisions amongst them with the utmost liberality. This clemency procured the highest honour to the King of

Poland; but his stay here was productive of a great disaster. Kiow being the most dissolute as well as the richest city in the north, the king and his soldiers gave themselves up to the pleasures of the place. Boleslas himself affected all the state of an eastern monarch, and contracted an inclination for the grossest debaucheries. The Hungarian and Russian wars having continued for seven years, during that time the king had never been at home, excepting for the short space of three months; and the Polish women, exasperated at hearing that their husbands had neglected them, raised their slaves to the beds of their masters, in order to be revenged for the infidelity of their husbands. This was so general that history has only handed down the name of one lady as remaining faithful to her lord—Margaret, wife of Count Nicolas de Zembosin. The soldiers hearing of this, blamed the king for their dishonour, and resolved to return home, in order to take vengeance upon their wives and their paramours. A dreadful kind of civil war now ensued. The women, knowing that they had no mercy to expect from their husbands, persuaded their paramours to take arms in their defence, and they themselves fought by the side of their gallants with the utmost fury, seeking out their husbands in the heat of battle, in order to secure themselves from all danger of punishment. They were, however, on the point of being subdued, when Boleslas, who had been left almost alone in the heart of Russia, arrived with the few remaining Poles, assisted by an army of Russians, with whom he resolved to take equal vengeance on the women, their gallants, and his own soldiers who had deserted him. This produced a carnage more dreadful than ever. The soldiers united with their former wives and their gallants against the common enemy, and fought against Boleslas and the Russians with the fury of lions. At last, however, the fortune of the king prevailed; the rebels were totally subdued; and the few who escaped the sword were tortured to death or perished in prison.

To add to the calamities of this unhappy kingdom, the schisms which for some time had prevailed in the Church of Rome found their way also into Poland; and the matter at length came to be a contention for wealth and power between the king and clergy. Bloodshed followed. The Bishop of Cracow was, like another Thomas à Becket, massacred in the cathedral whilst he was performing the duties of his office. Pope Gregory VII. thundered out anathemas against the king, released his subjects from their allegiance, and laid the kingdom under a general interdict. The whole kingdom became a scene of confusion, and the king fled with his son Miecislas, and took refuge in Hungary. Authors differ respecting the manner of his death, but the generally received account is that, being driven from place to place by the persecutions of the clergy, he was at last obliged to become a cook in a monastery at Carinthia, where in this mean occupation he ended his days.

Uladislas I.

The kingdom continued under a severe interdict, which could be removed only by the most abject concessions; but at length the Pontiff consented that the brother of the deceased monarch should be raised to the sovereignty, but only with the title of Duke. This prince, named Uladislas, being of a meek disposition, with little ambition, accepted the terms offered, and sent an embassy to Rome, earnestly entreating the removal of the interdict. The request was granted; but all his endeavours to recover the regal dignity proved fruitless, the Pope having, in conjunction with the Emperor of Germany, conferred that honour on the Duke of Bohemia. Russia availed itself of the recent disturbances to throw off the yoke; and this revolt drew after it that of Prussia, Pomerania, and several other provinces. The smaller provinces were soon reduced; but the duke had no sooner returned to Poland than they again rebelled. He marched against them with a considerable army; but was entirely defeated, and obliged to return. Next year, however, having led against them a more numerous army than before, he compelled them to submit and deliver up the ringleaders of the revolt. But no sooner were the Pomeranians reduced than civil dissensions took place. Sbigniew, his son by a concubine, was placed by the discontented nobility at the head of an army to subvert his father's government and dispute the title of Boleslas, his legitimate son, to the succession. Sbigniew was at length defeated and taken captive, but was afterwards pardoned and received into favour.

Boleslas III.

Uladislas died in 1102, in the fifty-ninth year of his age, and was succeeded by his son Boleslas III.; but a portion of his dominions was assigned to his brother Sbigniew. The latter, being dissatisfied with his share, stirred up the Bohemians, Saxons, and Moravians against his brother, and made such formidable preparations as threatened the conquest of all Poland. Boleslas, unable to oppose such a formidable force, had recourse to the Russians and Hungarians, who readily embraced his cause. At length Sbigniew was defeated, and might have easily been obliged to surrender at discretion, had not Boleslas generously left him in quiet possession of the duchy of Mazovia. Sbigniew, however, subsequently entered into other conspiracies, and was at length banished from the kingdom.

Boleslas was scarcely freed from the intrigues of his brother when he found himself in danger from the ambition of the Emperor Henry V. The emperor had attacked the King of Hungary, with whom Boleslas was in close alliance. The King of Poland determined to assist his friend, and therefore made a powerful diversion in Bohemia, where he repeatedly defeated the imperialists. The emperor then collecting all his forces, ravaged Silesia, and even entered Poland, where he laid siege to the strong town of Lubusz; but he was at last obliged to abandon the enterprise, after having sustained severe loss. Henry, in no degree discouraged, penetrated still farther into Poland, and was laying waste all before him, when the superior skill of Boleslas compelled him to retire. Enraged at this disappointment, Henry laid siege to Glogau, and after a spirited defence, the inhabitants were on the point of surrendering when Boleslas arrived and attacked the emperor with such vigour that he obliged him to retreat with disgrace into his own country. This soon brought on a peace, which was confirmed by a marriage between Boleslas and the emperor's sister. About 1135 he was brought into a war with Russia. He had conferred the government of Wislica, a strong town on the Nida, to a Hungarian who had insinuated himself into his affections; but the traitor delivered up the place to the Russians. Boleslas, incensed, immediately entered into a war with Russia. Having been implored for assistance by the inhabitants of Halitz, Boleslas marched to their relief with a choice body of troops; but as he was preparing to enter the town he was attacked by the Russian army, and, after a most violent conflict, entirely defeated. The unfortunate prince was so much afflicted by this reverse, that in a short time he died, after having reigned thirty-six years.

Uladislas II.

By his will he divided his dominions equally amongst his four grown-up sons. Uladislas, the eldest, had the provinces of Cracow, Sieradz, Lencsysa, Silesia, and Pomerania. Boleslas, the second son, had for his share the palatinates of Culm and Kujavia, with the duchy of Mazovia. The palatinates of Kalszh and Posen fell to Miecislas, the third son; and to Henry, who was the fourth, were assigned those of Lublin and Sandomir. No provision was, however made for Casimir, the youngest child, then an infant in the cradle. The eldest son had a certain superiority over his brothers.

The harmony of the princes was soon disturbed by the ambition of Christina, the wife of Uladislas, who formed a scheme to get possession of all Poland. Having obtained

Boleslas IV.

her husband's concurrence, she assembled the states of Poland, and made a long speech, showing the dangers which might arise from a partition of the ducal dominions amongst so many; and concluded with attempting to show the necessity of revoking the ratification of the late duke's will, in order to insure the tranquillity of the republic. At length all the nobility were gained over or intimidated by Uladislas, who then drove Boleslas from his territories, and next marching against Henry, dispossessed him also, forcing both to take refuge with Miecislas in Posnania, where all the three brothers were besieged. Thus driven to despair, the brothers sallied out, attacked the duke's army, and obtained a complete victory, taking possession of all his baggage and effects. They next laid siege to Cracow, which surrendered; and Uladislas retired into Germany to solicit assistance. Boleslas was raised to the supreme authority, and the new duke began his administration with an act of generosity towards his brother Uladislas, on whom he conferred the duchy of Silesia, which was thus separated from, and has never since been re-annexed to Poland. Uladislas, not content with this, found means to persuade the Emperor Conrad to invade Poland. Boleslas, however, so harassed and fatigued his army that he was soon obliged to return to his own country; and for some years Poland enjoyed profound tranquillity. The Emperor Frederic Barbarossa was next persuaded by Uladislas and his wife to invade Poland. The number of the Imperialists was so great that Boleslas and his brothers did not think proper to oppose them in the open field. They divided their forces, and laid waste the country before the enemy, burning all the towns and cities which were in no condition to stand a siege. Thus the emperor was at last reduced to such a situation that he was glad to come to terms, and the treaty was confirmed by a marriage between Adelaide, niece of the emperor, and Miecislas, Duke of Posen.

Boleslas subsequently attempted the conquest of Prussia, but his army having fallen into ambush, was almost entirely cut off; Duke Henry was killed, and Boleslas and Miecislas escaped with great difficulty. After this, Boleslas applied himself to promote the happiness of his subjects, and continued thus occupied until the period of his death, which happened in the year 1173.

Miecislas III.

On the death of Boleslas, the states raised his brother Miecislas to the ducal throne. But the moment that Miecislas ceased to be a subject he became a tyrant, and the slave of almost every vice; so that in a short time he was deposed, and his brother Casimir elected in his stead.

Casimir II.

Casimir, a prince remarkable for his justice and benevolence, set himself about securing peace and establishing tranquillity in all parts of his dominions. He redressed grievances, suppressed exorbitant imposts, and assembled a general diet, in which it was proposed to rescue the peasants from the tyranny of the nobility. The nobles, influenced by the example of their sovereign, immediately granted all that he required; and, to give still greater weight to this decision, the acts of the diet were transmitted to Rome, and formally confirmed by the Pope. But though the nobility in general consented to the partial retrenchment or limitation of their power, it occasioned discontent amongst some, who for this reason immediately became the partisans of the deposed Miecislas. That unfortunate prince was now reduced to such indigence, that his brother Casimir, affected by the accounts he had received, tried every method to relieve him, and even connived at the arts that were practised by some discontented noblemen to restore him. But this generous and amiable conduct was repaid by the grossest ingratitude. Miecislas used every art to wrest from his brother the whole of his dominions, and actually conquered the provinces of Mazovia and Cujavia; but of these he was soon dispossessed, and only some places in Lower Poland were left him. The last action of this amiable prince was the conquest of Russia, which he effected rather by the reputation of his wisdom and generosity than by the force of his arms. The people of that country voluntarily submitted to a prince so famed for his benevolence, justice, and humanity. Soon after his return he died at Cracow, lamented as the best prince that had ever filled the throne of Poland.

Lesko V.

Uladislas III.

Casimir left two sons very young, the elder of whom, named Lesko, was nominated his successor. Miecislas embraced the opportunity of renewing his attempts upon the throne, and formed an alliance with the Dukes of Oppeln, Pomerania, and Breslau. Having raised all the men in Lower Poland fit to bear arms, he took the road to Cracow with a numerous army. On the banks of the river Mozgarva a sanguinary conflict ensued; but both sides were so much weakened that they were forced to retire for some time, in order to repair their losses. Miecislas now had recourse to artifice rather than force; and having attempted in vain to corrupt the guardians of Lesko, he entered into a compact with the Princess Helen, his mother. Representing in the strongest manner the miseries which would ensue from war, he stipulated to adopt her sons Lesko and Conrad as his own; to surrender the province of Cujavia for their present support; and to declare them heirs to all his dominions. The principal nobility opposed this accommodation; but it was accepted by the duchess in spite of all their remonstrances; and Miecislas was once more put in possession of the capital, after having taken a solemn oath to execute punctually every article of the treaty. The princess was not long in perceiving that she had been duped, and having formed a strong party, she excited a general insurrection against the duke. Miecislas was expelled from Cracow, and on the point of being reduced to his former indigence, when he found means to foment a quarrel between the duchess and the palatine of Cracow, and thus once more turned the scale in his favour. He regained possession of Cracow, but did not long enjoy his prosperity, for he fell a victim to intemperance in 1203. He was succeeded by his eldest son, Uladislas III., a prince noble and generous as his father had been base and treacherous. Knowing that the crown rightfully belonged to his cousin Lesko, he was with difficulty induced to accept of it, and at length willingly resigned it to him, after a short reign of three years.

Lesko V. restored.

Tartar invasion.

During the government of Lesko the Tartars made an irruption into that country, and everywhere committed the most cruel ravages. At last they came to an engagement with the Poles, and obtained a complete victory. This incursion, however, terminated as precipitately as it had commenced; but the devastations they had committed produced a famine, which was soon followed by a plague that depopulated one of the most populous countries of the north. In this unhappy situation of affairs, death ended the misfortunes of Lesko, who was assassinated by his own subjects. A civil war followed his death; and the history of Poland is for some time so confused that it is difficult to say who was his successor. During this unfortunate state of the country, the Tartars made a second irruption, laid all waste before them, and were advancing towards the capital, when they were attacked and defeated with great slaughter by the palatine of Cracow, with only a handful of men. Next year, however, they returned, and committed barbarities such as can scarcely be imagined. Whole provinces were ravaged, and every one of the inhabitants massacred. They were returning, laden with spoil, when the palatine fell upon them a second time, but after a most obstinate engagement, he was defeated, and all Poland was thus laid open to the ravages of the barbarians. The nobility fled into Hungary, and the peasants sought an asylum amongst rocks and impenetrable forests. Cracow was taken, pillaged, and burned; and the barbarians, penetrating into Silesia and Moravia, desolated these countries, destroying Breslau and other cities.

Boleslas V. Poland was in this dreadful situation when Boleslas, surnamed the Chaste, obtained the sovereignty. But this, so far from putting an end to the troubles, only superadded a civil war to the other calamities with which the country was afflicted. Boleslas was opposed by his uncle Conrad, the brother of Lesko, who having assembled a powerful army, gained possession of Cracow, and assumed the title of Duke of Poland. His avarice and pride, however, offended equally the nobility and the peasants; and they unanimously invited Boleslas, who had fled into Hungary, to return home and head the insurrection which now broke out in every quarter. On his arrival, he was joyfully received in the capital. But Conrad still headed a powerful party; and it is reported that on this occasion the knights of the Teutonic order were first called into Poland, to dispute the pretensions of Boleslas. All endeavours of Conrad, however, proved unsuccessful. He was defeated in two pitched battles, and forced to live in a private situation; though he never ceased to harass his nephew, and make fresh attempts to recover the crown. Of the reign of Boleslas, however, we have little information, except that he made a vow of perpetual continency, and imposed the same on his wife; that he founded nearly forty monasteries; and that, after a long reign, he died in 1279, having previously adopted Lesko, Duke of Cujavia, and procured a confirmation of his choice by the free election of the people.

Lesko VI. The reign of this last prince was one continued scene of foreign and domestic trouble. On his accession, he was attacked by the united forces of Russia and Lithuania, assisted by the Tartars; but he had the good fortune to defeat the confederate barbarians in a pitched battle. This was followed by civil dissensions, which rose to such a degree that he was obliged to fly to Hungary, the common resource of distressed Polish princes. The inhabitants of Cracow alone remained firm in their duty, and withstood a tedious siege, until they were at last relieved by Lesko at the head of a Hungarian army, who defeated the rebels, and regained the government. But scarcely had he reascended the throne when the united forces of the Russians, Tartars, and Lithuanians made a second irruption into Poland, and desolated the country with the most savage barbarity. Their forces were now rendered more terrible than ever by their having along with them a vast number of large dogs trained to join in their attacks. With an army much inferior, however, Lesko obtained a complete victory, the Poles being animated by all the fury of despair. Soon after this, Lesko died, with the reputation of a wise, warlike, but on the whole an unfortunate prince.

Prezemislas. **Uladislas V.**

As this prince died without issue, a civil war again ensued; and the affairs of the state continued in a very declining condition till 1296, when Prezemislas was crowned king by the Archbishop of Gnesna, a title which had been forfeited for more than 200 years. He did not enjoy this title for more than seven months, having been murdered, it is said, by some Brandenburg emissaries. A series of dissensions again succeeded till the year 1305, when Uladislas Lokietek, who had seized the throne in 1300, and afterwards been driven out, was restored. The first transaction of his reign was a war with the Teutonic knights, who, during the recent disturbances, had usurped the greater part of Pomerania. They had been settled in the territory of Culm by Conrad, Duke of Mazovia, but soon extended their dominion over the neighbouring provinces, and had even obtained possession of the city of Dantzic, where they massacred a number of Pomeranian gentlemen in cold blood. The knights were commanded by the sovereign Pontiff to renounce their conquests; but they set at nought all his thunders, and even suffered themselves to be excommunicated rather than part with their acquisitions. Uladislas entered the territory of Culm, which he laid waste with fire and sword; and although opposed by the joint forces of the Marquis of Brandenburg, the knights, and the Duke of Mazovia, he obtained a complete victory, after a desperate and bloody engagement. Without following up the blow, however, he returned to Poland, where he recruited his army; and being reinforced by a body of auxiliaries from Hungary and Lithuania, he a second time ravaged all the dominions of the Teutonic knights. A treaty was concluded under the mediation of the kings of Hungary and Bohemia. But in a few months the knights not only refused to evacuate Pomerania, as had been stipulated in the treaty, but even endeavoured to extend their usurpations, and for this purpose assembled a very considerable army. Uladislas, enraged at their treachery, once more took the field, and gave them battle with such success that 4000 knights were left dead on the ground, and 30,000 auxiliaries killed or taken prisoners. Though the king had it in his power to destroy the whole order, he satisfied himself with obtaining the territories which had occasioned the war, after which he spent the remainder of his life in tranquillity and peace.

Casimir III. Uladislas was succeeded by his son Casimir III. surnamed the Great. Having in a single campaign subdued the province called Black Russia, he turned his arms against Mazovia, which he overran with great rapidity, and annexed as a province to the crown. He then applied himself to domestic affairs, and was the first who introduced a written code of laws into Poland. He was a most impartial judge, a rigid observer of justice, and the most submissive to the laws of any potentate mentioned in the history of Europe. He was a great patron of industry as well as an eminent legislator, and through his encouragement numbers flocked into his kingdom from various parts of Germany. He fortified many of his chief towns, which he also embellished; whilst colleges, hospitals, churches, and other public buildings, attested alike his genius, his magnificence, and his patriotism. His reign is considered as the golden age of Poland.

Louis. Casimir was succeeded in 1370 by his nephew Louis, King of Hungary; but as the Poles looked upon him as a foreign prince, they were not happy under his administration. He left Poland almost as soon as he was crowned, leaving the government in the hands of his mother Elizabeth. But at that time the state of Poland was too disturbed to be governed by a woman. The country was overrun with gangs of robbers, who committed the most horrid cruelties; the kingdom was likewise invaded by the Lithuanians, the province of Black Russia had revolted, and the land was universally filled with dissension. The Poles, displeased to see their towns occupied by Hungarian garrisons, sent a message to the king, informing him that they thought he had been sufficiently honoured in being elected king of Poland himself, without suffering the kingdom to be governed by a woman and his Hungarian subjects. Upon this, Louis raised a numerous army, intending to subdue the refractory spirit of his subjects. His first operations were directed against the Russians, whom he defeated, and again reduced to subjection. He then turned his arms against the Lithuanians, expelled them from the kingdom, and re-established public tranquillity. He died after a reign of twelve years, and his daughter Hedwig was proclaimed queen.

Uladislas. This princess married Jagellon, Duke of Lithuania, who was converted to Christianity, and baptized by the name of Uladislas. By this marriage, the duchy of Lithuania, as well as the vast provinces of Samogitia and Black Russia, were annexed to the crown of Poland. Such a formidable accession of power excited the jealousy of the Teutonic knights, and they assembled a large army, and suddenly invaded his territory. Uladislas raised a strong force with the utmost celerity, which he committed to the care of his brother Skirgello. The Teutonic knights were defeated, and obliged to abandon all their conquests.

After some years of peace, a long series of wars broke out between Poland and Prussia. The knights having now got possession of Samogitia, Mazovia, Culm, Silesia, and Pomerania, Uladislas resolved to punish them before they became too powerful; and with this view he assembled an army composed of several different nations. He then penetrated into Prussia; took several towns; and was advancing to Marienburg, the capital of Pomerania, when he was met by the army of the Prussian knights, who determined to hazard a battle. When the engagement began, the Poles were deserted by all their auxiliaries, and obliged to stand the brunt of the battle. But the courage and conduct of their king so animated them that, after a most desperate struggle, they obtained a complete victory; nearly 40,000 of the enemy being killed on the field, and 30,000 taken prisoners. Uladislas did not improve his victory, and a peace was concluded upon easier terms than his adversaries had any reason to hope for.

Uladislas VI.

Uladislas V. died in 1434, and was succeeded by his son Uladislas VI., at that time only nine years of age. He had scarcely ascended the throne, when the kingdom was invaded by the Tartars, who defeated the general of the Polish forces; and, committing everywhere dreadful ravages, returned to their own country loaded with booty. A few years afterwards the nation was involved in a war with Amurath, the sultan, who threatened to break into Hungary. But before the young king took the field, a strong body of auxiliaries was despatched under John Hunniades, woivode of Transylvania, to oppose the Turks, and likewise to support the election of Uladislas to the crown of Hungary. This detachment surprised the Turkish army near the river Morava, and defeated Amurath with the loss of 30,000 men; after which Hunniades retook all the places which had been conquered by Amurath, the sultan was forced to sue for peace, and Uladislas was raised without opposition to the crown of Hungary. A treaty was concluded, by which the Turks promised to relinquish their designs upon Hungary, and to give up all their conquests in Bosnia and Servia. This treaty was sealed by mutual oaths; but Uladislas broke it at the persuasion of the Pope's legate, who insisted that now was the time for humbling the power of the infidels, and produced a special commission from the Pope, absolving the king from the oath he had taken at the late treaty. The result of this perfidy was, that Uladislas was entirely defeated and killed at Varna, and the greater part of his army cut in pieces.

Casimir IV.

Uladislas VI. was succeeded by Casimir IV., in whose reign the Teutonic knights were subdued, and obliged to yield up the territories of Culm, Michlow, and the duchy of Pomerania, together with the towns of Elbing, Marienburg, Talkmith, Schut, and Christburg, to the crown of Poland. On the other hand, the king restored to them all the other conquests he had made in Prussia; granted a seat in the Polish senate to the grand-master; and endowed him with other privileges, on condition that, six months after his accession, he should do homage for Prussia, and take an oath of fidelity to the king and republic.

About this time the crown of Bohemia having become vacant, the barons were induced to bestow the crown upon Uladislas, eldest son of Casimir, in opposition to the intrigues of the King of Hungary. Not satisfied with this acquisition, Uladislas took advantage of the dissensions in Hungary, in order to unite that crown to his own, and thereby he greatly augmented his power. Casimir died in 1492. In the reign of this prince, the deputies of the provinces first appeared at the diet, and assumed to themselves the legislative power; all laws before that time having been framed by the king in conjunction with the senate.

John Albert. Alexand Sigismur I.

During the succeeding reigns of John Albert and Alexander, sons of the last monarch, the affairs of Poland fell into decline, the kingdom being harassed by continual wars with the Turks and Tartars. But they were retrieved by Sigismund I., who ascended the throne in 1507. This monarch, having reformed some internal abuses, set about rendering the kingdom as formidable as it had formerly been. He first quelled an insurrection which broke out in Lithuania; after which he drove the Wallachians and Moldavians out of Black Russia, and defeated the Russians in a pitched battle, with the loss of 30,000 men.

After this victory, the king turned his arms against the Teutonic knights, who had elected the Marquis of Brandenburg as their grand-master; whilst this prince not only refused to acknowledge the sovereignty of the crown of Poland, but even invaded the Polish territories. Sigismund marched against him, and gained possession of several important places in Brandenburg; but as he was pursuing his conquests, the marquis, reinforced by 14,000 Germans led by the Duke of Schonenburg, ventured to lay siege to Dantzic, after having ravaged the neighbouring country. The Dantzicers, however, defended themselves so bravely that the besiegers were soon obliged to relinquish their enterprise; whilst in their retreat they were attacked by a strong detachment of Polish cavalry, who made prodigious havoc amongst them, compelling the wretched remains to take shelter in Pomerania, where they were massacred by the peasants. Soon after this the marquis was obliged to submit to the clemency of the conqueror. To secure him in his interest, however, Sigismund granted him half the province of Prussia as a secular duke, dependent on the crown of Poland.

In the reign of Sigismund the kingdom of Poland may be considered as having attained its greatest pitch of glory. This monarch possessed, in his own person, the republic of Poland, the great duchies of Lithuania, Smolensko, and Saveria, besides vast territories lying beyond the Euxine and the Baltic; whilst his nephew Louis possessed the kingdoms of Bohemia, Hungary, and Silesia. But this glory received a sudden check in 1548, by the defeat and death of Louis, who perished in a battle fought with Solyman the Great, sultan of the Turks. The daughter of this prince had married Ferdinand of Austria, an alliance by which the dominions of Hungary, Bohemia, and Silesia became inseparably connected with the hereditary dominions of the Austrian family. Sigismund, then in the eighty-fourth year of his age, did not survive the news of this defeat many months, but died of a lingering disorder, leaving behind him the character of a complete general, an able politician, a good prince, and one of the strongest men in the North.

Sigismu II.

Sigismund Augustus, who succeeded his father Sigismund I., proved also a very fortunate prince. At that time the most violent and bloody wars were carrying on in Germany, and indeed throughout other parts of Europe, on account of religion; but Sigismund wisely avoided interfering in these disputes. He would not admit into his dominions any of those divines who were taxed with holding heterodox opinions, nor even allow his people the liberty of corresponding with them; yet he never persecuted, nor employed any other means for the preservation of the state than those of a well-conducted and regular policy. He applied himself diligently to the reforming of abuses, enforcing the laws, enriching the treasury, promoting industry, and redeeming the crown-lands where the titles of the possessors appeared illegal. Out of the revenue recovered in this manner he raised a formidable standing army without laying any additional tax upon his subjects; and though he preferred peace to war, he was always able to punish those who offered indignities to his person or his crown.

His knowledge of the art of war was soon tried in a contest with the Russians, who, encouraged by the disputes which had subsisted between the Teutonic knights and the Archbishop of Riga, cousin of Sigismund, had made an irruption into Livonia. The province was at that time divided between the knights and the prelate; and the Russians, under pretence of assisting the former, had seized great part of the dominions of the latter. The archbishop had recourse to his kinsman the King of Poland, who, after fruitless efforts to accommodate matters, marched towards the frontiers of Livonia with an army of 100,000 men. The knights were in no condition to resist such a formidable power; and therefore, deserting their allies, they put themselves under the protection of the King of Poland. But the czar, John Basilides, though deserted by the knights, did not lose his courage. His army consisted of 300,000 men, with whom he imagined himself able to reduce all Livonia, in spite of the utmost efforts of the King of Poland; but having met with some checks in that quarter, he directly invaded Poland with his whole army. At first he carried everything before him; but the Poles soon made a vigorous opposition; and the Russians, though everywhere defeated, still continued their incursions, which Sigismund at last revenged by invading Russia in his turn.

These mutual desolations and ravages at last made both parties desirous of peace, and a truce for three years was agreed on; but during the continuance of the armistice the King of Poland died, and with him was extinguished the house of Jagellon, which had governed Poland for nearly two hundred years. On the death of Sigismund, Poland became a prey to intestinal divisions; and intrigues were set on foot at the courts of Vienna, France, Saxony, Sweden, and Brandenburg, each of them endeavouring to establish a prince of their nation on the throne of Poland. The result of all this was, that the kingdom became one universal scene of corruption, faction, and confusion. The members of the diet consulted only their own interest, and were ready on every occasion to sell themselves to the best bidder. The Protestants had by this time got a considerable footing in the kingdom, and thus religious disputes were intermingled with political ones. One good effect, however, flowed from this confusion. A law was passed, by which it was enacted that no difference in religious opinions should occasion any contention amongst the subjects of the kingdom; that all the Poles, without discrimination, should be capable of holding public offices and trusts under the government; and that the future kings should swear expressly to cultivate the internal tranquillity of the realm, and to cherish without distinction their subjects of all persuasions.

Henry II., Duke of Anjou.

Whilst the candidates for the throne were severally attempting to support their own interest in the best manner they could, John Crasoski, a Polish gentleman of great merit, but diminutive stature, had just returned from France, whither he had travelled for improvement. His humour, wit, and diverting size had rendered him universally agreeable at the court of France, and in a particular manner engaged the esteem of Catharine de' Medicis, which the little Pole had the address to make use of for his own advantage. He owed many obligations to the Duke of Anjou, whom, out of gratitude, he represented in such favourable terms, that the Poles began to entertain thoughts of making him their king. These sentiments were confirmed and encouraged by Crasoski, who returned into France by order of several leading men in Poland, and acquainted the king and queen-mother that nothing was wanting except the formality of an embassy to procure the crown for the Duke of Anjou, almost without opposition. Charles IX., king of France, at that time also promoted the scheme; being jealous of the Duke of Anjou's popularity, and willing to have him removed to as great a distance as possible. The parties accordingly came to an agreement, in which it was stipulated that the Duke of Anjou should maintain the laws, liberties, and customs of the kingdom of Poland, and of the grand duchy of Lithuania; that he should transport all his effects and annual revenues in France into Poland; that the French monarch should pay the late King Sigismund's debts; that he should maintain a hundred young Polish gentlemen at his court, and fifty in other places; that he should send a fleet to the Baltic to assist Poland against the Russians; and, lastly, that Henry should marry the Princess Anne, sister of the late King Sigismund, though this article Henry refused to ratify till his return to Poland. Everything being thus settled, the young king quitted France, attended by a splendid retinue, and was accompanied by the queen-mother as far as Lorraine. He was received by his subjects on the frontiers of Poland, and conducted to Cracow, where he was soon afterwards crowned. The affections of the Poles were soon engaged by the youth and accomplishments of Henry; but scarcely had he been seated on the throne, when, by the death of Charles IX., he became heir to the crown of France. Being informed of this by repeated messages from Catharine, he repented his having accepted the crown of Poland, and resolved to leave it for that of France. But being sensible that the Poles would oppose his departure, he kept his intentions secret, and watched an opportunity of stealing out of the palace in disguise during the night-time. The Poles, as might well be expected, were irritated at being thus abandoned, from the mere motive of interest, by a prince whom they had so much loved and honoured. Parties were despatched after him by different roads; and Zamoski, a nobleman who headed one of these parties, overtook him some leagues distant from Cracow. All the prayers and tears of that nobleman, however, could not prevail on Henry to return; he rode post to Vienna, and then passed into France by the way of Italy. On the 15th of July 1575 he was in full diet solemnly divested of the regal dignity, and the throne declared vacant.

Batory.

After the deposition of Henry, commotions and factions again occurred, but the contending parties were now reduced to two,—one who supported the interest of Maximilian, Emperor of Germany; and the other, who were for electing the Princess Anne, and marrying her to Stephen Batory, prince of Transylvania. The latter prevailed; and Batory having married the princess, was crowned on the 1st of May 1576. No opposition was made to his authority, except by the inhabitants of Dantzic, who adhered to the interest of Maximilian, and after his death had the presumption to demand from the king an oath acknowledging their absolute freedom and independence. This led to a war in which the people of Dantzic were worsted; but it was not until after suffering severely that they were at length induced to submit.

The war with Dantzic had no sooner been ended than the king directed his whole strength against the Czar of Muscovy, who had laid siege to Revel, and made himself master of several important cities in Livonia. The czar behaved everywhere with the greatest cruelty, slaughtering without distinction all who were able to bear arms, and abandoning the women and children to the brutality of the Tartars who served in the army. At length, in 1578, a body of forces was despatched into the province; the towns of Wender and Dwinaburg were surprised; and an army sent by the czar to surprise the former was defeated. That unhappy province was at this time also invaded by the Swedes, who professed themselves to be enemies equally to both parties, and who in cruelty were scarcely inferior to the Russians themselves. The king, however, nothing daunted by the number of his adversaries, called to his assistance Christopher, prince of Transylvania, with all the standing forces of that country, and took the field in person against the Muscovites. He laid siege to Polocz, a town of great importance, situated on the river Dwina; and the Russians, in order to strike terror into the enemy, put to death all the citizens of the town. The river was dyed with blood, and a vast number of human bodies, fastened to planks and terribly mangled, were carried down the stream. But this barbarity, instead of intimidating the Poles, irritated them to such a degree that nothing could resist them. Finding that their cannon made little impression upon the walls of the city, which were constructed of wood, they advanced to the assault with burning torches in their hands, and reduced them to ashes. The Russian barbarians were thus obliged to surrender at discretion; and it reflects the highest honour on Batory that, notwithstanding the dreadful instances of cruelty which he had before his eyes, he did not suffer his soldiers to retaliate.

After the reduction of Polocz, Batory continued the war, and with great success. Two detachments from the army penetrated the enemy's country by different roads, wasted all before them to the gates of Smolensko, and returned with the spoils of 2000 villages which they had pillaged and destroyed. The czar was obliged to sue for peace, which he obtained on condition of relinquishing Livonia, after having thrown away the lives of more than 400,000 of his subjects in attempting to conquer it.

A peace was likewise concluded with the Swedes, and Batory being thus freed from war, applied himself to the internal government of his kingdom. He regulated the Polish cavalry in such a manner that they became formidable to the Turks and other neighbouring nations; and this is the military establishment to which the Poles have given the name of *quartienne*, because a fourth part of the revenue was employed in supporting it. Batory sent this body of cavalry towards the frontiers of Tartary, and by its means the Ukraine, a vast tract of desert country, was filled with flourishing towns and villages, and became a strong barrier against the Turks, Tartars, and Russians. The last memorable action of this prince was his attaching to Poland the Cossacks, whom he civilized and instructed in the arts of war and peace. All kinds of manufactures at that time known in Poland were likewise introduced among the Cossacks; the women were employed in spinning and weaving woollen cloths, whilst the men were taught agriculture and the mechanical arts.

Whilst Batory was employed in this manner, the Swedes broke the convention into which they had entered with Poland, and were on the point of obtaining possession of Riga. To this, indeed, Batory himself had given occasion, by attempting to impose the Catholic religion upon the inhabitants, after having promised them entire liberty of conscience; a proceeding which so irritated them that they revolted, and were on the point of admitting a Swedish garrison into the city, when the king became informed of what was going forward. He resolved to take a most exemplary vengeance on the inhabitants of Riga; but before he could execute his intention, he died in 1586, the fifty-fourth year of his age, and tenth of his reign.

Sigismund III.

The death of Batory involved Poland in fresh troubles. Four candidates appeared for the crown: the princes Ernest and Maximilian, of the House of Austria; Sigismund, prince of Sweden; and Theodore, czar of Muscovy. Each of these had a separate party; but Sigismund and Maximilian managed matters so cleverly that in 1587 both of them were elected. The result was a civil war, in which Maximilian was defeated and taken prisoner; and thus, without opposition, Sigismund III., surnamed Vasa, obtained the throne of Poland. He waged a successful war with the Tartars, and was otherwise prosperous; but though he succeeded to the crown of Sweden, he found it impossible for him to retain both kingdoms, and he was formally deposed from the Swedish throne. In 1610 he conquered Russia, and placed his son on the throne of that country; but the Polish conquests of that country have always been short-lived. The young prince was soon afterwards deposed; and the Russians not only regained their liberty, but began to make encroachments on Poland itself. A very unfortunate war also took place with Sweden, which was now governed by the great Gustavus Adolphus; but the particulars of that contest, with the other exploits of that renowned warrior, are elsewhere related. At last, Sigismund, worn out with cares and misfortunes, died in 1632.

Uladislas VII.

John Casimir.

After Sigismund's death the affairs of Poland seemed to revive a little under Uladislas VII., who obliged the Russians to sue for peace, and Sweden to restore some of her conquests; but an attempt being made to abridge the liberty of the Cossacks, they revolted, and gave the Poles several terrible defeats; nor did the war terminate in the lifetime of Uladislas, who died in 1648. His successor, John Casimir, concluded a peace with these dangerous enemies, but the war was soon after renewed; and whilst the kingdom was distracted between the hostility of the Cossacks and the discontents of its own inhabitants, the Russians took the opportunity of invading and pillaging Lithuania.

Michael Wieçnowieçki.

In a little time afterwards, the whole kingdom was subdued by Charles Gustavus, successor to Christina, Queen of Sweden. Happily for Poland, however, a rupture took place between the courts of Sweden and Copenhagen, and the Poles were thereby enabled to drive out the Swedes in 1657. This was succeeded by civil wars and contests with Russia, which so much vexed the king that he resigned the crown in 1668. For two years after the resignation of Casimir the kingdom was filled with confusion; but on the 17th September 1670, one Michael Koributh Wieçnowieçki, collaterally descended from the House of Jagellon, though in a very mean situation at that time, was chosen king. His reign continued only for three years, during which time John Sobieski, a celebrated Polish general, gave the Turks a dreadful overthrow, though their army consisted of more than 300,000 men; and if this blow had been followed up, the Cossacks would not only have been entirely subdued, but very advantageous terms might have been obtained from the sultan. Of that vast multitude of Turks, no more than 15,000 made their escape, the rest being all either killed or taken. However, the Polish soldiers, being only bound by the laws of their country to stay a certain time in the field, refused to pursue this signal victory, and suffered the king to make peace on any terms he could procure.

John Sobieski.

Wieçnowieçki died before the news of this transaction reached Cracow; and after his death a new scene of confusion ensued, till at last the fortune of John Sobieski prevailed, and he was elected king of Poland in 1674. He was a most magnanimous and heroic prince, and by his valour and good conduct retrieved the affairs of Poland. The Turks were everywhere defeated; but notwithstanding his great qualities, Poland was now so thoroughly corrupted, and pervaded by such a spirit of disaffection, that the latter part of this monarch's reign was involved in troubles, through the ambition and contention of some powerful noblemen. Sobieski died in 1696, and with him the glory of Poland descended into the tomb.

Augustus

Most violent contests now took place about the succession, but the recital of these would far exceed our limits. At last, Frederick Augustus, elector of Saxony, prevailed; but as some of the most essential ceremonies were wanting in his coronation, because the primate, who was in an opposite interest, would not perform them, he found it extremely difficult to keep his subjects in proper obedience; and, to add to his misfortunes, having engaged in a league with Denmark and Russia against Sweden, he was attacked with irresistible fury by Charles XII. The particulars of this war, however, as they form great part of the exploits of that northern hero, more properly fall to be related under the head of Sweden. Here, therefore, we shall only observe, that Augustus was reduced to the humiliating necessity of renouncing the crown of Poland on oath, and even of congratulating his rival Stanislas upon his accession to the throne. But when the power of Charles was broken by his defeat at Pultowa, the fortune of Augustus again prevailed; Stanislas was driven out; and the former, being absolved from his oath by the pontiff, resumed possession of the throne of Poland.

Degeneracy of the Poles.

After this Poland makes no figure, except in the history of political iniquity. Weakened by internal dissensions, it became unable to resist foreign aggression, and fell an easy prey to the ambitious powers by which it was surrounded. On 5th October 1763, Augustus II., elector of Saxony and king of Poland, died, and was succeeded by Count Poniatowski, a Polish grandee, who, on 7th September 1764, was proclaimed king by the name of Stanislas Augustus, and crowned on 25th November the same year. During the interregnum which took place between the death of Augustus III. and the election of Stanislas, a decree had been passed by the convocation-diet of Poland, with regard to the Dissidents, as they were called, or dissenters from the Catholic faith, by which they were prohibited the free exercise of their religion, and excluded from all offices and places under the government. On this occasion several of the European powers interposed, and the courts of Russia, Prussia, Great Britain, and Denmark, tendered remonstrances to the Diet; but, notwithstanding these, the decree was confirmed by the coronation-diet held soon after the king's election.

Interference of foreign powers in behalf of the Dissidents.

On the 6th of October 1766, an ordinary Diet was assembled. Here declarations from the courts above mentioned were presented to his Polish majesty, requiring the re-establishment of the Dissidents in their civil rights and privileges, and the peaceable enjoyment of their modes of worship secured to them by the laws of the kingdom, which had been observed for two centuries. These privileges, it was alleged, had been confirmed by the treaty of Oliva, concluded by all the northern powers, and could not now be altered except by the consent of all the contracting parties. The Catholic party contended strongly for a confirmation of some decrees against the Dissidents, made in the years 1717, 1723, and 1736. The deputies from the foreign powers replied, that those decrees had passed in the midst of intestine troubles, and were contradicted by the formal protestations and express declarations of those powers. At last, after a violent contest, the matter was referred to the bishops and senators for their opinion; and upon a report from them, the Diet came to a resolution that they would maintain the Dissidents in all the rights and prerogatives to which they were entitled by the laws of their country and by treaties; and that as to their complaints with regard to the exercise of their religion, the college of archbishops and bishops, under the direction of the prince primate, would endeavour to remove all those difficulties in a manner conformable to justice and charity. In the mean time, the court of Russia, resolved to enforce her remonstrances, marched a body of troops to within a few miles of Warsaw. These resolutions of the Diet were by no means agreeable to the Dissidents. The latter dated the beginning of their sufferings from the year 1717. Referring their grievances to the archbishops and bishops was looked upon as a measure the most unreasonable that could be imagined, as that body of men had always been their opponents, and in fact the authors of the evils which had befallen them. When matters came to be considered in this view, an additional body of Russians, to the number of about fifteen thousand, entered Poland.

Consequences of this interference.

The Dissidents, being now pretty sure of the protection of foreign powers, entered, on the 20th of March 1767, into two confederacies, at Thorn and Sluck. One of these was signed by the Dissidents of Great and Little Poland, and the other by those of the grand duchy of Lithuania. The purpose of these confederacies was, an engagement to exert themselves in the defence of their ancient privileges, and the free exercise of their religion; professing at the same time the utmost loyalty to the king, and resolving to send to him a deputation to implore his protection. They even invited those of the Catholic communion, and all true patriots, to unite with them in maintaining the fundamental laws of the kingdom, the peace of religion, and the rights of men in society. They also claimed, by virtue of public treaties, the protection of the powers who were guarantees of their liberties, namely, Russia, Sweden, Great Britain, Denmark, and Prussia. And they protested, that they had no intention of acting to the detriment of the Roman Catholic religion, which they duly respected, but only asked liberty for their own, and the re-establishment of their ancient rights. The three cities of Thorn, Elbing, and Dantzig, acceded to the confederacy of Thorn on the 10th of April; as did the duke and nobles of Courland to that of Sluck on the 15th of May. In the mean time the empress of Russia and the king of Prussia continued to issue forth new declarations in favour of the Dissidents; and the Russian troops in Poland were gradually augmented to thirty thousand men. Great numbers of other confederacies were also formed in different parts of the kingdom; but these at first took little part in the affair of the Dissidents. They complained chiefly of the administration of public affairs, in which they alleged that innovations had been introduced, and were therefore for some time called Confederations of Malcontents. All these confederacies published manifestos, in which they recommended to the inhabitants to receive and treat the Russian troops as the defenders of the liberties of Poland.

General confederacy.

The different confederacies of malcontents formed in the twenty-four districts of Lithuania united at Wilna on the 22d of June; and that general confederacy re-established Prince Radzivil, who had married the king's sister, in his liberty, estates, and honour, of which he had been deprived in 1764 by the states of that duchy. On the 23d of June Prince Radzivil was chosen grand marshal of the general confederacy of all Poland, which then began to be called the National Confederacy, and was said to be composed of seventy-two thousand noblemen and gentlemen. The general confederacy now took such measures as appeared most proper for strengthening their party. They sent to the several woivodes of the kingdom, requiring that all the gentlemen who had not signed the confederacy should do it immediately; that all the courts of justice should subsist as formerly, but not judge any of the confederates; that the marshals of the crown should not pass any sentence without the participation of at least four of the confederates; and that the marshals of the crown and the treasurers should be immediately restored to the possession of their respective rights. In the mean time the Catholic party were not idle. The bishop of Cracow sent a letter to the Diet assembled at Warsaw on the 13th of August, in which he exhorted them to arm their nuncios with courage, by giving them orthodox and pious instructions, that they might not grant the Dissidents new advantages beyond those which were secured to them by the constitutions of the country and the treaties with foreign powers. The pope also sent briefs to the king, the great chancellor, the nobility, the bishops of the kingdom, and to the prince primate, with such arguments and exhortations as were thought most calculated to ward off the impending danger. Councils in the mean time were frequently held at the bishop of Cracow's palace, where all the prelates at Warsaw assembled. On the 26th of September 1767 the confederacy of Dissidents was united with the general confederacy of malcontents in the palace of

Prince Radzivil, who on that occasion expressed great friendship for the Dissidents. In a few days afterwards the Russian troops in the capital were reinforced, and a considerable body of them was posted at about five miles distance.

Tumults in the Diet.

On the 5th of October an extraordinary Diet was held. But the affair of the Dissidents met with such opposition, that it was thought necessary to adjourn the meeting till the 12th, during which interval every expedient was used to gain over those who opposed Prince Radzivil's plan. This was, to appoint a commission furnished with full power to enter into conference with Prince Repnin, the Russian ambassador, concerning the affairs of the Dissidents. But notwithstanding all the pains taken, the meeting of the 12th proved exceedingly tumultuous. The bishops of Cracow and Kiow, with some other prelates, and several magnates, declared that they would never consent to the establishment of such a commission; and at the same time they spoke with more vehemence than ever against the pretensions of the Dissidents. Some of the deputies replied with great warmth; and this occasioned such animosities, that the meeting was again adjourned till the 16th.

Violent proceedings of the Russians.

On the 13th the bishops of Cracow and Kiow, the palatine of Cracow, and the starost of Domski, were carried off by Russian detachments. The crime alleged against them, in a declaration published next day by Prince Repnin, was, that they had been wanting in respect to the dignity of the empress of Russia, by attacking the purity of her intentions towards the republic; though she was resolved to continue her protection and assistance to the general confederacy united for preserving the liberties of Poland, and correcting all the abuses which had been introduced into the government of that country.

Confederacy of Bar.

It was probably owing to this violent proceeding of the Russians that Prince Radzivil's plan was at last adopted, and several new regulations were made in favour of the Dissidents. These innovations, however, soon produced a civil war, which at last ended in the ruin of the kingdom. In the beginning of the year 1768, a new confederacy was formed in Podolia, a province bordering on Turkey; it was afterwards called the Confederacy of Bar, and the intention of it was to abolish, by force of arms, the new constitutions, particularly those in favour of the Dissidents. The members of the new confederacy likewise expressed great indignation at the carrying away the bishops of Cracow, Kiow, and others, and still detaining them in custody.

Podolia was reckoned the fittest place for the purpose of the confederates, who imagined that the Russians could not attack them there without giving umbrage to the Ottoman court. Similar confederacies, however, were quickly entered into throughout the kingdom. The clergy excited all ranks of men to exert themselves in defence of their religion; and so effectual did their exhortations prove, that even the king's troops could not be trusted to act against these combinations. The empress of Russia threatened the new confederates as disturbers of the public tranquillity, and declared, that if they persisted, her troops would act against them. It was some time, however, before the Russian troops were considerably reinforced; nor did they at first seem inclined to act with the vigour that they might have exerted. A good many skirmishes soon occurred between the contending parties, in which the confederates were for the most part defeated. In one of these encounters, the latter being worsted, and hardly pressed, a number of them passed the Dniester and took refuge in Moldavia. This province had formerly belonged to Poland, but was now subject to the grand signior. The Russians, however, pursued their enemies into Moldavia; but in order to prevent any offence being taken by the Porte, Prince Repnin wrote to the Russian resident at Constantinople, that the conduct of the Russian colonel who commanded the party was quite contrary to the orders of his court, and that he would therefore be dismissed.

War between this confederacy and the Russians.

Great cruelty was in the mean time exercised against the Dissidents where there were no Russian troops to protect them. Towards the end of October 1768, Prince Martin Lubomirski, one of the southern confederates, who had been driven out of Poland, and had taken shelter with some of his adherents amongst the mountains of Hungary, caused a manifesto to be posted up on several of the churches of Cracow, in which he invited the nation to a general revolt, assuring them of the assistance of the Ottoman Porte, with whom he pretended to have concluded a treaty. The unhappy kingdom of Poland became the first scene of this war, and in a short time it was reduced to the most deplorable situation. In the end of the year 1768, the peasants of the Greek faith in the Ukraine took up arms, and committed the greatest ravages, having, as they pretended, been threatened with death by the confederates unless they would become Roman Catholics. Against these insurgents the Russians employed their arms, and made great numbers of them prisoners. The rest took refuge amongst the Haidamacks, by whom they were soon joined, and in the beginning of 1769 they entered the Ukraine, committing everywhere the most horrid massacres. Here, however, they were at last defeated by the Polish troops, at the same time that several of the confederacies in Poland were severely chastised. Soon afterwards, the khan of the Crim Tartars having been repulsed with loss in an attempt on Servia, entered the Polish territories, where he left frightful marks of his inhumanity; which, with the cruelties exercised by the confederates, induced the Polish Cossacks of Braclau and Kiovia, amounting to near thirty thousand effective men, to join the Russians, in order to defend their country against these destroyers. Matters continued much in the same state during the rest of the year 1769; and in 1770 skirmishes frequently occurred between the Russians and confederates, in which the latter were almost always worsted; but they took care to revenge themselves by the most barbarous cruelties on the Dissidents, wherever they could find them. In 1770, a considerable number of the confederates of Bar, who had joined the Turks, and been excessively ill used by them, came to an accommodation with the Russians, who took them under their protection upon very moderate terms. In the mean time agriculture had been so much neglected, that the crop of 1770 proved deficient. This encouraged a number of desperadoes to associate, who, under the denomination of Confederates, were guilty of still greater excesses than those who had been under some kind of regulation; and thus a great part of the country was at last reduced to a mere desert, the inhabitants being either exterminated, or carried off to stock the remote Russian plantations.

New confederacies.

In the year 1771, the confederacies, which appeared to have been extinguished, sprang up afresh, and increased to a great degree. This was occasioned by their having been secretly encouraged and supplied with money by France. A great number of French officers also engaged as volunteers in their service; and having introduced discipline amongst their troops, they acted with greater vigour than formerly, sometimes proving more than a match for their enemies. But these gleams of success served only to light them on to their ruin. The Russians were reinforced and properly supported. The Austrian and Prussian troops entered the country, advancing on different sides; and in a short time the confederates found themselves entirely surrounded by enemies, who seemed to have nothing less in view than an absolute conquest of the country, and sharing it amongst themselves.

Attempt to assassinate the king.

Before matters came to this crisis, however, the confederates had formed a design of assassinating the king, on account of his supposed attachment to the Dissidents. A Polish nobleman, named Pulaski, a general in the army of the confederates, was the person who planned the enterprise; and the conspirators who carried it into execution were about forty in number, headed by three chiefs, named respectively Lukawski, Strawenski, and Kosinski. On the 2d of September they obtained admission into Warsaw, unsuspected and undiscovered. On Sunday night, the 3d of September 1771, a few of these conspirators remained in the skirts of the town; but the others repaired to the place of rendezvous, the street of the Capucins, where his majesty was expected to pass about his usual hour of returning to the palace. The king had been to visit his uncle Prince Czartoryski, grand chancellor of Lithuania, and was on his return from thence to the palace between nine and ten o'clock. He was in a coach, accompanied by at least fifteen or sixteen attendants, besides an aide-de-camp in the carriage. Scarcely was he at the distance of 200 paces from Prince Czartoryski's palace, when he was attacked by the conspirators, who commanded the coachman to stop on pain of instant death. They fired several shots into the carriage, and almost all the other persons who preceded and accompanied his majesty were dispersed; the aide-de-camp having also abandoned him, and attempted to conceal himself by flight. The king himself attempted to escape under cover of the night, which was extremely dark, but they immediately laid hold of him by the collar, and, mounting on horseback, dragged him along the ground between their horses at full gallop for nearly 500 paces through the streets of Warsaw. Finding that he was incapable of following them on foot, they set him on horseback, and then redoubled their speed for fear of being overtaken.

The night was exceedingly dark, and they were absolutely ignorant of the way; so that they wandered through the open meadows without getting to any distance from Warsaw. At length they were suddenly alarmed by a Russian patrole or detachment, and instantly a number of the assassins disappeared, leaving only three with the king. Scarcely a quarter of an hour after, a second Russian guard challenged them anew, and two of the assassins then fled, leaving Kosinski alone with the king. At length, by means of expostulation and entreaty, the king prevailed on Kosinski to restore him to liberty, and upon his return to Warsaw, he was received with the utmost demonstrations of joy. But neither the virtues nor the popularity of the sovereign could allay the factious spirit of the Poles, nor prevent the dismemberment of his kingdom.

First partition of Poland.

The partition of Poland was first projected by the King of Prussia. Polish or Western Prussia had long been an object of his ambition. Exclusively of its fertility, commerce, and population, its local situation rendered it highly valuable to that monarch: it lay between his German dominions and Eastern Prussia, and whilst in the possession of the Poles it cut off at their will all communication between them. The period had now arrived when the situation of Poland seemed to promise the easy acquisition of this valuable province. Frederic, however, pursued it with all the caution of an able politician. On the commencement of the troubles, he showed no eagerness to interfere in the affairs of this country; and although he had concurred with the Empress of Russia in raising Stanislas Augustus to the throne of Poland, yet he declined taking any active part in his favour against the confederates. Afterwards, when in 1769 the whole kingdom became convulsed with civil commotions, and desolated by the plague, he, under pretence of forming lines to prevent the spreading of the infection, advanced his troops into Polish Prussia, and occupied the whole of that district. Though now completely master of the country, and by no means apprehensive of any formidable resistance from the disunited and distracted Poles, yet, as he was well aware that the security of his new acquisition depended upon the acquiescence of Russia and Austria, he planned the partition of Poland. He communicated the project to the emperor, either upon their interview at Niess in Silesia in 1769, or in that of the following year at Nieustadt in Austria, and from him the overture met with a ready concurrence. To induce the Empress of Russia to acquiesce in the same project, he despatched to St Petersburg his brother Henry, who suggested to the empress that the House of Austria was forming an alliance with the Porte, with which she was then at war; that if such alliance took place, it would create a most formidable combination against her; that nevertheless the friendship of that house was to be purchased by acceding to the partition; that, upon this condition, the emperor was willing to renounce his connection with the grand signior, and would suffer the Russians to prosecute the war without interruption. Catharine, anxious to push her conquests against the Turks, and dreading the interposition of the emperor in that quarter; perceiving, likewise, from the intimate union between the courts of Vienna and Berlin, that it would not be in her power at the present juncture to prevent the intended partition; closed with the proposal, and selected no inconsiderable portion of the Polish territories for herself. The treaty was signed at St Petersburg in the beginning of February 1772, by the Russian, Austrian, and Prussian plenipotentiaries. It would be tedious to enter into a detail of the pleas urged by the three powers in favour of their several demands; nor would it be less uninteresting to lay before the reader the answers and remonstrances of the king and Senate, as well as the appeals to the other states which had guaranteed the possessions of Poland. The courts of London, Paris, Stockholm, and Copenhagen remonstrated against these usurpations; but remonstances without assistance could be of no effect. Poland submitted to the dismemberment not without the most violent struggles; and now for the first time that unhappy country felt and lamented the fatal effects of faction and discord.

A Diet being demanded by the partitioning powers, in order to ratify the cession of the provinces, it met on the 19th of April 1773; and such was the spirit of the members that, notwithstanding the deplorable situation of their country, and the threats and bribes of the three powers, the partition-treaty was not carried through without much difficulty. For some time the majority of the nuncios appeared determined to oppose the dismemberment, and the king firmly persisted in the same resolution. The ambassadors of the three courts enforced their requisitions by the most alarming menaces, and threatened the king with deposition and imprisonment. They also gave out by their emissaries that, in case the Diet continued refractory, Warsaw should be pillaged. This report was industriously circulated, and made a sensible impression upon the inhabitants. By menaces of the same sort, by corrupting the marshal of the Diet, and by bribes, promises, and threats, the members were at length prevailed on to ratify the dismemberment.

The partitioning powers, however, did less injury to the republic by dismembering its fairest provinces than perpetuating the principles of anarchy and confusion. Under pretence of amending the constitution, they confirmed all its defects, and took effectual precautions to render this unhappy country incapable of ever emerging from the deplorable state into which it had fallen, as was seen in the failure of the most patriotic attempt ever made by a king to reform the constitution of his kingdom.

Government.

The kings of Poland were anciently hereditary and absolute, but afterwards became elective and limited. In the reign of Louis, towards the end of the fourteenth century, several limitations were imposed on the royal prerogative. In that of Casimir IV., who ascended the throne in 1445, representatives from the several palatinates were first called to the Diet; the legislative power till then having been lodged in the states, and the executive in the king and Senate. On the decease of Sigismund Augustus, it was enacted by law that for the future the choice of a king should perpetually remain free and open to all the nobles of the kingdom; and this law was accordingly observed, to the great injury of the kingdom.

As soon as the throne became vacant, the authority was transferred to the primate, who in quality of interrex, had in some respects more power than the king himself. He notified the vacancy of the throne to foreign princes, and issued the *universalia*, or circular letters for the election.

The place of election was the field of Vola, at the gates of Warsaw; and all the nobles of the kingdom had a right of voting. The Poles encamped on the left side of the Vistula, and the Lithuanians on the right, each under the banners of their respective palatinates. The field of election was surrounded by a ditch provided with three gates; one to the east for Great Poland, another to the south for Little Poland, and a third to the west for Lithuania. In the middle of the field was erected a great building of wood, named the *Szopa*, or Hall of the Senate. All who aspired openly to the crown were expressly excluded from the field of election, that their presence might not constrain the voters. The king must be elected *nemine contradicente*, by all the suffrages without exception. The primate in few words recapitulated to the nobles on horseback the respective merits of the candidates; he exhorted them to choose the most worthy, invoked heaven, gave his blessing to the assembly, and remained alone with the marshal of the Diet, while the senators dispersed themselves into the several palatinates to promote a unanimity of sentiment. If they succeeded, the primate himself went to collect the votes, at the same time naming again all the candidates. "Szoda," answered the nobles, "that is the man we choose;" and instantly the air resounded with his name, together with cries of "*Vivat*," and the noise of pistols. If all the palatines agreed in their nominations, the primate got on horseback, and then, the profoundest silence succeeding to the greatest noise, he asked three times if all were satisfied, and after a general approbation, three times proclaimed the king; upon which the grand marshal of the crown repeated the proclamation three times at the three gates of the camp.

The *pacta conventa*.

Before the king was proclaimed, the *pacta conventa* were read aloud to him, which, on his knees at the altar, he swore to observe. This contract, which had been drawn up, methodized, and approved by the Senate and nobility, was deemed the great part of the charter of Poland. It provided that the king should not attempt to encroach on the liberty of the people by rendering the crown hereditary in his family; that he should preserve all the customs, laws, and ordinances respecting the freedom of election; that he should ratify all treaties subsisting with foreign powers, which were approved by the Diet; that it should be his chief study to cultivate peace, preserve the public tranquillity, and promote the interest of the realm; that he should not coin money except in the name of the republic, or appropriate to himself the advantages arising from coinage; that in declaring war, concluding peace, making levies, hiring auxiliaries, or admitting foreign troops upon any pretext within the Polish dominions, the consent of the Diet and Senate should be necessary; that all offices and preferments should be given to natives of Poland and Lithuania; that the king should not marry without the approbation of the Senate; that he should administer justice by the advice of the Senate and his council; that he should not diminish the treasure kept at Cracow; but, on the contrary, endeavour to augment it, as well as the number of the crown jewels; that he should not borrow money without the consent of the Diet; that he should not equip a naval force without the consent and full approbation of the republic; that he should profess the Roman Catholic faith, and promote, maintain, and defend it, throughout all the Polish dominions; and, finally, that all their several liberties, rights, and privileges should be preserved to the Poles and Lithuanians in general, and to all the districts and provinces contained within each of these great divisions, without change, alteration, or the smallest violation, except by the consent of the republic.

The Diet.

The Diet of Poland was composed of the king, the Senate, the bishops, and the deputies of the nobility or gentry of every palatinate, called, in their collective capacity, *comitia togata*, that is, when the states assembled in the city without arms and horses; or *comitia paludata*, when they met in the fields armed, as during an interregnum, at the Diet of election. When it was proposed to hold a general Diet, the king, or, in case of an interregnum, the primate, issued writs to the palatines of the several provinces, specifying the time and place of the meeting. A sketch likewise was sent of the business to be deliberated on by the assembly; the Senate was consulted in this particular, and six weeks were allowed the members to prepare themselves for the intended session. The Diet never sat more than six weeks even in the most critical conjunctures and pressing emergencies. On receipt of the king's writ, the palatine communicated the meeting of the Diet to all the castellans, starosts, and other inferior officers and gentry within his jurisdiction; requiring them to assemble on a certain day to elect deputies, and take into consideration the business specified in the royal summons. These meetings were called petty diets, *dietines* or *lantage*, in the language of the country, every gentleman possessing three acres of land having a vote, and matters being determined by a majority; whereas in the general Diet decrees were only valid when the whole body was unanimous. Every palatinate had three representatives, though the business devolved on one called a nuncio, who was elected on account of his ability and experience; and the other two were added only to give weight to this leading member. As these deputies, since the reign of Casimir III., had seats in the Diet, it naturally divided the general assembly into two bodies, the upper and lower; the one being composed of the Senate, the superior clergy, and the great officers; and the other of the representatives of the palatinates, who prepared all business for the superior body.

Among the inconveniences which attended the constitution of the Diet of Poland was a spirit of venality in the deputies, and a general corruption, that possessed all ranks and degrees in that assembly. There, as in some other countries, the cry of liberty was kept up for the sake of private interest. Deputies came with a full resolution of profiting by their patriotism, and not lowering their voice without a gratification. Determined to oppose the most salutary measures of the court, they either withdrew from the assembly, and protested against all that should be transacted in their absence, or else excited such a clamour as rendered it necessary for the court to silence them by some lucrative pension, donation, or employment. Unanimity was necessary to the passing of any bill.

The Senate

Perhaps the most respectable department of the Polish government was the Senate, composed of the bishops, palatines, castellans, and ten officers of state, who derived a right from their dignities of sitting in that assembly, and amounting in all to 144 members, who were styled "senators of the kingdom," or "counsellors of the state," and had the title of Excellency,—a dignity supported by no pension or emoluments necessarily annexed to it. The Senate presided over the execution of the laws, and was the guardian of liberty, the judge of right, and the protector of justice and equity. All the members except the bishops, who were senators *ex officiis*, were nominated by the king, and took an oath to the republic before they were permitted to enter upon their functions. Their honours continued for life.

The Permanent Council.

Such was the constitution of Poland before being new-modelled by the partitioning powers. That it was in all respects a very bad one, needs no proof whatever. But those foreign reformers did not improve it. For two centuries at least the Poles had with great propriety denominated their government a republic, because the king was so exceedingly limited in his prerogative that he resembled more the chief of a commonwealth than the sovereign of a powerful monarchy. That prerogative, already too confined to afford protection to the peasants, groaning under the tyranny of the nobles, was, after the partition-treaty, still further restrained by the establishment of the Permanent Council, which was vested with the whole executive authority, leaving to the sovereign nothing but the name. The Permanent Council consisted of thirty-six persons, elected by the Diet out of the different orders of nobility; and though the king, when present, presided in it, he could not exert a single act of power without the consent of the majority of persons, who might well be called his colleagues.

That Stanislas should have laboured to extricate himself and the great body of the people from such unparalleled oppression, and that the more respectable portion of the nation should have wished to give to themselves and their posterity a better form of government, was surely very natural and very meritorious. The influence of the partitioning powers was indeed exerted to render the king contented with his situation. His revenues, which before did not exceed L.100,000, were now increased to three times that sum. The republic likewise agreed to pay his debts, amounting to upwards of L.400,000. It also bestowed on him, in hereditary possession, four starosties or governments of castles, with the districts belonging to them, and re-imbursed him for the money which he had laid out on account of the state. It was likewise agreed that the revenues of the republic should be raised to 33,000,000 of florins, or nearly L.2,000,000 sterling; and that the army should consist of 30,000 men. Soon after the conclusion of peace with Turkey, the Empress of Russia also made the king a present of 250,000 rubles, as a compensation for that part of his dominions which had fallen into her hands.

he new onstitution of 791.

These bribes, however, were not sufficient to blind the penetration of Stanislas, nor to cool the ardour of his patriotism. He laboured for posterity, and with such apparent success that, on the 3d of May 1791, a new constitution of the government of Poland was established by the king, together with the confederate states assembled in double number to represent the Polish nation. That this constitution was perfect, we are far from asserting; but it was probably as much so as the inveterate prejudices of the nobles would admit of. It deviated as little as possible from the ancient forms, and consisted of eleven articles respecting the government of the republic, to which were added twenty-one sections, regulating the dietines or primary assemblies of Poland.

The first article of this constitution established the Roman Catholic faith, with its various privileges and immunities, as the dominant national religion; but to all other people, of whatever persuasion, it secured peace in matters of faith, and the protection of government. The second article guaranteed to the nobility or the equestrian order all the privileges which it enjoyed under the kings of the House of Jagellon. The third and fourth articles granted to the free royal towns internal jurisdictions of their own; and exempted the peasants from slavery, declaring every man free as soon as he set his foot on the territory of the republic. The fifth article, after declaring, that in civil society all power should be derived from the will of the people, enacted that the government of the Polish nation should be composed of three distinct powers; the legislative, in the states assembled; the executive, in the king and the Council of Inspection; and the judicial power, in the jurisdictions existing or to be established. According to the sixth article, the Diet, or the legislative power, was to be divided into two houses,—viz., the House of Nuncios or deputies, and the House of Senate, where the king was to preside. The former, being the representative and central point of supreme national authority, was to possess the pre-eminence in the legislature; therefore all bills were to be decided first in this house. The Senate was to consist of bishops, palatines, castellans, and ministers under the presidency of the king.

These ordinary legislative Diets were to have an uninterrupted existence, and be always ready to meet. The length of sessions was to be determined by the law concerning diets. If convened upon some urgent occasion out of ordinary session, they were only to deliberate on the subject which occasioned such a call, or on circumstances which might arise out of it. No law or statute enacted by such ordinary Diet could be altered or annulled by the same. The majority of votes was to decide everything and everywhere. Every twenty-five years an extraordinary constitutional Diet was to be held for the revision of the constitution, and making such changes and alterations as might be found requisite. The seventh article intrusted to the king and his council the highest power of executing the laws. The duty of such executive power was to watch over the laws, and to see them strictly executed according to their import, even by means of public force, should it be found necessary. The throne was to cease to be elective, and on the death of the present king was to become hereditary in the family of the Elector of Saxony. Every king, on his accession, was to take a solemn oath to support the present constitution, and to fulfil the *pacta conventa*. The king's person was sacred and inviolable. As no act could proceed immediately from him, he could not in any manner be responsible to the nation; he was not an absolute monarch, but the father and the head of the people; and his revenues, as fixed by the *pacta conventa*, were to be sacredly preserved. All public acts, the acts of magistracies and the coin of the kingdom, were to bear his name. He had the right of pardoning those who were condemned to death, except the crimes were against the state; and in time of war he had the supreme command of the national forces, but he might appoint the commanders of the army, with the consent of the states. The nomination to all offices and dignities was vested in him. The king's Council of Inspection was to consist of the primate as the head of the clergy, and the president of the commission of education, or the first bishop *in ordine;* of five ministers,—viz., those of police, justice, war, finances, and foreign affairs; of two secretaries to keep the protocols, one for the council and another for the foreign department, but both with a decisive vote. The hereditary prince, on coming of age, and having taken the oath to preserve the constitution, might assist at all sessions of the council, but could have no vote therein.

The eighth article regulated the administration of justice. It constituted primary courts of justice for each palatinate or district, composed of judges chosen at the dietine; and appointed higher tribunals, one being erected in each of the three provinces into which the kingdom was divided, with which appeals might be lodged from the primary courts. It likewise appointed for the trial of persons accused of crimes against the state one supreme general tribunal for all classes, called a *comitial tribunal*, or court composed of persons chosen at the opening of every Diet.

The ninth article provided a regency during the king's minority, in case of his settled alienation of reason, or upon the emergency of his being made a prisoner of war. The three great divisions of the kingdom (Great and Little Poland, and Lithuania) were entitled to send sixty-eight deputies each to the House of Nuncios. Every possessor of land, however small, had the right of voting at the election of representatives to the Diet. Every person of the equestrian order that paid territorial tax to government was eligible to all the elective offices in his district.

This constitution opposed by Russia.

Such were the chief heads of the Polish constitution established by the king and the confederates in 1791. It cannot be compared with systems that have been matured by long experience; but it is surely infinitely superior to the motley form of government which, for a century previous, rendered Poland a perpetual scene of war, tumult, tyranny, and rebellion. Many of the corrupt nobles, however, perceiving that it would curb their ambition, deprive them of the base means which they had long enjoyed of gratifying their avarice by setting the crown to sale, and render it impossible for them to continue with impunity their tyrannical oppression of the peasants, protested against it, and withdrew from the confederates. This was nothing more than what might have been expected, or than what the king and his friends undoubtedly expected. But the malcontents were not satisfied with a simple protest; they preferred their complaints to the empress of Russia, who, ever ready on all occasions, and on the slightest pretence, to invade Poland, poured her armies into the republic, and surrounding the king and the Diet with ferocious soldiers, compelled them, by the most indecent menaces, to undo their glorious labour of love, and to restore the constitution as settled after the partition-treaty.

General rising.

On the 21st of April 1792, the Diet received the first notification from the king, of the inimical and unjust intentions of Russia. He informed them that, without the shadow of pretence, this power had determined to invade the territory of the republic with an army of sixty thousand men. This formidable force, commanded by Generals Soltikof, Michelson, and Kosakowski, was afterwards to be supported by a corps of twenty thousand, and by the troops then acting in Moldavia, amounting to seventy thousand. The king, however, professed that he was not discouraged; and he declared his readiness to put himself at the head of the national troops, and to terminate his existence in a glorious contest for the liberties of his country. Then, and not before, the Diet decreed the organization of the army, and its augmentation to a hundred thousand. The king and the council of inspection were invested with unlimited authority in everything that regarded the defence of the kingdom. Magazines were ordered to be constructed when it was too late, and quarters to be provided for the army. The Diet and the nation rose as one man to maintain their independence. All private animosities were obliterated, all private interests were sacrificed; the greatest encouragements were held forth to volunteers to enroll themselves under the national standard; and it was unanimously decreed by the Diet that all private losses should be compensated out of the public treasury.

Russian declaration.

On the 18th of May the Russian ambassador delivered a declaration worthy of such a cause. It asserted that this wanton invasion, which was evidently against the sense of almost every individual Pole, was intended solely for the good of the republic. It censured the precipitancy with which the new constitution had been adopted, and ascribed the ready consent of the Diet to the influence of the mob of Warsaw. It represented the constitution as a violation of the principles on which the Polish republic was founded; complained of the licentiousness with which the sacred name of the empress was treated in some speeches of the members; and concluded by professing, that on these accounts, and in behalf of the emigrant Poles, her imperial majesty had ordered her troops to enter the territories of the republic. At the moment when this declaration was delivered to the Diet, the Russian troops, accompanied by Counts Potocki, Rzewuski, Branicki, and a few Polish renegades, appeared upon the frontiers, and, before the close of the month, entered the territories of the republic in several columns.

Spirit of the nobles.

The spirit manifested by the nobility was truly honourable to that body. Some of them delivered in their plate to the mint. Prince Radzivil engaged voluntarily to furnish ten thousand stand of arms, and another noble offered to provide a train of artillery. The courage of the new and hastily embodied soldiers corresponded with the patriotism of their chiefs. Prince Poniatowski, nephew of the king, was appointed commander-in-chief; and though his force was greatly inferior to the enemy, it must be confessed that he made a noble stand.

Conduct o the court of Berlin.

The perfidy, the meanness, and the duplicity manifested by Prussia on this occasion is probably without a parallel in history. By the treaty of defensive alliance, solemnly contracted between the republic of Poland and the king of Prussia, and ratified on the 23d of April 1790, it is expressly stipulated, that the contracting parties shall do all in their power to guarantee and preserve to each other reciprocally the whole of the territories which they respectively possess; that, in case of menace or invasion from any foreign power, they shall assist each other with their whole force, if necessary; and that if any foreign power whatever should presume to interfere in the internal affairs of Poland, his Prussian majesty would consider this as a case falling within the meaning of the alliance, and assist the republic according to the tenor of the above article, that is, with his whole force. What, then, was the pretext for violating this treaty? It was this, that the empress of Russia had shown a decided opposition to the order of things established in Poland on the third of May 1791, and was provoked by Poland presuming to put herself into a posture of defence. It is ascertained, however, by the most authentic documents, that nothing was effected on the 3d of May 1791, to which Prussia had not previously assented, and which she did not afterwards sanction; and that Prussia, according to the assertion of her own king, did not intimate a single doubt respecting the revolution till several months after it had taken place; in short, to use the king's own words as explanatory of his double politics, "not till the general tranquillity of Europe permitted him to explain himself." Instead, therefore, of assisting Poland, Prussia insultingly recommended to Poland to retrace her steps; in which case, she said that she would be ready to attempt an accommodation in her favour. But this attempt was never made, and probably never intended; for the empress pursued her measures without opposition.

War with Russia.

The duchy of Lithuania was the great scene of action in the beginning of the war. But the Russians had made little progress before the middle of the month of June. On the 10th of that month, General Judycki, who commanded a detachment of the Polish troops between Mire and Swierzna, was attacked by the Russians; but, after a combat of some hours, he obliged them to retire with the loss of five hundred men dead on the field. The general was desirous of profiting by this advantage, by pursuing the enemy, but was prevented by a violent fall of rain. On the succeeding day, the Russians rallied again to the attack; and it then too fatally appeared that the Poles, being young and undisciplined, were unable to contend with an inferior force against experienced troops and able generals. By a masterly manœuvre, the Russians contrived to surround their antagonists, at a moment when the Polish general supposed that he had obliged the enemy to retreat; and though the field was contested with the utmost valour by the troops of the republic, they were at length compelled to give way, and to retire towards Nieswiesz.

On the 14th another engagement took place near Lubar, on the banks of the river Sluez, between a detachment of the Russian grand army and a party of Polish cavalry despatched by Prince Joseph Poniatowski to intercept the enemy. The patriotic bravery of the Poles proved victorious in this contest; but upon reconnoitring the force of the enemy, the prince found himself incapable of making a successful stand against such superior numbers. He, therefore, gave orders to strike the camp at Lubar, and commenced a precipitate retreat. During their march, the Polish rear was harassed by a body of about four thousand Russians. The Polish army next directed its course towards Zielime, where meeting, on the 17th, with a reinforcement from Zaslow, it halted to give battle to the enemy. The Russians were upwards of seventeen thousand strong, with twenty-four pieces of cannon, and the force of the republic much inferior. After a furious contest, from seven in the morning till five in the afternoon, the Russians were at length obliged to retreat, and leave the field of battle in possession of the patriots.

Notwithstanding these exertions, the Poles were obliged gradually to retire before their numerous and disciplined enemies. Nieswiesz, Wilna, Minsk, and several other places of less consequence, fell one after another into their hands. On a truce being proposed to the Russian general Koehowski, the proposal was haughtily rejected; whilst the desertion of vice-brigadier Rudnicki and some others, who preferred dishonour to personal danger, proclaimed a tottering cause. The progress of the armies of Catharine was marked with devastation and cruelty; whilst such was the aversion of the people, both to the cause and the manner of conducting it, that, as they approached, the country all around became a wilderness, where scarcely a human being was to be seen.

In the mean time, a series of petty defeats, to which the inexperience of the commanders, and the intemperate valour of newly-raised troops, appear to have greatly contributed, served at once to distress and dispirit the defenders of their country. Prince Poniatowski continued to retreat; and on the 17th of July, his rear being attacked by a very superior force, it suffered a considerable loss, although the skill and the courage of General Kosciuszko enabled him to make a most respectable defence. On the 18th, a general engagement took place between the two armies. The Russian line extended opposite Dubienka, along the river Bug, as far as Opalin; and the principal column, consisting of fourteen thousand men, was chiefly directed against the division of General Kosciuszko, which consisted only of five thousand men. After a most vigorous resistance, in which the Russians lost upwards of four thousand men, the troops of the republic were compelled to give way before the superior numbers of the enemy, and to retire further into the country.

The king proposes submission.

This unequal contest was at last prematurely terminated. The king, whose benevolent intentions were, perhaps, overpowered by his mental imbecility, and whose age and infirmities, probably, rendered him unequal to the difficulties and dangers which must attend a protracted war, instead of putting himself at the head of his army, determined at once to surrender at discretion. On the 23d of July he summoned a council of all the deputies at that moment in Warsaw, and laid before them the last despatches from the empress, which insisted upon total and unreserved submission. He pointed out the danger of a dismemberment of the republic, should they delay to throw themselves upon the clemency of the empress, and to entreat her protection. He also mentioned the fatal union of Austria and Prussia with Russia, and the disgraceful supineness manifested by every other court in Europe. Four citizens, the intrepid Malachowski, and the Princes Sapieha, Radzivil, and Soltan, vehemently protested against these dastardly proceedings; and the following evening a company of gentlemen from the different provinces attended for the same purpose. The assembly immediately waited upon these four distinguished patriots, and returned them their acknowledgements for the spirit and firmness with which they had resisted the usurpations of despotism. The submission of the king to the designs of Russia was no sooner made known than Poland was bereft of all her best and most respectable citizens. Malachowski, as marshal of the Diet, and Prince Sapieha, grand marshal of Lithuania, entered on the journals of the Diet strong protests against these proceedings, and declared solemnly that the Diet legally assembled in 1788 was not dissolved.

The former constitution restored

On the second of August a confederation was formed at Warsaw, of which the renegade Potocki was chosen marshal. The acts of this confederation were evidently the despotic dictates of Russia, and were solely calculated to restore the ancient abuses, and to place the country under the aggravated oppression of a foreign yoke. It is remarkable, however, that at the very moment when Poland was surrendering its liberties to its despotic invaders, the generous sympathy of Great Britain was evinced by a liberal subscription, supported by the most respectable characters in the nation, of every party and of every sect, for the purpose of assisting the king and the republic to maintain their independence; and though the benevolent design was frustrated, yet the fact remains on record as a noble testimony of the spirit by which Britons are animated in the cause of freedom, of the indignation which fills every heart in this empire at the commission of injustice, and of the liberality with which all are disposed to assist those who suffer from the oppression of tyrants.

Part of the Polish territory seized

Not satisfied with restoring the old wretched constitution, the empress of Russia seized upon part of the territory which, at the last partition, she and her coadjutors had left to the republic; and her ambassador entering into the Diet with a crowd of armed men, compelled the king and that assembly to grant the form of legality to her usurpations. The nation, however, did not submit.

Gallant effort of Kosciuszko.

In February 1794 General Kosciuszko appeared in the neighbourhood of Cracow with a small force of armed peasants. He beat some detachments of Russians and Prussians, compelled them to evacuate Cracow, and there proclaimed the constitution of 1791. Everywhere the people and the nobles flew to arms. The Russians, who occupied Warsaw with fifteen thousand men, began to seize suspected persons, and demanded possession of the arsenal. But at that moment the news arrived of a defeat sustained by a corps of six thousand Russians, with the loss of a thousand killed, and their general, Woronzow, made prisoner. Encouraged by this event, the people rose on the garrison, and after forty-eight hours' hard fighting, drove them out, with the loss of six thousand killed, three thousand prisoners, and fifty pieces of cannon. The whole country was now in arms. Russia and Prussia, however, sent a hundred and ten thousand men into Poland. Kosciuszko, pressed by superior forces, made an able retreat upon Warsaw. The king of Prussia, after besieging the city during three months, was compelled to retire towards his own territories with the loss of twenty thousand men. Here he was harassed for some time by Madalinsky with a small corps of cavalry. Kosciuszko, relieved from the Prussians, marched against the new Russian armies, which, during the siege of Warsaw, had reconquered Lithuania and Volhynia. But the battle of Noezylac, on the 10th of October 1794, in which the Poles fought with heroic resolution against overpowering numbers, proved fatal to their unhappy country. Kosciuszko was made prisoner and carried to St Petersburg, where he languished in a dungeon until the death of Catharine. The

Russians, after this event, united their forces and marched upon Warsaw, where the Poles had named Wawrzecky general-in-chief. He had only ten thousand men to oppose to fifty thousand, but an obstinate resistance was nevertheless offered. The last remains of the national army were concentrated at Praga, on the right bank of the Vistula, immediately opposite Warsaw; but they were soon broken by the furious charges of the Russian general Suwarof, who gratified his natural cruelty by the most frightful carnage. The fate of Poland was now decided. After the capture of Praga, Warsaw capitulated. Nine thousand Poles fell in the fight; thirty thousand persons of all ages and either sex were destroyed in cold blood; and thirty thousand more, who still refused to submit, were suffered to leave the place, and afterwards hunted down by the soldiery. The most distinguished chiefs were carried away to distant provinces; and the wretched king was sent to Russia, where he ended his days in 1798.

Treaty of partition.

The two powers were proceeding to divide the remaining provinces between them, when Austria interfered, and declared that she would not permit the destruction of Poland unless she received a share. At that moment it was not thought prudent to raise up a new enemy; and Austria obtained a considerable addition of territory, without having struck a blow or expended a florin. The negotiation continued till 1795, when the definitive treaty of partition was signed, which closed a series of transactions unparalleled for perfidy, cruelty, and infamy in the history of Europe. Austria received Cracow, with the country lying between the Pilitsa, the Vistula, and the Bug. Prussia had the capital, with the territory as far as the Niemen. The lion's share, as usual, fell to Russia. After an existence of near ten centuries, the republic was thus erazed from the list of nations. No people on earth, perhaps, have ever shown so much personal bravery as the Poles. Their whole history indeed is full of wonderful victories. But with such a vicious frame of society as we have already described, the most chivalrous valour, and the most splendid military successes, could avail nothing. It could not enforce obedience to the laws, nor maintain domestic tranquillity; it could not preserve the proud nobles from dissipation, nor prevent them from receiving bribes to repair their shattered fortunes; it could not restrain the powers which lavished the means of corruption from interfering in the affairs of the kingdom; it could not dissolve the union of these powers with the malcontents at home; it could not infuse vigour into a government corrupted by foreign gold, nor avert the invasion of foreign armies to support the factious and rebellious; it could not, while divided against itself, uphold the independence of the nations against foreign and domestic treason; in a word, it could not effect impossibilities, and though it might dazzle by its glory, it could not counteract those slow but sure-working causes which determined the inevitable doom of Poland.

This great crime committed with impunity.

The extinction of the Polish republic afforded ample scope for political declamation. The tribunes of France, the parliament of England, and the press of both countries, resounded with eloquent invectives against the perfidy and violence of the partitioning powers, and general sympathy was awakened in favour of a people whose great actions were entitled to admiration, whilst their misfortunes moved our commiseration. But complete impunity awaited the despoilers of that unhappy country. The troubled state of affairs throughout Europe did not permit any power to interfere in behalf of the oppressed. A selfish and shortsighted policy paralysed every arm, and chilled every heart. The great cause of public justice and national independence found no advocates, whilst the attention of all was absorbed in a narrow and confined struggle for their own preservation. The three potentates were therefore enabled to perfect their common wickedness without the slightest hindrance; to repress the indignant efforts of the sufferers; to crowd their prisons with the best and bravest, who had either distinguished themselves in the recent struggle, or had ventured to express dissatisfaction with the new state of things; to disarm the inhabitants of the great towns, and to establish formidable garrisons of foreign troops, who were ready to crush the very first attempt at insurrection.

Compact of the Poles with Franc

The Poles had no longer a country to fight for or defend; they had lost everything but honour and the feeling of revenge. They carried all they had left, namely, their valour, into the market, and soon entered into a compact with republican France. At Cracow was formed a secret confederation, the members of which offered to the French Directory to sacrifice their lives at the first call of the republic. Nor was this a vain or futile offer. Hundreds of the warlike nobles, escaping from bondage at home, proceeded to Venice or to Paris, and under Dombrowski, their brave leader, were formed Polish legions, in aid of the newly-created Italian republics, and ready to act wherever their services might be required. Their pay and subsistence were to be furnished by the Italian states; they preserved their national arms and dress; and, taking as their motto that all freemen are brothers, they fully participated in that daring spirit which then shook Europe to its centre. That they were allured by the prospect which had been held out to them of their country's restoration, is well known; and if their faith was rather the measure of their own ardent hopes than the result of any rational or well-grounded conviction, it may at least be pleaded in their favour, that the unfortunate are naturally credulous, and that a true Pole can never eradicate from his heart the belief that all his fondest wishes will one day be gratified. But be this as it may, their martial prowess contributed essentially to the success of the republican cause. Their number was increased by fresh recruits, which more than compensated the casualties of the field; their brilliant valour shone resplendent in every battle where they were engaged; patriotism and revenge alike nerved their arms for the conflict. But they soon had occasion to distrust the fair professions of the republican hero. When anxious, by his means, to preserve an entrance to the congress of Rastadt for a representative of Poland, they were coolly told that the hearts of all friends of liberty were for the brave Poles, but that time and destiny alone could restore them as a nation. Still they did not despair. If the day of regeneration was deferred, might it not yet arrive, perhaps at no distant period, when a more favourable conjuncture of circumstances would render it impossible for the French government any longer to evade urging their claims? Where justice, and freedom, and independence were concerned, they could not believe that fortune would always frown on their cause, or that iniquity in high places would secure for itself an immunity from all retribution.

The natur of their connectio with Fran

The connection of the Polish legions with France exhibits the same unvaried picture of gallant services performed, and of hope deferred. Their loyalty was sustained by a strong passion for military fame; to them the tent was their home, the battle-field their country; and though they suffered severely, particularly during the absence of Napoleon in Egypt, yet they repaired their losses with astonishing promptitude, and, in the year 1801, amounted to fifteen thousand. But their blood flowed in vain. In every treaty which their valour had been instrumental in winning, their services were overlooked, and their country was forgotten. In Italy and on the Danube, Generals Dombrowski and Kniaziewicz, with their legions, represented the Polish nation, and maintained its ancient renown in arms, though to little purpose, as far as regarded their country. For five years, their bravery proved unavailing, in as far as concerned the main object for which they had fought and bled.

But with the year 1806 new hopes began to revive. The

Campaigns of 1806 and 1807.

brilliant campaign of that year, the simultaneous victories of Jena and Auerstadt, and the advance of the French army into Poland, seemed an earnest of future success, a sure pledge of approaching restoration. A general burst of enthusiasm followed. Polish regiments were organized with amazing rapidity, and the approach of Kosciuszko was proclaimed. On the 27th of November, Napoleon entered Posen in triumph; in December Warsaw received him with not less enthusiasm; a commission of government was immediately organized; and as his purpose was announced, his armies were recruited by thousands of the best troops in Europe. The battle of Eylau had been a mere butchery, unproductive of any result; but on the field at Friedland, Dombrowski had given signal proofs of his own talents and the valour of the heroes he commanded; and the opening of the negotiations at Tilsit was hailed by the Poles as the dawning of a bright and auspicious futurity. But the result proved that they had been far too sanguine in their anticipations. Napoleon in effect, though not probably in intention, betrayed them, and at the same time lost the opportunity of erecting a powerful barrier against the encroachments of Russia. Instead of restoring the kingdom of Poland in something like its ancient power and dimensions, he contented himself with forming a small portion of his conquests into the grand duchy of Warsaw, which he united with Saxony.

Grand duchy of Warsaw.

The duchy of Warsaw, thus established, consisted of the departments of Posen, Kalisch, Plock, Warsaw, Lomza, and Bydgoszez, with a population somewhat exceeding two millions. With this shred and mockery of a country the Poles were highly dissatisfied. They had been taught to expect that the ancient kingdom, if not Lithuania itself, would become irrevocably their own; and their mortification may therefore be conceived on finding that Prussia was to retain several palatinates, that Austria was guaranteed in her Polish possessions, that the provinces east of the Bug were to remain in the power of Russia, and that a considerable portion of the ancient republic west of that river, as far as the department of Bialystok, was ceded in perpetual sovereignty to the czar. Still the establishment of this duchy was probably intended as a point of departure in a new order of things, the ultimate term of which should be the restoration of Poland. By the new constitution, the Catholic religion was declared to be the religion of the state; but ample toleration, and even a community of civil rights, were allowed to the Dissidents. Serfage was abolished. In the king of Saxony, as grand duke of Warsaw, was vested the initiative of all bills or projects of law, the selection of senators, the nomination of the presidents of the dietines and the communal assemblies, and the appointment of all officers, civil and military; and the Code Napoleon was subsequently admitted as the basis of all judicial proceedings.

Reflections on this partial restoration.

Something had thus been gained, though the arrangement was far from being satisfactory; indeed, by some the peace of Tilsit was regarded as the grave of all their hopes. But the greater number, reposing an unexhausted faith in the justice of their cause, consoled themselves with the belief that eventually Poland would be recalled into political existence, and her independence re-established upon a sure foundation. Accordingly, in the war with Austria in 1809, they rendered the most important services to Napoleon. They conquered Gallicia, without the smallest aid from France; they reduced Cracow and the adjoining territory; they regained possession of the capital, which the archduke had temporarily occupied; and they humbled their enemies on every side. What their own arms had won, they conceived that they had a right to retain, and they regarded as inevitable the incorporation of these conquests with their infant state. But they were destined to be speedily undeceived. Not a foot of ground were they allowed to retain in Gallicia; and half of their other conquests between the capital and the Austrian frontier was wrested from their hands. Four departments were indeed incorporated with the grand duchy, viz. Cracow, Pradom, Lublin, and Siedlec. This acquisition, however, afforded but a small compensation for the sacrifices which had been made, the forcible loans which had been raised, the lives which had been wasted, and the misery which afflicted every class of the inhabitants. In truth, the policy pursued by Napoleon in regard to the Poles bore traces of doubt and hesitation; it was always timid, seldom judicious, never generous. He had not the courage to break through the entanglements of diplomacy, by which his inclinations were fettered, and to do a great act of retributive justice, leaving the consequences to Providence. He suffered himself to be paralyzed by conflicting pretensions, and sacrificed his own glory to conciliate powers who took the earliest opportunity of betraying him.

Invasion of Russia in 1812.

Nevertheless, when the war with Russia became inevitable, Napoleon, with the view of interesting the Poles in his behalf, had recourse to all the arts of popular excitement, and, strange as it may seem, with his usual success. The more reflecting portion, wearied out and disgusted, refused to be again deluded. "We are flattered when our services are required," said they. "Is Poland always to be fed on hope alone?" The mass, however, swayed by their feelings, listened to the representations of the imperial agents, and a great body of Poles took the field, whilst a general confederation of nobles declared the republic restored, the declaration being signed by the king of Saxony, in whose house the hereditary monarchy was to be vested. But the enthusiasm thus excited proved short-lived. The reply of Napoleon to the Polish deputation, which had followed him to Wilna, at once dissolved the spell, by showing the deputies that he had guaranteed to the Emperor Francis the integrity of the Austrian possessions in Poland. Illyria therefore could not, as they had hoped, be exchanged for Gallicia; and as to Lithuania, Napoleon not only considered, but even proclaimed it a hostile country, and treated it accordingly. But still the deputation erred egregiously in giving up all for lost. Everything depended on the success of the expedition, which would have enabled Napoleon to give the law to Austria as well as to Russia; and hence, when he exhorted them to fight for their own independence, and assured them that if all the palatinates combined they might reasonably expect to attain their object, he gave them advice which they would have done well to follow. At a moment so critical he could not give Austria a fair pretence for betraying him on the occurrence of the very first reverse; this would indeed have been the height of folly in one who had risked everything upon the issue of a single campaign. But, on the other hand, the success of the expedition must have proved highly beneficial to Poland; and, in chilling the national enthusiasm at this time, the deputation were innocently instrumental in inflicting the greatest evils on their unhappy country.

Results.

This is not the place to dwell on the unexampled disasters of the Russian campaign, which were greatly aggravated by the apathy of the Poles, and their refusal to co-operate in covering the retreat of the French army. The details are in the memory of all. The work of Napoleon was destroyed; the grand duchy of Warsaw ceased to exist; the king of Saxony was stripped at once of it and of a portion of his hereditary dominions; the allied, who were also the partitioning powers, again took possession of the towns which they had held previous to the invasion of Napoleon; and in this state matters remained, awaiting the meeting of a congress, which was to assemble to decide, amongst other things, the fate of this unhappy country.

Treaty of Paris. Poland.

The negotiations which commenced with the downfall of Napoleon, and were completed by the treaty of Paris in 1814, necessarily embraced the future condition of Poland, which, though then occupied by Russian troops, had from previous cession to France become a fit subject of arrangement, not for the eventual benefit of Russia alone, but for that of the whole European commonwealth. Public opinion, the interests of rulers, and the sympathies of the governed, were all in favour of the re-establishment of the kingdom in its ancient integrity; and the side of justice, policy, and humanity was powerfully advocated by France and England, whose ministers regarded the Polish question as one in comparison of which all others were of but secondary importance. But neither of these powers, nor both of them united, were in a situation to control the views of those interested in maintaining the state of things created by the successive dismemberments of Poland. France, exhausted by long wars, and now restricted within her ancient limits, had no longer a voice potential in the decision. Britain, with the right of remonstrance, which her minister freely exercised, was in no condition to brave two great military powers; and although Austria not only expressed a desire for Polish independence, but a readiness to surrender part of her Gallician provinces in order to endow the new kingdom, yet all this might have been easily counteracted by the predominant influence of Russia and Prussia. At that period, indeed, the Emperor Alexander displayed or affected a spirit of liberality, which appears to have owed its origin to various circumstances; but whether he was sincere or the contrary, "an accident," as Madame de Stael described him, or merely the impersonation of hypocrisy and perfidy, it was certain the genius of the Russian system would govern the ultimate determinations of his policy on a subject of so much importance to his empire.

The kingdom of Poland.

At this juncture, however, Napoleon escaped from Elba, and the whole question assumed a new phasis. In the common danger, Poland was scarcely remembered; and the czar, finding that his aid would be indispensable in the approaching contest, was enabled to insist on a measure which he had long contemplated, namely, the union of the grand duchy with Russia as a separate kingdom. The facility with which he carried his object proves the alarm that had been occasioned by the re-appearance of Napoleon, and the anxiety felt to adopt any measure calculated to prevent Polish partisanship from swelling the ranks of the invader. It was therefore decided that the grand duchy of Warsaw should be attached to the empire of Russia, under the name of the kingdom of Poland, and that it should be governed by separate institutions. "The duchy of Warsaw, with the exception of those provinces and districts which are otherwise disposed of, is united to Russia. It shall be irrecoverably bound to the Russian empire by its constitution, to be enjoyed by his majesty the emperor of all the Russias, his heirs and successors, for ever." Such are the expressions employed in an article relating to this point in the treaty of Vienna. The two sovereignties were united by the constitution alone, and not otherwise. This was the connecting link which bound them together. Austria and Prussia acceded to a similar arrangement, and also agreed to confer on their Polish subjects a national representation and national institutions. The concessions required by public opinion were made, and certain bases were solemnly sanctioned by the treaty of Vienna.

Bases of the union between Poland and Russia.

These were four in number. In the first place, Gallicia and the salt-mines of Wieliczka were restored to Austria. Secondly, the grand duchy of Posen, forming the western palatinates bordering on Silesia, and containing a population of about eight hundred thousand souls, was surrendered to Prussia; which power was also confirmed in the conquests made at the period of the first partition. Thirdly, the city and district of Cracow, about 445 English square miles in extent, and containing a population exceeding an hundred thousand souls, was formed into a free and independent republic, under the guarantee of the three powers. Fourthly, the remainder of ancient Poland, comprising the chief part of the recent grand duchy of Warsaw, with a population of about four millions, reverted to Russia, and was to form a kingdom irrecoverably bound, by the constitution which the czar had engaged to confer upon it, to the Russian empire. "The kingdom of Poland," said the Emperor Alexander, "shall be united to the empire of Russia by the title of its own constitution, on which I am desirous of founding the happiness of the country." Thus a part of Poland was re-established as a separate state, by the act of all the powers of Europe; and although the emperor of Russia was to be king of that state, still the independence and separate existence of the kingdom were not only recognised in the fullest manner, but at the same time solemnly guaranteed.

The constitutional charter.

The new kingdom of Poland was proclaimed on the 20th of June 1815, and on the 24th of December following a constitutional charter was granted to the Poles. The articles of this charter, by which Poland became united to Russia, were of so liberal a nature as to astonish all Europe. According to some, they prove that, at the time of their promulgation, Alexander was no enemy to liberal institutions. But the more probable supposition seems to be, that the earnest and loyal interposition of Great Britain and France, favoured by the declared disposition of Austria, and strengthened by the public opinion of Europe, had more effect on the mind of the czar than any presumed inclination towards liberal institutions, of which he afterwards became the most uncompromising opponent. The principle articles, which are now only matter of history, were as follow.

The principal articles of this charter.

The Catholic religion was declared to be the religion of the state; but all dissidents were placed on a footing of perfect equality as to civil rights, with the professors of the established faith. The liberty of the press was recognised in its fullest extent. It was provided that no subject could be arrested prior to judicial conviction. The inviolability of person and property was, in the strictest sense, guaranteed. All public business was to be transacted in the Polish language; and all offices, civil or military, were to be held by natives alone. The national representation was to be vested in two chambers, one of senators and another of deputies. The power of the crown was not greater than seemed necessary to give due weight to the executive. All kings of Poland were to be crowned at Warsaw, at the same time swearing to maintain the full observance of the charter; and during the absence of the sovereign for the time being, the chief authority was to be vested in a lieutenant and council of state. The great public departments of the state were to be presided over by responsible ministers. The legislative power was vested in the king and the two chambers; an ordinary Diet to be held every two years, and to sit thirty days, and an extraordinary Diet to be convened whenever this should be judged necessary by the king. No member of the Diet could be arrested during a session, except for great offences, and not even then without the concurrence of the assembly. The deliberations of the Diet extended to all projects submitted to it by the ministry, affecting the laws and the whole routine of internal administration. The deliberations of the Diet were to be public, except when committees were sitting. All projects of law originated with the council of state, and were laid before the chambers by order of the king; such projects, however, being previously examined by committees of both houses. In the case of all projects or bills, the majority of votes was to decide. The senators were to be nominated by the king, and to exercise their functions during life. The deputies, a hundred and twenty-eight in number, were seventy-seven for as many districts, and fifty-one for communes, or about double the number of senators. To become a member of the second or lower chamber, the qualifications were, citizenship, the age of thirty, possession of some portion of landed property however small, and the payment in annual contributions to the state of a hundred Polish florins. No public functionary was eligible to a seat without the consent of the head of his department. The nobles of each district were to meet in dietines for the purpose of electing one of their body to the general Diet, and returning two members to the palatine assemblies, all dietines being convoked by the king. The class of electors was numerous, comprising, first, all landowners, however small, who paid any contribution towards the support of the state; secondly, every manufacturer or shopkeeper possessing a capital of ten thousand florins; thirdly, all rectors and vicars; and, lastly, all artists or mechanics distinguished for talent. The electors required to be enrolled, and to have attained the age of twenty-one years. The tribunals were to be filled with judges partly nominated by the king, and partly elected by the palatinates; the former being appointed for life, and removeable only for misconduct, or judicial iniquity, in the discharge of their functions.

Remarks thereon.

Such were the principal provisions of the charter which was thus conferred on the Poles, and received by them as the first instalment of that restitution which they hoped would one day be made effectual and complete. Its greatest defect consisted in the incompetency of either chamber to propose laws, the initiative being confined exclusively to the executive, or the king and the council of state, and an effectual check thereby applied to legislative amelioration. Nor was any provision made in the charter for the establishment of trial by jury, an institution which, however suitable to our habits and modes of thinking, may not have been equally so to those of the Poles. But it is nevertheless certain that Alexander, on his return from witnessing the prosperity of this country, which he attributed in part to our judicial system, ordained the establishment of trial by jury throughout Poland within six months; being in this carried by mere impulse, without any regard to the fitness or unfitness of the institution to the wants, habits, and prejudices of the people amongst whom he proposed to naturalize it. It is not thus that national benefits are really conferred, or that new systems can ever be advantageously introduced.

Perfidy of Russia. Constantine.

From the re-establishment of the kingdom in 1815, until the year 1820, the affairs of Poland were conducted apparently in conformity with the constitution. The benefits of the government had to a certain extent disarmed the prejudices and antipathies of the people; the opposition to ministers in the lower chamber was comparatively trifling; the emperor's lieutenant, Count Zayonczek, a Pole, endeavoured to attach the Poles to his sway; and Alexander, congratulating himself on the liberal policy which he had adopted towards his new subjects, declared in full senate at Warsaw, that he only waited to try the effect of the free institutions he had given them, in order to extend those institutions over all the regions which Providence had placed under his sway. But all this fair promise proved hollow and deceptive. From the very first there had been perpetual breaches in the constitution; and after the Spanish revolution of 1820, followed as it speedily was by the establishment of the Holy Alliance, all disguise was thrown aside, and an attempt made to suppress entirely the spirit of national independence in Poland. Count Zayonczek was only nominally the king's lieutenant. The real power was invested in the Grand Duke Constantine, who held the appointment of commander-in-chief of the army. This personage, who played so conspicuous a part in the affairs of Poland, is deserving of notice, in consequence of the position in which he was placed. Although possessed of considerable talents, he was, in fact, an untamed tiger, giving way on all occasions to the most violent paroxysms of passion. He had a strong sense of the rights of his order, and held as nought the feelings of every other class. As soon, therefore, as he found that his brother was no longer the liberal patron of constitutional rights, he gave the most unrestrained license to his natural violence and caprice. The outrages ascribed to him display a mixture of ferocity, cruelty, and cowardice, altogether unparalleled. With him no right was respected, and no condition safe. Females were insulted, abused, sometimes kicked; shaving the heads of such women as displeased him was a common occurrence; and to this was added tarring and feathering, a favourite recreation of the commander-in-chief, whose delight it was to witness these barbarities. He kept in his employment a legion of spies; and the liberty or life of every man was at the mercy of a common informer. With him suspicion was a sufficient warrant to exclude the proof of innocence, and accusation led at once to conviction.

Political tyranny superadded to private oppression.

But whilst acts of private oppression were calling forth all that hatred of Russia which is the birthright of every Pole, political tyranny was superadded, as if it were desirable to concentrate upon one point the entire indignation of a brave and devoted people. The liberty of the press was abolished, and a censorship established, in violation of article sixteenth of the constitutional charter. This was effected by an ordinance dated the 31st of July 1819; and not long afterwards the patriotic association formed by General Dombrowski, who had modelled it almost after the recommendation of Alexander, was suppressed, and a military commission appointed, which tried and condemned civilians without any of the prescribed formalities. "What have we to hope," exclaimed Dombrowski; "what have we not to fear? This very day might we not tremble for the fate which may await us to-morrow?" Meanwhile, the secret police pursued its fatal career, and arbitrary arrests, followed by hidden condemnations, the banishment of many and the imprisonment of more, signalized its hateful activity. The university of Wilna was also visited with severity by the agents of this dreaded institution. Twenty of its students were seized, and subjected to different punishments. Nor were those of Warsaw treated with greater leniency. A state-prison was likewise erected in the capital, and its dungeons were soon crowded with inmates, victims of the execrable system adopted by the government. Nor were these the only grievances of which the people had reason to complain. Although the constitutional charter had provided that Russian troops, when required to pass through Poland, were to be maintained at the sole charge of the Russian treasury, yet for years they had been stationed at Warsaw, and paid by the inhabitants of the capital, whom they were employed to overawe. Further, independently of the violations of individual liberty, the difficulty of procuring passports, the misapplication of the revenue to other objects than those for which it had been raised (as the maintenance of the secret police), and the nomination of men as senators, without the necessary qualifications, or any other merit than that of being mere creatures of the government, were infractions of the charter as wanton as they were intended to be humiliating. But the worst of all yet remains to be told. In the dietines Russian money and influence were unblushingly employed to procure the return to the general Diet of such members only as were known to care less for the honour of their country than the advancement of their own fortunes. Instead of a Diet being held every two years, in accordance with article eighty-seventh of the charter, none was convoked from 1820 to 1825, and only one from the year 1825 until after the accession of Nicolas in 1829. Finally, an ordinance issued as early as 1825 had abolished the publication of the debates in the two chambers; and on one occasion, the most distinguished members of opposition were forcibly removed from Warsaw the night preceding the opening of the Diet. Add to all this the constant irritation produced by the ungovernable temper and consequent excesses of Constantine; the useless but vexatious manœuvres he introduced into the army; his rigorous mode of exercise, exceeding the ordinary measure of human strength and endurance; his overbearing manner towards the best and highest officers in the service; and, above all, that progressive increase in cruelty which a regimen of terror presupposes and almost necessitates: take these matters into consideration, along with all the other circumstances of grievous oppression which have already been stated as affecting the mass of the people, and it will easily be seen that it was vain to whisper peace, and that the grand duke was treasuring up to himself wrath against the day of wrath.

Universal discontent. Favourable moment for rising lost. Revolution of Paris, July 1830.

It has been matter of some surprise to foreigners that the Poles did not take advantage of the Russo-Turkish war to erect the standard of independence. The reverses experienced by the Russian army on the Danube in the campaign of 1828, were so great, that an insurrection in Poland at that critical and perilous moment would have had almost every chance in its favour. But at that period the plan of the Poles had evidently not been matured. That it was even so in November 1830 may reasonably be doubted. In fact, no preparations seem to have been made, and when the explosion actually took place, it was wholly unexpected by the leading patriots, who conceived that the propitious moment had not yet arrived. At the same time it must be confessed, that the French Revolution of July 1830 produced an almost electric effect on the whole Polish nation, and, by its daring character and its splendid success, disposed the initiated to anticipate the time for a general rising. Besides, it is generally believed that emissaries from Warsaw had held confidential meetings with the leaders of the Revolution of July, and were instigated to rouse their countrymen by the promise of immediate aid from the government of the citizen king; and that such aid was confidently relied on by the Polish patriots themselves, must be known to all who have conversed with those who acted a prominent part in the national insurrection, and seems to be further confirmed by the universal impression of the people. Two other circumstances also contributed to accelerate the catastrophe. The army began to entertain a notion, not altogether unfounded, that it was to be removed to the south of Europe, to assist in extirpating freedom in France and other countries; and that its place was to be supplied by a native Muscovite force. The students of the military school likewise found ample cause of apprehension in the previous arrest of several of their number, upon suspicion of being connected with secret associations, which had for their object to promote a general rising. The repugnance of the army to the service intended for them; the apprehensions of the students, who had everything to fear from the grand duke, should he try their companions by martial law, as he had threatened to do, and most probably meditated; the conviction that the whole populace of the capital were friendly to the project of an insurrection; the secret encouragement held out by France; the eagerness of the enterprising to court danger for its own sake; the number of those who had personal wrongs or insults to avenge; and, lastly, the presumed, or rather the certain, approbation of the free in all countries towards the insurrection itself, if not towards the time and the circumstances: all these, therefore, concurred to hasten the opening of the great tragedy, the enacting of which all Europe regarded with such deep and thrilling interest.

The first object of the actors in this enterprise was to seize the person of the grand duke, their most obnoxious enemy, and to detain him as a hostage for their own safety in the event of failure. The students of the military school were the voluntary leaders of the movement, which burst forth on the 29th of November 1830. Early in the evening of that day, several of them repaired to their barrack, in accordance with a preconcerted plan; and having addressed their comrades, summoned them to take up arms. The call thus made was instantly obeyed. On their way to the residence of Constantine, who had established himself at the palace of Belvedere, in the outskirts of the city, their number was increased by the students of the university, and the young men attending the public schools. Constantine had no troops about his residence, but at a short distance from it were the barracks of three regiments of Russian guards. The hour chosen for the attack was seven o'clock, and at that time the assailants proceeded to the bridge of Sobieski, where the main body posted themselves, whilst some of the most determined pressed forward to complete their object. They forced their way into the palace, where they were first opposed by the director of the police, Lubowidizki, who, on being wounded, took to flight. Next they encountered the Russian general, Gendre, a man obnoxious for his cruelties and crimes, who was killed in the act of resisting. Lastly, when on the point of reaching the bedchamber of the grand duke, whom the alarm had just awaked from his evening siesta, they were stopped by a valet, Kochanowski, who, closing a secret door, thus enabled his master to escape undressed through a window. Constantine fled to his guards, who instantly turned out. Disappointed in their prey, the devoted band rejoined their companions at the bridge of Sobieski, where they had been awaiting the result of the attack on the palace. On finding that their first object had failed, they now resolved to gain the city, and at once proclaim a general insurrection. Their retreat was opposed by the Russian guards, close to whose barracks it was necessary to pass. But such was the spirit which animated them, such were the skill and courage they displayed, that they killed three hundred of their opponents, and triumphantly effected their retreat. On reaching the city, they instantly liberated every state-prisoner, and were joined by the school of engineers and the students of the university. A party entered the only two theatres which were open, calling out, "Women, home; men, to arms." Both requisitions were instantaneously complied with. The arsenal was next forced, and in less than two hours from the first movement, so electrical was the cry of liberty, forty thousand men of all descriptions were in arms. The sappers and the fourth Polish regiment declared early in favour of the insurrection; and by eleven o'clock the remainder of the Polish troops in Warsaw, with the exception of two regiments of guards whom Constantine had forced along with him, espoused the popular cause, declaring that their children were too deeply compromised to be abandoned. Never perhaps was any popular movement more universal or more triumphant.

By the morning of the 30th of November the commotion had subsided, and the results could be calmly surveyed. Besides the troops of the line which had joined the patriots, nearly thirty thousand citizens had taken up arms, and now swelled their dense ranks. In twelve hours the revolution had been begun and completed. In vain did the grand duke, who lay without the walls, meditate the recovery of the intrenchments and fortifications. His isolated though desperate efforts to re-enter the city were repulsed with serious loss; and finding it hopeless to contend with the mass opposed to him, he not only desisted from all further attempts of the kind, but removed to a greater distance from the walls. In the excitement consequent on this extraordinary commotion, no one will be surprised to learn that, notwithstanding the regularity with which every part of it was conducted on the part of the principal actors, some excesses were committed. But these were neither many in number nor aggravated in character; and although some Russians lost their lives, as did also several Poles, who were known to have been on terms of intimacy with Constantine, yet these men courted their fate by recklessly intermingling amongst an excited population when their passions were inflamed by the heat of battle, the tumult of victory, and the feverish excitement of revolution.

The functionaries of the government having abandoned their posts, an administrative council was immediately formed to preside over the destinies of the new state. It consisted of men distinguished for their talents, their character, or their services, and numbered amongst its members Czartoryski, Radzivil, Niemcewicz, Chlopicki, Pac, Kochonowski, and Lelewel. But no good resulted from this heterogeneous assemblage of persons professing moderate and ultra opinions, or what may be called Whigs and Radicals. The former were not men made for revolutions, though in this instance they obtained the direction of the movement; and in the hope of accommodation, which from the first was desperate, they allowed the grand duke to retire under a convention, when they might have captured his entire army, and detained himself as a hostage. At first they evidently entertained no intention of throwing off their allegiance to the Czar. All their proclamations ran in his name, and their claims were confined to a due execution of the charter. On the part of the provisional government, however, this seems to have been the very excess of weakness. Men who engage in revolutions, if they hope or wish to succeed, should, when they draw the sword, throw away the scabbard. Besides, as nothing less than unconditional submission would gratify the Czar, it is obvious that negotiation was at once a waste of time, and a confession of indecision. The next blunder of the council was in the opposite direction. As their patriotism appears to have risen with their success, they at length insisted on the incorporation of Lithuania, and the other Polish provinces subject to Russia, with the kingdom; and, as if this had not been enough, they some months afterwards declared the throne vacant, an act which, upon their own principles, was equally rash and impolitic. But, what was worst of all, they lost precious time. The force of the first impulsion was wasted. The great and sudden outburst of national enthusiasm was allowed to exhaust itself. Russia had been braved at a time when all her energies might be concentrated to enforce submission; when neither foreign war nor domestic disturbance distracted her councils or divided her means; yet, so far from profiting by the only advantage resulting from the wild improvisation so rapidly nationalized, the provisional government acted as if their sole object had been to forego the chances which the national movement had, in the first instance, accumulated in their favour.

But all these errors were nobly redeemed. When it appeared that negotiation was vain, and that nothing but unconditional submission would satisfy the Czar, they gallantly prepared themselves for the unequal struggle. Their plans were evidently not matured. Neither from Lithuania, nor from any of the other Polish provinces incorporated with Russia, did they receive the aid on which they had relied; so that the honours of the first campaign were exclusively their own. Their efforts were stupendous, and their bravery was worthy the age of Boleslas and Sobieski. The laurels which Diebitsch Zabalkanski had reaped in his campaign against the Turks, protected by mountains and fortresses, were blighted and withered in the plains of Poland. On the 25th of February 1831 his dense masses, first brought into contact with the patriotic forces at Grochow, recoiled from the shock, after one of the most unequal and sanguinary conflicts of modern times. March was illustrated by the victories of Dembewielki and Wawr; and in May was fought the celebrated battle of Ostrolenka, where, after performing prodigies of valour, the Polish army retired from the field, unpursued, towards Modlin. In the meantime, Diebitsch had perished, the victim of disease, chagrin, and fatigue. Paskewitsch, distinguished by his Armenian campaigns, succeeded, and, following the example of his predecessor Suwarof, concentrated all his means for an attack on the capital. On the 5th, 6th, and 7th of September was fought the ever-memorable battle of Warsaw, which ended in the defeat of the patriot forces and the loss of that city, after a struggle unparalleled in history. This blow proved decisive. European interference had been hoped for, but in vain; the faith of treaties had been appealed to without effect; the interests and the sympathies of the civilized nations of the West and the South had been invoked to no purpose. A powerful force still remained, and, for a time at least, a partisan warfare might have been carried on; but thus abandoned to its own resources, Poland must at last have yielded to her gigantic antagonist. That country had no mountain fastnesses, where her children, when overpowered by numbers, might take shelter; it had no fortresses capable of arresting and breaking the force of her assailants. Nothing could have saved her but a prompt and active interposition, founded on the treaty of Vienna; and such was the situation of France and England at the time that neither judged it safe or expedient to interfere otherwise than by remonstrance.

The Poles submitted. With reluctance they laid down those arms which they had taken up in the hope of re-conquering their national independence, and which they had so gloriously employed in many a hard-fought field. But all former experience of Muscovite vengeance could scarcely have prepared them for the miseries which have since been accumulated, in new and fearful forms, on their unhappy country. To say nothing of proscription and confiscation, her plains have been covered with ruins, her resources exhausted, her industry and commerce destroyed; abundance has given place to wretchedness and want; she has no longer a name or a place amongst the nations; her language, her literature, and her history cannot any more be publicly taught in her schools; and every effort has been made to destroy that sentiment of nationality which is part of the inheritance of every Pole. And all this has been done in the face of the public guarantee of the powers of Europe, if not without remonstrance, at least without any effectual opposition.

Cracow. The history of the little republic of Cracow forms an appropriate sequel to that of the unhappy kingdom of Poland. That small state, created by the treaty of Vienna, and having its independence guaranteed by the same general compact, enjoyed the constitution which had been conferred on it until the year 1846, when it was seized upon by Austria, Russia, and Prussia; and by decree of 9th November its freedom was abolished, and it was annexed to Austria. (See CRACOW.) A greater outrage against every principle of public law or public faith was never probably perpetrated. It was an act of naked despotism, done in defiance of the other powers of Europe, and in open contempt of the most sacred principles of public law and public justice. Soon afterwards the kingdom of Poland was incorporated with Russia, and made a Russian province; and the history of Poland becomes a part of the history of the countries with which it has been united. (See RUSSIA, PRUSSIA, and AUSTRIA.)

Commerce. In former times the commerce of Poland was very considerable; the natural resources of the country and liberal commercial regulations opened a wide field for the activity and enterprise of foreign merchants. During the fourteenth, fifteenth, and sixteenth centuries, Poland not only carried on a lucrative commerce with the Levant, the Black Sea, and the Mediterranean, and maintained a commercial intercourse with the Italian republics, particularly Venice, but she also exported her corn and other raw materials to the western countries of Europe, especially Holland, Sweden, and Denmark, and formed an entrepôt of oriental merchandise for the northern part of Germany and the countries adjoining. Owing to their commercial activity, Cracow and Dantzic were at an early period admitted into the Hanseatic League.

Besides wood, flax, tallow, and some other products, corn has always been the principal article of export. According to Cellarius, who wrote in the sixteenth century, the amount of corn exported in one year was 10,950,000 korzec, or 4,380,000 English quarters. Opalinski, a writer of the seventeenth century, states that in his time Dantzic alone received from the interior of the country more than 6,000,000 korzec, or 2,400,000 English quarters, of different kinds of grain for exportation. The importation of foreign produce was of course proportioned to the exportation of home produce; and it was abundantly supplied to Poland both by national and foreign bottoms. Holland and Venice were extensively engaged in trade with this country. But with the political misfortunes of Poland its commercial importance declined; and its destruction has been completed in consequence of the system of monopoly pursued by the governments of Russia, Prussia, and Austria. In that part of Poland which is under the dominion of Russia, the consumption of every article of foreign produce is strictly prohibited, and every branch of industry is discouraged; whilst the governments of Austria and Prussia overwhelm their Polish subjects with disproportionate taxes, in the hope of thereby retaining them in more complete subjection. The consequence is, that the farmers have no motive or interest to produce more grain than they require for their own consumption; and hence, whenever any unforeseen contingency occurs, a famine must ensue, as has actually happened in some parts of Volhynia, Podolia, and the Ukraine; countries the soil of which is perhaps the most fertile of any in Europe.

Manufactures.

Poland never was a great manufacturing country. Her natural resources consisted in the produce of her soil, and her commerce in exchanging these for the cheaper and superior manufactures of other countries. With more than 80,000 square miles of fine wood; with the richest mines of salt Europe possesses at Bochnia and Wieliczka; with the fertile plains of the Ukraine, Podolia, Volhynia, and Landomierz; with the flax of Samogitia (so much employed in the English manufactures), the wool of Great Poland imported into Saxony, fine cattle and horses, abundance of tallow and other products; Poland possessed resources which, under a good government, might have made her, not indeed a manufacturing, but certainly one of the most commercial nations of Europe.

Literature.

Before the introduction of Christianity in the tenth century, the Polish language could boast of numerous traditional tales, warlike songs, and pastoral poems, which have been collected by Wodrich, and show that this language, having already attained to some degree of perfection, had consequently taken the lead of almost all the other Sclavonic tongues. It is no doubt true that the introduction of Christianity at first retarded the natural improvement of the language, by an admixture of foreign terms; but it enlarged and purified the ideas of Polish writers, and opened a new and attractive field for their talents and genius. It may appear surprising to some that, from the tenth till the end of the sixteenth century, Poland should have produced such a number of writers in the native idiom and in Latin; especially considering the continual wars in which she was engaged for the defence of her frontiers. But the wonder will cease when it is known that schools and colleges were then thrown open to every one; that education was eagerly sought after and freely imparted; that the order of St Benedict, assisted by other religious communities, devoted their whole time and attention to the gratuitous education of every class, implanting in all a love of science and literature, a taste for the arts, a knowledge of the classics, and an affection for the Muses; and that, under these same orders, the youth of the country were, both by precept and example, trained up to the practice, and excited to aspire to everything that was liberal, generous, and manly. Hence, prior to the foundation of the university of Cracow, which took place during the reign of Casimir the Great, in 1347, and preceded that of the universities of Prague, Vienna, and Leipsic, Poland possessed several historians and other learned men, whose writings still survive to attest the early cultivation of literature in that country.

Amongst these, the first place is due to the chroniclers. Gallus wrote his Chronicle of Poland between 1110 and 1135. Matthias Choleva, Bishop of Cracow, who wrote a Chronicle of Poland, died in 1165. Kadlubek Vincent, born at Cracow in 1160, enjoyed the favour of Casimir surnamed the Just, and officiated as tutor to Lesko the Fair. He wrote his Chronicle under the title of *Historia Polonica*, which was first published in 1612. Godislas Reszko, dean of Cracow, composed Annals of Great Poland. Martinus Polonus is known by his numerous writings, and particularly by his Chronicles of the Popes and Emperor. He died at Bologna in 1278. To this period also belong several men of science. Amongst these may be mentioned Octavian Wolener of Cracow, an architect who, a little before 1044, was invited to Vienna to erect the church now called St Stephen's. Ciolek, in Latin *Vitellio*, a native of Cracow, was celebrated as a naturalist and mathematician. He lived in the middle of the thirteenth century, and was considered as having contributed to improve and extend the science of optics. His works were printed for the first time at Nuremberg in 1533, under the title of *Vitellionis Perspectivæ libri decem.*

But whilst the intellectual superiority of Poland at this period was owing to her frequent and direct intercourse with Italy, it is to be observed that after the foundation of the university of Cracow, about the middle of the fourteenth century, she herself became the centre and source of civilization to the neighbouring nations. From this time Hungarians, Bohemians, Germans, Swedes, and Danes, who formerly used to repair to Italy for study, resorted almost exclusively to the university of Cracow. Of those who added celebrity to the university, there were some whose reputation was not confined to their own country. George of Sanok, born about 1400 and died in 1477, was first professor of moral philosophy in the university of Cracow, and afterwards archbishop of Leopol. His biography was written by Buonacorsi, surnamed Callimachus, a celebrated Italian philosopher. John of Glogau, born in 1440 and died in 1477, was also a professor in the university of Cracow, and left numerous manuscripts on different subjects, but mostly on the Aristotelian philosophy, several of which were afterwards published. Dlugosz, in Latin *Dlugossius*, born in 1415 and died in 1480, was a statesman and historian. As great treasurer of Poland, he, on many occasions, rendered important services to his native country; he also protected science, established hospitals, and founded an exhibition or bursary in the university of Cracow. Of his numerous writings, the most important is his *History of Poland.* Brudzewski, born in 1445 and died in 1497, studied at Cracow, and afterwards became professor of mathematics in that university, where he had the distinction of being the master of Copernicus. He left several works, the principal of which treat of astronomical subjects and the construction of the astrolabe. Nicolas Copernik, called in Latin *Copernicus*, born in 1473 and died in 1543, studied at Cracow, and by divining, through the mists of error rendered venerable by time, the true system of the world, established for himself a name which will live whilst sun and moon endure. Martin of Olkusz, the school-fellow and friend of Copernicus, died in the year 1530.

These men, however, with all their individual merits, were only the precursors or harbingers of a period of higher excellence and greater refinement. Free at home and powerful abroad, Poland during the sixteenth century occupied a distinguished place amongst the states of Europe; and the period of her political glory was also the golden age of her literature. Amongst the poets of this period, the first place belongs to John Kochanowski, born in 1530 and died in 1584, who is justly regarded as the father of Polish literature. He was the author of works both lyrical and dramatic, and translated Anacreon, Horace, some parts of the *Iliad*, and also the Psalms of David, which are remarkable for purity and vigour of style. Rey of Naglowice also wrote several works in verse and prose; whilst Peter Kochanowski left translations of Tasso's *Gerusalemme Liberata*, and Ariosto's *Orlando Furioso*, which were printed at Cracow in the year 1618. Miaskowski, Sarzynski, Rybinski, Grochowski, and Klonowitz, were likewise eminent as poets. As prose writers, may be mentioned Michowita, who wrote several important works, particularly on Polish history; Kromer, the son of a peasant, who by his talents obtained the highest ecclesiastical dignity in Poland (that of Prince-Bishop of Warmia), and left important works on the history of his country; Bieliski, who wrote on subjects of moral philosophy and history; Gornicki, an eminent writer on politics and history, and whose style is remarkable for its purity; Stryjkowski, a poet and historian; and Orzechowski, an apostate priest, but a distinguished writer and speaker, who, by his defence of the principles of the Dissidents, attracted the notice of Pope Julius III., with whom he maintained a long and animated controversy.

This period also produced several men distinguished in law, ethics, mathematics, and astronomy, the natural sciences, medicine, and agriculture. Amongst the lawyers and jurisconsults may be mentioned Herbert, secretary of Sigismund Augustus, who published a collection of statutes and privileges; Malecki, who wrote a book entitled *The Lawful Marriage of Bishops, Priests, and Monks;* Groicki, a civilian of eminence, the author of a work on the statute law of Magdeburg; besides Ianuszewski, Lazarowitz, and Smiglecki. In ethics, Rey, Koszucki, and particularly Petrycy, distinguished themselves, though in different degrees. Petrycy translated the *Ethics* of Aristotle, and also the *Policy* of the same author, which he published at Cracow in 1618, along with his own commentaries. In mathematics and astronomy, Poland could boast some of the most distinguished men of the age; but as most of them published their works in Latin, it is only necessary to mention here those who wrote in Polish. These were Klos, author of a treatise on arithmetic, published at Cracow in 1538; Grzebski, professor in the university of Cracow, whose works on geometry were published in 1656; and the astronomers Latos, Rosciszewski, Zebrowski, and Bernat. Nor were the cultivators of the natural sciences either few in number or inferior in zeal and knowledge. Amongst the more eminent may be mentioned Spiezynski, who wrote several works on botany, published at Cracow; Martin of Urzadow; Falimierz Syrenski, professor of medicine in Cracow, whose work on the properties and uses of plants, published after his death, is highly esteemed; Peter of Kobylny, Andrew Glader, Valenti of Lublin, Oleszko, and Umiastowski, skilful physicians, who published important works on different maladies; Trzecieski, author of several works on agriculture and husbandry published at Cracow in 1540 and 1571; and Dubrawski, whose work on fishes, published in 1600, is still considered a work of great merit. There were also during this period several writers on the art of war, amongst whom may be mentioned Strubiez, Paprocki, and Cielecki.

This, the golden age of Polish literature, continued from the middle of the fifteenth until the commencement of the seventeenth century. But from the reign of Stephen Batory, in 1586, we may date the temporary decline of Polish literature and the corruption of the Polish language. During the seventeenth century the introduction of the Latin language into official transactions, and the great political crisis which Poland had to undergo, obstructed the tendency of the national literature, and directed the energies of the Poles towards one great object, namely, the preservation of their political existence. Amidst growing internal disorder, at once the cause and the effect of national calamity, the peaceful pursuits of science were neglected; and under the two princes of the houses of Saxony, Augustus I. and his son Augustus II., Poland sunk into a state of both political and intellectual degradation; nor was it until towards the end of the eighteenth century that the national mind awoke from its long trance, and a reform was effected which has since produced good fruit. Whilst Konarski and a few others began to combat that maccaronic mixture of Latin and Polish which was then so much in fashion, a number of distinguished men, such as Krasicki, Archbishop of Warmia, a poet and political writer; Naruszewicz, Archbishop of Luck, a poet and historian; the two brothers Augustus and Michael Czartoryski, Albertandy, Zamojski, Potocki, Kollontay, Czacki, and many others, opened a new career for Poland; and by the impulse thus given the regeneration of literature was assured, although the liberties of the nation have been destroyed.

The first place amongst modern Polish writers is commonly assigned to John Paul Woronicz, born in 1757 and died in 1829, the archbishop of Warsaw, metropolitan primate of the kingdom of Poland, and an eminent poet and prose writer. Julian Ursyn Niemcewicz, distinguished alike as a poet, a historian, and a statesman, has been elevated by his tales to a high place amongst modern Polish writers; whilst in some of his other productions, particularly his *Powrot Posla*, or the Return of a Deputy to his Home, he has exhibited a most lively and animated picture of Polish habits and manners. Karpinski is the Burns of Poland; and Brodzinski, Felinski, and Ossolinski are likewise popular poets. Of the patriotic bards, Adam Mickiewicz is the head and prince. His effusions are generally of a plaintive character, except when they dwell with rapture on the past glories of Poland. The muse of freedom is indeed the idol of his poetical worship, and like many other great poets, he has taken from the altar of liberty that hallowed fire, the divine flame of which warms and animates his strains. Lastly, in the class of modern historical writers, no one can claim precedence of Joachim Lelewel, a name venerable in literature, and honourably known for his strict regard to truth and the liberality of his political writings.

Lastly, in closing this brief survey, a melancholy feeling is awakened in the mind. We are, in fact, writing of the past, without almost any reference to the present. Since the failure of the insurrection of 1830–1831, literature may be said to have expired in Poland, or rather to have been destroyed by the barbarous despot who has sought to proscribe her history, and even to eradicate her language; but amongst the exiles there are many men of distinguished literary acquirements whose talents and learning enable us to form a tolerable estimate of the general state of education in their native country previously to the revolution; and we know from history that high mental cultivation has long co-existed in Poland with that chivalrous heroism for which they have always been pre-eminently distinguished.

Area and population.

At the date of the first partition Poland had an area of about 282,764 English square miles, and a population of about 12,216,000.

			Square miles.	Inhabitants.
In the first partition,	Russia	obtained	41,804	1,800,000
„	Prussia	„	13,335	416,000
„	Austria	„	27,093	2,700,000
In the second partition,	Russia	„	96,372	3,000,000
„	Prussia	„	22,436	1,100,000
In the third partition,	Russia	„	42,968	1,200,000
„	Prussia	„	21,103	1,000,000
	Austria	„	17,653	1,000,000
		Total.........	282,764	12,216,000

Poland.

List of the Dukes and Kings of Poland.

A.D.
550. Lech.
Visimir.
12 Woivodes.
700. Cracus.
Lech II.
750. Venda.
12 Woivodes.
760. Lesko I.
776. Lesko II.
804. Lesko III.
810. Popiel I.
815. Popiel II.
830. Piast.
861. Ziemowitz.
892. Lesko IV.
913. Ziemovislas.

A.D.
964. Miecislas I.
999. Boleslas I.
1025. Miecislas II.
1034. Rixa.
1041. Casimir I.
1058. Boleslas II.
1081. Uladislas I.
1102. Boleslas III.
1138. Uladislas II.
1146. Boleslas IV.
1173. Miecislas III.
1177. Casimir II.
1194. Lesko V.
1200. Miecislas IV.
1203. Uladislas III.
1206. Lesko V. (restored).

A.D.
1227. Boleslas V.
1279. Lesko VI.
1296. Prezemislas.
1300. Uladislas IV.
1300. Wenceslas.
1305. Uladislas IV. (restored).
1333. Casimir III.
1370. Louis.
1385. Hedwig.
1399. Uladislas V.
1434. Uladislas VI.
1445. Casimir IV.
1492. John Albert.
1501. Alexander.
1507. Sigismund I.
1548. Sigismund II.

A.D.
1574. Henry.
1576. Stephen Batory.
1587. Sigismund III.
1632. Uladislas VII.
1648. John Casimir.
1670. Michael-Koributh-Wieçnowiçki.
1674. John Sobieski.
1697. Frederick-Augustus.
1704. Stanislas I.
1709. Frederick-Augustus (restored).
1734. Frederick-Augustus II.
1764. Stanislas II., who died a state prisoner at St Petersburg in 1798.

(J. B—E.)

POLAND (Pol. *Polska*, Germ. *Polen*, Fr. *Pologne*), a kingdom or czarat of European Russia, forming the most westerly portion of the empire, and bounded on the N.E. and E. by Western or Polish Russia, S. by the Austrian empire, and W. and N. by the kingdom of Prussia. It is in the form of an irregular square, with a long and narrow strip of territory extending from its N.E. angle; and it lies between N. Lat. 50. 4. and 55. 5., and E. Long. 17. 30. and 24. 18. The length and breadth, exclusive of the projecting tract (which is about 120 miles long, and from 20 to 50 broad), are each about 200 miles; and the area of the whole is 49,408 square miles. Though Poland derives its name from the flatness of its surface, and is in general a very level country, yet there are some hills and undulations to break the uniformity of this extensive region. A branch of the Carpathian chain, not exceeding 2000 feet in height, extends northwards between the Vistula and its affluent the Pilica. The rest of the country slopes very gradually towards the N., being in the highest parts only 300 or 500 feet above the sea. In the more elevated regions there are numerous small lakes and morasses, and extensive portions of the country are occupied with forests and heaths. The largest river in Poland is the Vistula, which, rising at the foot of the Carpathians in Austrian Silesia, flows N.E., forming the boundary between Poland and Galicia, and then flows northwards through the kingdom. After receiving the Bug, it turns to the west, and enters the kingdom of Prussia a short distance above Thorn. It then takes a northerly course, and falls into the Baltic at Dantzic. It receives from the right the Bug and its affluent the Narew, both of which constitute, the former for a considerable, and the latter for a very short distance, the boundary of Poland towards the E. The Vistula also receives from the right the Wieprz; and from the left its chief affluent is the Pilica. The other rivers of Poland are the Warta in the west, flowing westwards to the Oder; and the Niemen, which forms the N.E. boundary, and flows into the Baltic. The Vistula and Niemen are both navigable as far as they flow through Poland or along its borders, and the Bug, Narew, and Warta, for a considerable portion of their course. In the hilly parts of the country various kinds of minerals are obtained, chiefly iron, copper, lead, zinc, cadmium, and sulphur. In 1849 the governments of Warsaw and Radom contained seventy-two private iron mines, producing ore to the value of L.47,305; and ten imperial mines producing ore to the value of L.3399. The copper obtained and worked in the same year amounted in value to L.31,127, the lead to L.437, the cadmium to L.28,311, and the sulphur from one mine alone to L.2265. The soil of Poland is fertile, producing more grain, hemp, flax, tobacco, &c., than is necessary for home consumption. Wheat is grown only among the hilly regions; in other parts, rye, oats, and buck-wheat are the crops chiefly raised. The forests supply large quantities of timber. The country contains many horses, cattle, and pigs; fewer sheep; but immense swarms of bees, which produce excellent honey. Game abounds in the forests; and there are also bears, wolves, and lynxes. The climate is warm in summer, but very cold in winter, when the country is frozen and covered with snow for four or five months of the year. Manufactures, which were formerly little attended to, and almost unknown in Poland, have recently made great advances. At the close of 1849 the country contained 82 wool-spinning factories, with 1175 machines, and 48,606 spindles; 2405 woollen cloth factories, employing 8200 hands, and producing in the course of the year 2688 cwt. of goods, valued at L.277,965; 5 cotton-spinning factories, with 460 machines, and 52,197 spindles; 9317 establishments for cotton-weaving, employing 14,156 hands, and producing L.413,785 worth of goods; 4242 linen-weaving factories, employing 7288 hands, and producing in all about 11,518,500 yards of cloth; 16 silk-mills, with 109 looms, employing 152 hands, and producing goods to the value of L.19,709; 24 manufactories of liqueurs, 47 of oil, and 20 of vinegar, producing L.26,694 worth of liqueurs, L.17,659 worth of oil, and L.10,029 worth of vinegar; and 12 breweries, producing beer and porter to the value of L.15,144. Poland also produced in the same year L.4116 worth of surgical and other instruments, L.2331 of arms, L.27,761 of glass and crystal ware, and L.48,660 of paper, &c. The trade of the country is considerable: corn, wool, oil, timber, and zinc, the chief articles of export, are conveyed down the Vistula to Dantzic; and many goods are also carried into Austria. The value of the exports to Prussia in 1851 was L.627,480, to Austria L.214,615; that of the imports was L.1,496,342. The commerce of Poland is for the most part in the hands of the Jews. The capital is Warsaw, and the kingdom is divided into five governments as follows:—

	Area in Square Miles.	Arrondissements.	Pop. (1855).
Augustowo	7,242	5	613,921
Ljublin	11,627	8	1,007,251
Plock	6,744	6	550,643
Radom	9,631	8	923,355
Warsaw	14,164	12	1,702,675
Total	49,408	39	4,797,845

The kingdom contained in 1855, 3,714,016 Roman Catholics, 572,052 Jews, and 270,412 Protestants; and the capital had 156,072 inhabitants.

POLAR REGIONS.

Arctic Regions.

THIS title embraces the Antarctic as well as the Arctic seas and lands; but we mean to confine ourselves mainly to the North Polar Regions, which, cold and inhospitable as they are, have witnessed many of the most strenuous and masterly efforts of British seamen, placed under circumstances of extraordinary peril and privation. The intensely interesting narratives of the exploits of these "marine worthies" will continue to incite the youth of the land to deeds of daring enterprise as long as Britain enjoys the blessings of free government, and its accompanying liberty of thought and action.

Phœnician voyages.

From the ancients we get but a few glimpses of the northern regions. It is true that in the very dawn of history the tin of Cornwall and the amber of the Baltic were known on the coasts of Palestine and Asia Minor, and that the Phœnicians,[1] and after them the Carthaginians, extended their commerce and commercial establishments coastwise from Tartesus or Gaddir, in the Bay of Cadiz, to the Œstrymnades, Cassiterides, or Fetis, in the south of Albion. These skilful mariners may even have penetrated in their coasting voyages into the Baltic through the Sound or Belt; but there is no evidence of their ever having crossed, or even approached, the Arctic Circle.[2] Commercial jealousy kept the secret of these voyages concealed from the Greeks, but at a later period the conquest of Britain must have given to the Romans some knowledge of the seas which wash its shores; yet it was not until 138 years after Cæsar had first ventured across the Straits of Dover that Agricola circumnavigated the island. In process of time, the Roman seamen espied the Scandinavian peninsula, which they believed to be a cluster of islands; but they did not cross the Arctic Circle, that feat being reserved for a hardier race of mariners, nurtured in a ruder clime, and on more stormy seas. After Roman civilization had been overthrown in England by invading hordes of Jutes, Angles, and other heathen tribes, and the Saxon dominion in that island was acquiring strength under the authority of one ruler, the raven flag of Scandinavia appeared in the narrow seas, carrying terror and rapine to all the coasts of Europe. Considering warfare the only honourable employment, death in the battle-field the only desirable termination of a hero's life, and accustomed to all the vicissitudes of a variable sky, the Northmen were no summer sailors; but, on the contrary, often chose the winter time for their piratical descents, as being the season when they were least expected. And so it happened that, either from being casually driven out of their course by tempests, or urged by the spirit of daring enterprise to roam over the waters in quest of new lands,—the mythic white islands and seas of the early ages,—they acquired a general knowledge of the coasts of the Northern Ocean.

Norman voyages.

About the year 890, "Octher (aliter *Audher*) said to King Alfred that he dwelt the furthest north of any other Norman at Helgoland" (on the coast of Norway, in Lat. 66. N.), and that "upon a time he fell into a fantasie to prove and know how far that land stretched northwards;" whereupon he made sail directly to the north for six days; then, after delaying till he had another fair wind, plain east for four days more; and, lastly, after waiting again for a wind, went due south, to the mouth of a large river, from whence he turned back. (Hakluyt, i. 4, 235.) Octher must have sailed 60 miles a day to have doubled the North Cape, which is a large allowance; yet as an Arctic summer would give him light enough by night, he might have gone at that rate for the twenty-four hours, and have reached the Varanger Fiord, or perhaps the mouth of the Kola; but the time is evidently too short for him to have traversed the White Sea, and attained the mouth of the Dwina, as Hakluyt supposes. Octher found the banks of the river from whence he returned so well peopled by Biarmes that he was afraid to land. The country he had previously coasted was very sparingly inhabited by fishermen, fowlers, and hunters, who were all Fynnes or Terfynnes. The Queenes (Kwæns, Kainulainen, or Fins of Latham), he further stated, were in the habit of crossing the mountains at times to the maritime coasts of Norway, for the purpose of invading and spoiling the Normans.

In 860, or thirty years before Octher made this communication to King Alfred, Iceland was discovered by the Norwegian Naddodr, visited in the following season by Gardar, a Swede, and colonized in 874 by Ingolfr and other Norsemen. Some years later, one Gunbiorn having been driven by a storm to the westward of Iceland, discovered first a few low rocks or skerries, and afterwards an extensive land, whose remarkable snowy southern headland he named *Hvidsærk* (White Shirt); and about 982 Erikr Rauði, being banished for a term from Iceland for manslaughter, sailed in quest of Gunbiorn's Land, and having found it, coasted along towards the south, and rounding the promontory of *Hvarf*, or "the turning point," spent three years in exploring the country; then returned to Iceland, where he made so favourable a report of the western land, that in 985 or 986 twenty-five vessels, carrying colonists, set out with him on his second voyage. Half of these ill-fated ships perished in the ice, but the remainder reached their destination, and in a few years thereafter all the habitable spots of Greenland were occupied. A barren district of about 80 miles divided the settlements into two groups, named the East and West Bygd, both being, nevertheless, on the western coast. Lieutenant Graah, after criticising elaborately the published accounts of these voyages, concludes that *Hvidsærk* (aliter *Muckla Jokel* and *Blaasærk*) is the lofty island now known as Cape Farewell, which is visible at the distance of 80 miles; *Hvarf* is Cape Egede, or some promontory near it; and *Herjulfrnes* (*Hernoldus Hook*), lying between the two, is the southern point of the East Bygd. The West Bygd was included within the parallels of 62½. and 66. N. Lat. One of the colonists who accompanied Erikr to Greenland was Herjulfr Bardson, a descendant of Ingulfr, the first settler in Iceland. This man's son, Bjarni, was in Norway at the time of Erikr's migration; but returning from thence in the spring of 985 or 986 to Eyras in Iceland, he found that his father had sailed for Greenland, and immediately resolved on following him, that they might spend the winter together. The crew of his ship consenting to his proposals, they put to sea again; but encountering thick, stormy weather, were driven far to the southward and westward. On the sky clearing, they found themselves in sight of a wooded part of the American coast, which, not agreeing with the description Bjarni had received of Greenland, they turned their prow northwards; and after passing several of the projecting headlands of Newfoundland and Labrador, but without landing on any, or even naming them, they finally came in sight of White Sark, where they fortunately met with a boat, and were directed to Herjulfrnes, his father's new abode.

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[1] Such voyages in the Northern Atlantic from one advanced commercial colony to another would be easy to the seamen who, by command of Pharaoh Necho, had in the seventh century B.C. sailed from the Red Sea round the south end of Africa, and in the third year of their voyage entered the Mediterranean by the Pillars of Hercules. Herodotus, from not being able to understand one of the physical phenomena reported by the mariners, discredits this voyage; but the very circumstance of the sun having had a northerly bearing as they rounded South Africa is an evidence of its truth, and full credit is now given by competent geographers to the report. (Rawlinson's Herodotus, Introduction; Prideaux's *Connect.*, Ezekiel, c. xxvii., &c.)

[2] The volumes of Heeren on the African and Asiatic Nations (translated in 1832) contain references to all the known authorities on this subject. We there find that Gades (Gaddir) and Utica were founded about the same time, and 270 years prior to the building of Carthage, or 1130 B.C. Aristotle, quoting from the Phœnician annals, also records the foundation of Utica. (Diod. Siculus and Pomponius Mela.) Festus Avienus, in his *Ora Maritima*, composed after consulting the Punic records, mentions the naval armaments of Hanno and Himilco, sent from Africa to found colonies outside of the Straits of Gibraltar, the former on the African coasts, and the latter on the western shores of Europe. A record of the widely-diverging Phœnician trade is supposed to be preserved in the peculiar and very ancient glass-beads still in existence on the western coast of Africa, in Cornwall, and in Ireland. (Rawlinson's Herod. ii., p. 50.) The Carthaginian vessels were flat-bottomed barks, so constructed for more conveniently navigating shoal waters. Himilco's voyage northwards lasted four months, when he reached the country which yielded tin and lead. From the Œstrymnades, whether these were promontories or islands, communication with the rest of Albion was kept up in skin boats by the natives, whose chief employment was commerce. Diodorus also mentions that the inhabitants of Britain were very skilful in obtaining tin, which they conveyed at low-water to the island of Fetis (supposed to be St Michael's Mount). Much of the Cornish tin seems to have been carried across Gaul to Massilia (now Marseilles); and Pythias, a Massilian Greek, is reported to have sailed in the year 333 B.C. out of the Straits of Gibraltar along the coasts of Spain, Gaul, and Jutland to the Scaw, where he turned to the east, and passed onwards into the Baltic. This voyage was probably prompted in part by a wish to visit the amber coasts at the mouths of the Vistula. Herodotus seems to have been much puzzled by the Greek name of Eridanus applied to that river, but the appellation of Rho-daun or Rauden is still that of one of the affluents of the Vistula. (Larcher in Beloe's Herodotus; circa, 111–106 B.C.) G. Cornewall Lewis does not believe that the Phœnicians reached the Baltic, but thinks that the ancients acquired their knowledge of that sea solely from the overland traders. Yet Pliny, speaking of the *Basilia* of Timæus, a navigator who succeeded Pytheas, says that it is the same island with the *Baltia* of others. If the word Baltic did not originate in the latter name, the similarity of sound is at least remarkable. (See a paper on the Amber Trade, *Notes and Queries*, 2d series, vi. 131 and 134; by G. C. Lewis.) Juba, the Mauritanian prince, sent ships to examine the Canaries; and Sertorius, a general under Marius, meditated a retreat to these "Fortunate Islands" in the year 82 B.C.

Erikr's son Leifr, who had gone to Norway at the close of the tenth century, being, by command of the king Olaf Triggeweson, instructed in the principles of Christianity, was by him sent back to Greenland, attended by a priest, who baptized Erikr and his followers. In the year 1000, Erikr having purchased the ship in which Bjarni had traded with Norway after his discovery of America, sailed to acquire more perfect knowledge of the western country. He wintered in *Vinland*, now recognised by its position and productions as comprising Rhode Island and Massachusetts. The peninsula named at present Nova Scotia he called *Markland*, on account of its woods. Newfoundland and Labrador were termed *Litla Helluland* and *Helluland it mikla*, or the Lesser and Greater Slaty Lands. Leifr's Booths, the wintering station of the expedition, is identified by Professor Rafn with the banks of Taunton River; *Straumfiorðr* of the Norsemen with Buzzard's Bay; and *Kialarnes* with Cape Cod. Leifr, on his way back to Greenland, rescued the crew of a Norwegian vessel that had struck on a rock, and being enriched by the salvage of her merchandise, took thenceforth the appellation of *Leifr hin hapni*, or Leifr the Fortunate. Vinland was afterwards sought with the view of forming settlements by Thorwaldr Erikson, Leifr's brother, Thorfinn Karlesefne, and others; but the hostility of the Skrællings frustrated all attempts at permanent habitation. In 1008 Snorre Thorfinnson was born at *Thorfinn's Buðr*, near Taunton, being the first child of European extraction born in America. The intercourse between America and Greenland seems to have been kept up as late as 1347, chiefly, it would appear, to procure wood for building purposes.

In the palmy days of the Greenland Icelandic colonies the West Bygd had 4 churches and 90 farms (some authors say 110); and the East Bygd a cathedral, 11 churches, 190 farms, a town, and at least 2 cloisters. The *Kongskuggsiö*, or *Speculum Regale*, supposed to have been written in the twelfth or thirteenth century, mentions that the interior of Greenland is covered with ice, but that the habitable banks of the fiords abound in good pasturage, and that the colonists subsisted by raising cattle and sheep, and by the chase of the rein-deer, walrus, and seal, the climate being adverse to the production of grain. The country was governed by Icelandic laws, and had a series of bishops, beginning with Arnold, who was elected at the instance of Sokke, Leifr's grandson, in 1121, and ending with Endride Andreason, who was consecrated in 1406.[1] Before this date the colony had begun to decline. In 1348 a black pestilence had committed wide ravages among the people of the North; and in 1379 the Skrællings had utterly destroyed the West Bygd. Ivar Bere or Bardsen (translated *Boty* by Barentzoon)[2], a principal man in the bishop's court, sailing to the rescue with a levy of East Bygd people, found no man, neither Christian nor heathen, but only sheep running wild, of which he brought away as many as he could. The East Bygd held out some time longer; but in the beginning of the fifteenth century Margaret, the Queen of Denmark and Norway, called the "Semiramis of the North," having imprisoned the merchants who traded with Greenland on the charge of intercepting the tribute due to her from the colonists, and interdicted all her subjects from going thither, the settlement languished away. The final blow was, according to a pastoral letter of Pope Nicholas V., given by a hostile fleet (suspected by Graah to have been English), which in 1418 laid waste the country, and carried into captivity all the vigorous inhabitants that were found, a few dwellers in remote parishes only escaping. By a treaty between our Henry VI. and King Erik of Norway in 1433, the captives in England were set at liberty; but nevertheless the neglect of the mother country continuing, the colonists either returned to Iceland or perished under the repeated assaults of the Skrællings. Vestiges of the ancient colonization have been traced in ten different localities within the bounds of the West Bygd; and the ruins are yet more numerous and in better preservation in the East Bygd, where the walls of several churches are still standing. Runic inscriptions have moreover been discovered at the ancient episcopal site of Gardar in Eriksfiorð, and in other places. One of these, found by an Eskimo Greenlander named Pelinut, at Kingitorsoak, in Lat. 72. 55. N., Long. 56. 5. W., bears the date of 1135, and informs us that on the Saturday before *gangday* of that year, Erling Sighvatsson, Bjarni Thorðarson, and Eindrid Oddsson, cleared the ground and raised these marks. This inscription is important, as furnishing incontestible evidence of the Norrænu Greenlanders having carried their sealing expeditions into Baffin's Bay. The usual summer resort of the sealers was *Greipar*, whose site is placed by Rafn in Lat. 67., to the south of Disco, where the fiords resemble the intervals between a man's fingers, which

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[1] Professor Finn Magnusen and several other learned Icelanders deduce their pedigree from a couple who were married in Greenland in 1409 by Bishop Endride. The sculptor Thorwaldsen also traced his descent from these ancient stocks. See *Kongs Skugg Siö*, *Islands Landnamabok*, and Rafn's *Antiquitates Americanæ*. For translations, see Beamish, 1841; Blackwell's Mallet, 1847; *Geograph. Journ.*, 1858.

[2] Purchas, ii., p. 518. In the *Relation du Groenland*, par Isaac de La Peyrère, Paris, 1663, Ivar Bardsen's name becomes Iver Bert.

greipar signifies. Disco itself was called *Bjarney* by the old colonists, meaning "bear island." We learn further from the *Hauksbok* that in 1266 the priests of Gardar, in consequence of information obtained from those who returned from *Norðursæta*, or the northern summer haunts, sent out a vessel on discovery, which, leaving Greipar far behind, came to an inlet that was named, from its curvature, *Kroksfiorðr*, beyond which they were driven in thick weather by a southerly gale. On the weather clearing, the mariners found themselves in an archipelago, amid much ice, with the sun as high above the horizon at midnight as it is in the inhabited parts of Greenland when in the north-east quarter of the sky in the same season of the year. It is unsafe on such data to fix on the sound into which this vessel was driven, as Rafn has done; but we must conclude that these adventurous Northmen, passing far within the Arctic Circle, had seen much of the shores of Baffin's Bay upwards of three centuries before it received the latter appellation.

The fate of the Greenland colonies, and the existence of the western land, had been almost wholly forgotten until the success of Columbus produced a search for ancient records, which, however, instead of being honestly published, were quoted as vouchers for many fables and much inaccurate cosmogony.[1]

Southern enterprize.

During the latter third part of the thirteenth century, when Venice was in the zenith of its prosperity, and monopolized the overland trade of Europe with India, Marco Polo, following the steps of his uncles and other merchants, travelled across Asia to Khan-balik, or Pekin, the seat of the Tartar conqueror of China, Kublai-khan. By his narratives Europe became acquainted with the condition and, approximately, with the position of China; but the project of reaching the fabulously rich lands of the extreme East by sea does not seem to have presented itself at that time to northern navigators; and maritime enterprise lay dormant until the middle of the fifteenth century, when Prince Henry of Portugal gave the impulse by which his countrymen went forth to trace the western coast of Africa down to the *Cabo Tormentoso*, the haunt of the Genius of Tempests, that most poetical creation of Camoëns. In 1492 Columbus made his glorious discovery of the Western Indies; and six years afterwards Vasco de Gama, doubling the storm-beaten extremity of Africa, which had become the Cape of Good Hope, reached India by an eastern route. These splendid achievements of the peninsular mariners stirred the spirit of northern adventure; and the sagacity of Henry VII. secured to England the services of John Cabot, and of his greater son Sebastian. How far the doings of the Norsemen in the Greenland seas were known at this period to the English cannot be easily ascertained, but it is difficult to believe that the merchants of Bristol, who traded to Iceland in the time of Edward IV., did not retain some memorials of Engröneland, Hellnland, Markland, and Vinland, of which they must have heard; yet in the absence of correct topographical description, and the entire defect of astronomical observations, these words would be mere names of remote places. No printed detail of the Norwegian discoveries was given to the world until 1705, more than two centuries after Columbus had made the first of his great voyages across the Atlantic, though, as mentioned below, some obscure notices had appeared in authors after the middle of the sixteenth century.[2] Certain it is, however, that from the Columbian epoch, whether in the spirit of enterprise inherited from their ancestral Scandinavian kindred, or, what is more likely, in pure rivalry of the Portuguese and Spaniards, the project of a passage to China in a high latitude, either by the N.W. or by the N.E., or directly across the Pole itself, began to stir the minds of English seamen. Robert Thorne, a merchant of Bristol, who had dwelt long in Spain, was the first who distinctly proposed the bold speculation of a north polar passage, which he did in two letters, one of them addressed to Henry VIII. in the year 1527, and the other to the ambassador of that monarch residing at the court of the Emperor Charles V. He adduces as one of his chief reasons for sending a naval armament that way, the discovery of three parts of the world by other princes; so that the fourth way by the north was the only one that remained to be tried. His second letter is accompanied by a map,[3] in which Asia is drawn 120 degrees of longitude too far to the east, and the North-East Passage consequently abbreviated to that extent; while China is placed far to the west of oriental Cathayo.

It does not enter into the plan of this article to give a chronological list of all the voyages to the Arctic regions which, with short intervals of rest, have succeeded each other from the time of Henry VII. down to the reign of Victoria; but having already mentioned those of former ages as fully as our limits would allow, we purpose to notice those merely of the post-Columbian ones which have brought material additions to our knowledge of the coasts of the Northern Ocean. The reader desirous of entering fully into the interesting histories of Arctic exploits may have recourse to the many valuable compilations which have of late years issued from the press.[4]

English voyages

On the 5th of March 1496,[5] Henry VII. granted letters patent to John Cabot, a Venetian, and to his three sons Lewis, Sebastian, and Sancius, to sail with five ships to all parts and seas of the East, of the West, and of the North, and to discover and possess all lands previously unknown. The expedition did not sail until the following year; and the most explicit account of its doings, though a very brief one, is that which Hakluyt copied from an engraving by Clement Adams of a map drawn by Sebastian himself, in which the discovery of the land named *Prima Vista*, and the island of St John lying off it, are ascribed to John Cabot, and Sebastian his son, as having been made on the 24th of June 1497, at five in the morning. In his translation of this Latin manuscript, Hakluyt has interpolated in brackets "with an English fleet from Bristol;" and Master Robert Thorne, above mentioned, in his letter to the English ambassador in Spain, states that his "father, a merchant of Bristowe, and Hugh Eliot, were discoverers of the Newfound lands" (being doubtless adventurers in the fleet of John Cabot). Master Thorne further intimates that if the seamen would have followed their pilot's mind, they would have gone southward, and discovered the West India

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[1] The adventures of the Zeni in *Frieslanda*, *Eslanda*, *Engrovelanda*, *Estotilanda*, *Drogeo*, and *Icaria*, under the Arctic pole, in 1380–95, but not published till 1558, are evidently a compilation of reports, mostly fabulous, collected probably in Bristol or Scandinavia. Szkolni (Scolvus, Sclolvus, or Scalve), a Polish pilot in the service of Christian II. of Denmark, is said to have landed in Groetland in 1476 or 1477, after visiting Greenland. Master Thorne's map places Groetland in Lat. 72.; but its position is wholly uncertain, there being no authentic details of the voyage extant. Sir Humfrey Gilbert calls him *Scolmus*, and says that he entered far into the North-West Passage.

[2] The discovery of America by the Scandinavians is alluded to by Adam of Bremen in his *Hist. Eccl. Hamb. et Brem.*, written in 1073–6, printed in 1579; by Ortelius in his *Theatr. Orbis*, 1601; by Mylius, *De Antiq. Ling. Belg.* 1611; and by Grotius, *De Orig. Gent. Amer.* 1642 (Major. l. c. xii.). See also Torfæus, *Hist. Vinlandiæ*, 1705; and Olaus Magnus, *Hist. Gent. Sept.*, lib. ii., c. ix.

[3] For a fac-simile of the chart, see *Voy. to Am.*, Hakluyt Soc. pub. 1850. A map of North America, dated 1544, or 17 years after the date of Thorne's, is published in the Atlas of Baptista Agnese, of which Trinity College, Dublin, possesses a copy, and contains evidently the discoveries of the coast as far as Newfoundland and Labrador, made by Cabot, Cortoreale, and the Basque and Breton fishermen, up to the time of its construction; but there is no indication of land as high as Hudson's Strait.

[4] Coxe, Burney, Barrow, &c.

[5] Not 1495, as in Hakluyt. Consult *Div. Voy.*, Hakl. Soc., ed. J. W. Jones, Esq., p. lxviii.

Islands. Sebastian's map is not known to be in existence now, though Hakluyt says that in his time it was in many ancient merchants' houses, as well as in "Her Majestie's privie gallerie" at Westminster. The name of the English vessel that first touched the American shore is said to have been the Mathew of Bristol.

A second patent was granted in February 1498 to "John Kabotto, Venecian," in which reference is made to the "londe and isles of late found by the said John." It was probably under this patent that Sebastian armed two ships at the expense of King Henry VII., as related by Pietro Martire. This author, who was a member of the Council of the Indies to the Catholic king, says that "Sebastian Cabot, his very familiar friend, was called out of England after the death of Henry VII., and made one of our council and assistants as touching the affairs of the Indies," and further that he was told by him, that at the time in question, having two ships manned by 300 men, he directed his course towards the North Pole, and found, even in the month of July, in a manner continual daylight, and monstrous heaps of ice swimming in the sea, so that he was enforced to turn his sails and follow towards the west, along the land, where the heat of the sun had melted the ice. He coasted this land, which he named *Baccalaös,* until he reached the same parallel of latitude as the Straits of Gibraltar, in the longitude of Cuba. Authors disagree as to the northern latitude attained by Sebastian. Petro Martire, as reported by Hakluyt, and by Ramusius in one part of his compilation, says that it was 55° N. Butrigarius, the Pope's legate, who had his information from Sebastian himself, calls it 56° N.; and Gomara states it to have been 58° N., beyond the Cape of Labrador. Ramusius, again, in his *Discorso sopro la terra ferma dette del Lavorador et de los Bacchalaos,* says that Sebastian searched the land up to the 67th degree; and in his general Preface to the same volume he informs us that "Il Signor Sebastian Gabotto nostro" wrote to him many years past that, having sailed a long time W. and by N. behind the islands of *Nova Francia* up to the 67. 30. N. Lat., he found the sea open, and would have gone on to *Cataio Orientale,* if the malignity of the shipmaster and mutinous seamen had not forced him back. Sir Humfrey Gilbert, in his *Discourse on the North-West Passage,* published by Hakluyt, uses nearly the words of Ramusius, stating the latitude reached by Cabot to be 67½ degrees, and referring, like Hakluyt, to the map in the Queen's private gallery as his authority. Sir George Peckham, in a treatise on the same subject, also in Hakluyt's collection, mentions 63 degrees as the northern limit of the discoveries of the Cabots. Sebastian's "owne mappes and discourses, drawn and written by himself," were, Hakluyt says, "in the custodie of the worshipful Master William Worthington;" and though it is probable that they were, as Mr Biddle conjectures, afterwards suppressed at the instance of Philip II., they appear to have been accessible to geographers in the time of Elizabeth. Mr Richard Willis, in his argument on a North-West Passage (in Hakluyt), mentions the "table of our countryman Sebastian Cabot, which the Earl of Bedford hath at Cheinies, in which a gulf is left between 61° and 64° N., as Gemma Frisius also hath it in his globes." Taking these various reports into account, it seems probable, but by no means proved, that Sebastian Cabot anticipated Frobisher in the discovery of the strait now known as Hudson's. Thorne's chart carries the land up to the North Pole; Ramusius' stops short at the Arctic Circle; but it was evidently the custom of the map-makers of the times to carry the contour of the land a few degrees beyond the limits of the coasts actually traced. Ramusio, though he corresponded with Cabot, does not seem to have been accurately acquainted with the dates of his several voyages; and being consequently ignorant of his claim to the discovery of Labrador, he says that Gasparo Cortoreale was, as far as he knows, the first who sought to find a short way to the Spice Islands by the N.W.[1]

Cortoreale of Portugal.

This able and adventurous navigator, he tells us, sailed from Portugal with two caravels in 1500, and discovered *Terra Verde* lying between the N. and N.W., coasting it from *Rio Nevado* (Hudson's Straits), in Lat. 60., to *Rio San Lorenzo* and its gulf, called *Quadrato,* which turns at the end of *Los Bacchalaos,* whose highest point, named *Cabo di Buenovista,* lies in 48½°.[2]

English voyages.

The memorial of Master Thorne, mentioned in a preceding page, took, as Hakluyt says, present effect; and in May 1527 King Henry VIII. sent forth two ships, well manned and victualled, to seek strange regions. These ships were the Sampson, which was lost in a storm, and the Mary of Guildford, which returned to England after touching at Newfoundland, when her master, John Rut, gave a very meagre account of the voyage. Other Englishmen made at this time private adventures to the new continent, some of which Hakluyt mentions;[3] and Rondelet, whose work appeared in 1554, states that even thus early the fishery for cod had been established by the Bretons and Normans on the banks of Newfoundland.[4] The enterprising seamen of Bristol are not likely to have been tardy in seeking the same lucrative employment.

Voyages to the N.E.

The first expedition, however, which we have specially to mention is that of which Sir Hugh Willoughby was captain-general, and which sailed in 1553, after preparations on a scale beyond all previous example. The fleet, consisting of the admiral, named the Bona Esperanza, the Edward Bonaventure (Captain Richard Chancelor), and the Bona Confidentia (Cornelius Durfoorth master), dropped down from Ratcliffe to Greenwich, passing under the windows of the young king, then confined to his chamber by illness. The outfit was carefully directed by Cabot, who, as Mr Richard Eden has recorded, had long before had the secret of this voyage to Cathay in his mind; and he also drew up a detailed code of instructions for the mariners. On the 2d of August Sir Hugh took a departure from Seynam in Lat. 70. on the coast of Norway; and on the 14th saw land, computed to bear from that place E. by N. 160 leagues, and lying on the 72d parallel of latitude. This discovery, named "Willoughby's Land," is on the S.W. coast of Novaya Zemlya, between the North and South Gousinoi Nos, and has been named by Lütke the "Goose Coast," because of the numbers of these birds which breed there.[1] After plying about and sighting the land on various days, he finally bore round, and returned to the haven of Arzina in Lapland, which had been previously examined by him. Here he and his whole crew, and that of the Bona Confidentia, were miserably frozen to death, as was ascertained in the spring by some Russian fishermen. The English agent at Moscow, on hearing of the sad event, sent men to conduct the ships, the goods, and the dead bodies to England; but the ships, having become leaky, sunk by the way, carrying to the bottom both dead and living navigators. From the recovered papers, it appeared that Sir Hugh Willoughby and most of his company were alive in January 1554; but as the provisions, though calculated to last eighteen months, were found to be in part corrupt, it seems probable that the crews, weakened by low and bad diet, and their sure concomitant scurvy, were rendered incapable of resisting the severity of the climate. The great expenditure of carbon by respiration in the high latitudes, and the consequent requirement of a large increase of food, was not understood in those days, and is even at the present time seldom sufficiently provided for in regulating the diet of seamen employed within the Arctic Circle; nor are recent instances wanting of the food being bad as well as scanty.

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[1] When the war with Scotland engaged Henry VIII.'s attention, to the exclusion of enterprises of discovery, Sebastian Cabot went to Spain, and was employed in exploring the Brazil coasts, nominated one of the Council of the Indies, and finally salaried as pilot-major. In 1548 he returned to England, was made grand pilot by King Edward VI., receiving, for that age, a large pension; and in the reign of Philip and Mary was invested with the office of "Governor of the Mysterie and Companie of Merchant Adventurers for the discovery of New Trades." Ramusio, in the *Discorso* prefixed to his third volume, attributes to Cabot a desire of discovering a short way to Cataio Orientale as the motive of his voyages; so that it must have been from ignorance or inattention to dates that he gave Cortoreale the credit of being the first to seek a passage to China by the north-west.

[2] Ramusio quotes Cortoreale's letters to the King of Portugal; but Mr P. Frazer Tytler, in his *Progress of Discovery in the Northern Parts of America,* says that the most authentic account of Cortoreale's voyage is to be found in a letter of the Venetian ambassador residing at Lisbon to Pietro Pasquiligi, written only eleven days after the return of Cortoreale to Portugal. The *Terra Verde* (which must not be confounded with the Scandinavian *Grönland*), is named, according to Mr Tytler, *Terra Cortorealis* in a Roman map dated 1508, which we have not seen. The name is preserved in Michael Lok's map of 1582. In Thorne's map of 1527 the whole coast is designated *Nova terra laboratorum dicta ab Anglis primum inventa.* Baptista Agnese's map of 1544 represents Labrador (but not so naming it) as a very broken coast, with the bottoms of the very numerous inlets left open. Its most northern part is a gulf or strait called *La Fortuna,* and probably intended for the *Golfo di Castelli* (the Straits of Belleisle). *Baccalaos* is a small island lying south of *Ilhas de los Aves,* and five or six degrees north of *Terra de los Bertones* (Cape Breton). A chart in Ramusius, designed to illustrate the narratives of Verrazzano and Jacques Carthier, represents a large *Isola de Demoni* immediately to the north of *Terra Nuova,* which is smaller, but still a large island. *Baccalaos* is one of several islets, *Capo de Ras* (Cape Race) being the most southern of them; *Isola de Bertoni* is more to the west, and *Cape Breton* adjoins the mainland of *Nuova Francia* or *Terra de Nurumbega.* In the French charts of early date *Nurumbega* is identified with the territory of the present state of Maine.

[3] Hakl. ii., p. 129; Purchas, iii., p. 809; *Div. Voy.,* Hakl. Soc., p. 54.

[4] Rondeletius (Ramusius, iii., p. 419).

The Edward Bonaventure, under command of Chancelor, captain and pilot-major, was better, or, at all events, more fortunately managed. A storm off Seynam having driven the other two ships out of sight, Chancelor made for the rendezvous at Wardhuis, from whence, after waiting seven days for the admiral, he again sailed, and eventually reached St Nicholas in the White Sea. From that place he proceeded overland to Moscow, delivered his credentials to the Czar Ivan Vasilovitch, and obtained from him many privileges for Cabot's company, which thereafter assumed the appellation of the Muscovy Company. In the following season he returned to England with his ship.

In 1556 Stephen Burrough, otherwise Burrowgh or Burro, late master of Chancelor's ship, and William his brother, subsequently comptroller of the navy, were furnished with the pinnace Serchthrift for the further prosecution of the North-East Passage. On Monday the 27th of April, the right worshipful Sebastian Cabot went on board with divers gentlemen and gentlewomen, who, after they had tasted of the cheer, and viewed the pinnace, gave to the mariners right liberal rewards; and the *good old gentleman*, Master Cabota (then eighty-eight years of age), gave to the poor most liberal alms, willing them to pray for the success of the Serchthrift. Then he and his friends banqueted at the sign of the Christopher, and for very joy of the forwardness of the intended discovery, he entered into the dance himself among the young and lusty company. Up to the 7th of June the Serchthrift was accompanied by the Edward, Captain Chancelor, and another of the Muscovy Company's vessels on their way to the White Sea, afterwards it held on its course alone to the Petchora and Waigatz Straits, which it passed through; and Stephen Burrough thus became the discoverer of the south-eastern extremity of Novaya Zemlya. Accumulations of ice prevented further progress; and the Serchthrift returned to England. Richard Johnson, one of the mariners, wrote at a later date some notices of Novaya Zemlya, and of the customs of the Samöeids, which are to be found in Hakluyt. Chancelor, on the other hand, bringing back an ambassador from Russia, together with commodities to the amount of L.20,000, had a most disastrous voyage. Only one of his ships reached the Thames, two were wrecked on the coast of Norway, and the Edward was driven ashore in a very dark night at Pitsligo in Scotland, when the ambassador succeeded in reaching the land, but Chancelor himself was drowned.

Though the Muscovy Company were much occupied in prosecuting their inland commerce through Russia to Persia, they renewed from time to time their attempts to find a passage eastward along the northern coasts of Europe and Asia. With this view, they instructed their agents to collect information respecting the mouths of the Ob and other large rivers that flow into the Arctic Sea; and they sent out at least two sea expeditions, one in 1568, under Bassendine, Woodcocke, and Browne, of whose proceedings nothing is now known; and the other in 1580, under two able and persevering seamen, Arthur Pet and Charles Jackman, but they also, after visiting Novaya Zemlya, and entering the Sea of Kara by the opposite side of Waigatz Island to that by which Burrough had passed, were arrested in their progress eastward by large masses of ice. Purchas has preserved some papers written by Antonie March, a chief factor of the Moscovy Company, from which it is clear that, previous to the year 1584, an English vessel had crossed the Sea of Kara to the mouth of the Ob, where it was wrecked, and the crew murdered by the natives.

Dutch north-east voyages.

The Netherlanders had witnessed with no small commercial jealousy the progress of the English in Russia, and after trying in vain, through the agency of John de Walle, merchant-ambassador at the court of the Czar, to shake the credit of the Muscovy Company, determined to compete with them in the search for the North-East Passage. Middleburgh, Enkhuysen, and Amsterdam were the towns chiefly concerned in this enterprise; and the citizens of the latter wisely entrusted their ship to William Barentzoon (by abbreviation Barentz),[2] who was peculiarly fitted to direct an expedition of discovery, being endowed with courage and perseverance, to which he united nautical and astronomical skill, with great fertility of resource. His writings, preserved by Purchas, further indicate that he had prepared himself for such a service by consulting the Icelandic records of the ancient voyages.[3] In his first voyage, performed in 1594, Barentzoon rounded the north end of Novaya Zemlya, to the islands of Orange, at its extreme point. In the second, undertaken in the succeeding year, Barentzoon was nominated pilot-major of a squadron, of which Cornelius Corneliszoon was admiral-superintendent. The fleet entered the Sea of Kara, but effected no discovery. In the third and most memorable of these Dutch voyages, Barentzoon was again chief pilot, while Jacob Van Heemskerck and Jan Corneliszoon Rijp were captains. It was Barentzoon's intention to have proceeded to Cape Taimur[4] by the north end of Novaya Zemlya; but, yielding to the urgency of Rijp, he kept much to the westward, and on the 9th of June discovered Bear Island, which seven years later was named Cherie Island by Stephen Bennet, a shipmaster in the service of the Moscovy Company. From Bear Island Barentzoon held a northerly course; and on the 19th of the same month fell in with land in 74. 49. N. Lat., being the N.E. land of Spitzbergen, but thought by him at the time to be part of Greenland. Passing to the S. of this land, through Vaigats or Henlopen Strait, he rounded the north end of that island now known by the appellations of New Friesland and North Spitzbergen, and passing a few miles above the 80th parallel, and then steering S. along the western shores of Spitzbergen, he returned to Bear Island on the 1st of June. Here Rijp separated from him, and sailed to Bird Cape, in the north of Spitzbergen, and from thence home; while Barentzoon, resuming his original design, made for the north end of Novaya Zemlya, which he succeeded in doubling, but was eventually icebound on the 26th August in Ice Haven, lying in Lat. 75. 45. N. There he and his companions were forced to stay, "in great cold, poverty, misery, and grief all that winter," till the 14th of June 1597, when, having previously buried two of their company, and being all reduced by scurvy to a state of extreme weakness, they departed in two open boats or schuits, to retrace the W. coast of Novaya Zemlya, and to strike over to the Russian and Norwegian coasts. The death of William Barentzoon almost at the commencement of this perilous boat voyage, says Gerit de Veer, one of the company, put us in no small discomfort, as he was the chief and only pilot on whom we reposed ourselves under God. Deprived of their skilful leader, the survivors made a greater circuit than they intended, and suffered grievously from want of provision; but at length they reached the river Kola, where they were most unexpectedly welcomed and tenderly relieved by Corneliszoon Rijp, from whom they had parted the year before at Bear Island, and who had, fortunately for them. come that year to Lapland on a trading voyage.[1]

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[1] Rundall, *Voy. to North-East*, Hakl. Soc., p. ii., Introd.

[2] Meaning the son of Barent, or Bernard. Purchas, iii., p. 518. Beke, *Three Voy.*, &c. Hakl. Soc. 1853.

[3] Ivar Bardson, a Greenlander by birth, mentioned in a previous note, was proctor of the episcopal city of Gardar about the beginning of the fifteenth century. His description of Greenland was preserved by Erik Wakkendorph, Archbishop of Drontheim, and a translation of it occurs in Torfæus' *Greenlandia*. Purchas calls the author Ivar Boty, and gives a translation of an imperfect copy of the work found in the Feröe Islands, made out of High Dutch into Low Dutch by William Barentzoon, and out of Low Dutch by Mr Stybre in 1608, for one Henrie Hudson, &c.

[4] De Caep Tabijn, the N.E. end of Siberia, the *Tabis* of Pliny, Beke, &c.

English north-west voyages.

The further exploration of the seas and coasts of Northern Europe and Siberia having been made at much later dates by the subjects of Russia, we now turn to the English voyages undertaken for the discovery of a *North-West Passage;* and first in order are the three voyages of Sir Martin Frobisher in the years 1576–77–78, and consequently eighteen or nineteen years prior to those of Barentzoon, above mentioned. Frobisher's projected enterprise was met at the outset by strong opposition on the part of the Muscovy Company, which was overcome by a mandate from the lord treasurer; and Michael Lok pledged his means and credit for the equipment of the ships. The first expedition, projected on a small scale, consisted of two barks of 20 or 25 tons a piece, and a pinnace of 10 tons, manned by 35 men in the aggregate, victualled and found for twelve months. At Greenwich the mariners, apparelled in sky-coloured cloth, discharged their ordnance, "according to the order of war;" and Queen Elizabeth, standing at an open window, returned the salute by waving her hand. On the 11th of July land was discovered in Lat. 61., "rising like pinnacles of steeples, and all covered with snow," which is now known to have been Cape Desolation, or *Torsukatek*, at the N.W. extremity of the deserted colony of East Bygd in Greenland, but which was thought at the time by our navigators to be "Friseland." At this period Greenland was supposed to lie to the N., in the position of what was afterwards ascertained to be Baffin's Bay. Off Friesland the pinnace foundered in a storm, carrying down her crew of four men; and the Michael, one of the barks, "mistrusting the matter," returned to England, and reported that Frobisher had been cast away. Frobisher, however, stood on to the westward in the Gabriel, and, "knowing that the sea at length must needs have an ending, and that some land should have a beginning, determined therefore at least to bring true proofe what land and sea the same might be, so farre to the north-westwards beyond any man that has heretofore discovered." On the 28th of July (20th, G. Best) he saw a headland which he named "Queene Elizabeth's Foreland," but was prevented from approaching the coast by ice till the 11th of August, when the latitude at noon was 63° 8', and that day he entered the strait, "which he named after his name, Frobisher's Streights, like as Magellanus at the S.W. end of the world." So he entered the same, and passed above 80 leagues therein, having on the "right hand as he sailed westward a great maine, which he judged to be Asia, there divided from the firme of America, which lieth upon the left hand."[2] The strait was subsequently ascertained to be bounded on both sides by islands and not by continuous land. The entrance is described by Best in his account of the second voyage as follows:—"About noone we made the *North Foreland* (Cape Labrador of Hall), otherwise called Halles Island; also the small island bearing the name of the said Hall, whence the ore was taken. . . . This North Foreland is thought to be divided from the continent of the northerland by a little sound which maketh it an island, and is thought to be little less than the Isle of Wight, and is the first entrance of the straights upon the norther side, and standeth in the latitude of 62° 50' N. . . . Queene Elizabeth's Foreland being the entrance of the streits of the southerland, standeth in the latitude of 62° 30' N., northwards of Newfoundland, and upon the same continent, for anything that is yet known to the contrary. . . . The narrowest place of the straights from land to land, between Jackman's Sound and the Countesse of Warwick's Sound, which is reckoned scarcely thirty leagues within the straights from Queene's Cape, was judged nine leagues over at least." Gabriel's Island is 10 leagues within the straits, and Prior's Sound 10 leagues farther. Beyond that is Thomas Williams' Island; and N.W. from it, at the distance of 10 leagues, is Burcher's Island, which is the farthest land attained by Frobisher. Trumpet Island is between Williams' and Gabriel's islands, Mount Warwick is on the S. side of the straits, and Leicester Island and the Countess of Warwick's Sound on the N.

Frobisher, on his first return to England, "was highly commended of all men for his great and notable attempt, but specially famous for the great hope he brought of the passage to Cataya;" and the queen condescended to name the islands on both sides of the straits *Meta Incognita.* A piece of black stone, brought home by one of the company, being submitted to one Agnello, who (by coaxing nature, as he privately said to Michael Lok) obtained therefrom a grain of gold; thereupon the gold-finers promised great matters for more of the same, and a greater opinion was kindled in the hearts of many to advance the voyage again. On the second and third voyages, accordingly, discovery was repressed, cargoes of ore being the sole object; fifteen sail were engaged to bring home this worthless stuff in 1578; and luckless Michael Lok again pledged his credit for the outfit. On this third voyage, off the Queen's Foreland, the fleet encountered a great storm, in which the bark Dennis foundered. A swift current from the north-east meanwhile carried the fleet into *Frobisher's Mistaken Strait*, now known by the name of *Hudson's Straits*. Part of the fleet following the general, "entered within the said doubtful and supposed straights, having alwayes a faire continent upon the starboorde, and a continuance still of an open sea before them; and had it not been for the charge and care he had of the fleete and fraughted ships, the general both would and could have gone through to the South Sea, and dissolved the long doubt of the passage which we seek to find to the rich countrey of Cataya; . . . and where in other places we were much troubled with yce, as in the entrance of the same, so, after we had sayled fifty or sixty leagues therein, we had no lets of yce." After many days, Frobisher turned through a great sound into Frobisher's Straits; and the Gabriel having been sent round, proved the Queen's Foreland to be an island.[1] Best tells us nearly as much of *Meta Incognita*, its natural productions and inhabitants, as we know in the present day. "It is now found," he says in one passage, "that Queene Elizabeth's Cape, being situated in latitude 61½°, which was before supposed to be part of the firme land of America, and also all the rest of the south side of Frobisher's Straites, are all several islands and broken land, and likewise so will all the north side of the said straites fall out to be; and some of our companions being entered above sixty leagues within the *Mistaken Straites*, in the third voyage mentioned, thought certainly that they had descryed the firme land of America towards the south, which I think will fall out to be. These broken lands and islands being very many in number, do seem to make there an *archipelagus*, which, as they all differ in greatnesse, form, and fashion, one from another, so are they in goodnesse, colour, and soyle much unlike. They are all high lands, mountanous, and in most parts covered with snow all the summer long."[2]

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[1] The most remarkable event during the winter in Novaya Zemlya was the unexpected re-appearance of the sun on the 25th of January 1597, indicating a refraction of 3° 49'. (For explanations and comments on this occurrence, we refer to the pages of Dr Beke, *lib. cit.*)

[2] The true position of Frobisher's Straits was long debated, and some charts placed them at the southern point of Greenland; but by the aid of Sir Humfrey Gilbert's map, bearing date 1576, and of modern surveys, they are doubtless correctly laid down in the Admiralty circumpolar chart of 1855. Hakluyt gives two narratives of each of Frobisher's three voyages, which do not always coincide in the dates and names of places. The astronomical observations appear to have been ascertained, or at least recorded, chiefly by Christopher Hall, master of the Gabriel in the first voyage, of the Ayde in the second, and chief pilot of the fleet in the third. Lieutenant George Best occasionally quotes the sayings of Frobisher, his chief, but seems to have copied Hall's latitudes. Neither Master Dionise Settle nor Thomas Ellis notice the latitudes or longitudes. The latitudes were taken with the staffe rather than the astrolabe, because the degrees of the latter were too small to observe minutes.

On each of the three voyages, "Frizeland," as they continued to call the Greenland coast, was seen; and on the third voyage, on the 20th of June, after sailing for a time along "a very hie and cragged land, almost cleane covered with snow," they landed on a place somewhat void of ice. There they saw certain tents made of skins, and boats (kayacks), much like those of Meta Incognita; but along with the usual Eskimo furniture there was found a *box of nails*, whence it was conjectured that the natives had traffic with other nations. Ellis, who mentions this fact, adds no description of the nails, from which we might learn whether they had been extracted from some ancient colonial buildings, or from the timbers of some wreck. Frobisher was the first who is known to have landed on Greenland after the Scandinavian settlements had perished, and he took possession of the country in the name of Queen Elizabeth, calling it West England, and naming a high cliff "Charing Crosse."

The search for the North-West Passage was again promoted in 1585–6 and 1857 by the merchants of London, who committed the charge of the enterprise to Master John Davis. In his voyages, as in Frobisher's, the coast of Greenland was always either sighted or landed upon, though it was generally named Friseland, the appellation of Greenland (Danice *Grönland*) being at that epoch restricted to the coasts opposed to Iceland, and lying in the vicinity of Cape Farewell. A portion of the west coast was, as has been mentioned, named West England by Frobisher; and Davis called a part of the same coast, still further north, the *Land of Desolation*. On one fiord, lying in Lat. 64. 15., which he termed Gilbert's Sound, and where he had many interviews with the Eskimos or Skrællings, the Moravian missionary settlements of Godhaab and Nye Hernhut have been established in modern times. Leaving this fiord, Davis stood to the westward, and discovered land in 66. 40. N. Lat., altogether free from the "pester of ice, and ankered in a very faire rode, under a brave mount, the cliffes whereof are orient as golde." This conspicuous hill was named Mount Raleigh, the anchorage Totnes Rode, and the sound which compasses the mount, Exeter Sound; the foreland towards the north was called Dier's Cape, and the southern one, which projected farther, Capé Walsingham. Coasting the land southwards, Davis came to the Cape of God's Mercy; and keeping close to the north shore because of fogs, found, when clear weather came, that he had shot into a very fair passage, in which he sailed sixty leagues, when he arrived at certain islands having an open passage on both sides. These islands were named, on the third voyage, in honour of the Earl of Cumberland; and Davis then ascertained that the inlet was separated merely by a chain of islands from Frobisher's Straits, which was renamed by him Lumlie's Inlet, and described as a great passage twenty leagues broad. The southern headland of Lumlie's Inlet, named Warwick's Foreland, stands near the 62d parallel of latitude. This headland is also the north promontory of another very great inlet, whose southern cape he terms "Chidleis." Warwick's Foreland is evidently the north or back of Resolution Island of the modern charts, and Cape Chidley the south portal of the Mistaken Strait of Frobisher, or Hudson's Strait. Cumberland Strait has of late years been explored by the whale fishers, and chiefly by Captain Penny, who has named an arm of it running to the north Hogarth Sound. There he has wintered for several years, and carried on a very successful fishery.

In the earlier part of his third voyage, Davis, keeping near the Greenland coast, as the whalers are at the present time accustomed to do, in the spring reached Lat. 72. 14. N., and on the 30th of June had the sun five degrees above the horizon at midnight. The land lying to the east he named the *London Coast*, and a passage south of Upernavik, called by him Sanderson's Hope, is now identified with the *Kosarsuik* of the natives.[3]

Of the northern passage now known as Davis' Straits,

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[1] La Peyrouse, on his way to attack the Hudson's Bay Company's forts, entered Frobisher's Straits by mistake, but afterwards found his way into Hudson's Straits and Bay probably by the sound through which Frobisher passed.

[2] The ore which Frobisher had hazarded so much to procure was found to contain no metal, and poor Michael Lok, being unable to redeem his suretyship, was shut up in the Fleet Prison, and himself and his fifteen children involved in ruin.

[3] In the narrative of the first of Davis' voyages, the necessity of increasing the daily allowance of food in high latitudes is made evident, and incidentally the existence of the Newfoundland cod fishery is indicated in the following passage:—"The men fell in dislike of their allowance, because it was so small, on which every mess of five had four pounds of bread a day, twelve wine quarts of beere, six *Newland fishes*, and on the flesh days a gill of pease more; so we restrained them from their butter and cheese." Part of Davis' fleet was employed in fishing for cod on the Labrador coast while the rest were on discovery in the north; and he mentions that in Lat. 52. he met a "Biskaine" fishing, as he judged, for whales, of which there were many in that sea. Another passage deserves to be quoted. "While the captain was rowing to the shore (of Greenland), our men saw woods on the rocks, ... but I could not discern them." This illusive vision of woods was evidently an instance of the strange effects of refraction so common

Davis himself says,—"I departed from the London Coast (of Greenland), thinking to discover the north parts of America; and after I had sailed towards the west forty leagues, I fel upon a great banke of yce (the middle ice of the whalers): the wind being north, blew much, and I was constrained to coast the same towards the south, not seeing any shore west from me, neither was there any yce towards the north, but a great sea,—free, large, very salt and blew, and of an unsearchable depth. . . . By this last discovery it seemed most manifest that the passage was free and without impediment toward the north; but by reason of the Spanish fleet and unfortunate time of Mr Secretarie Walsingham's death, the voyage was omitted, and never sithens attempted." Mr Sanderson, however, Davis' steady friend, had a globe constructed, exhibiting all that navigator's discoveries, and which is said to be still preserved in the Middle Temple.

Henry Hudson is the next north-west discoverer of note. His first voyage, in 1607, was a bold attempt to cross the Pole. After passing the latitude of Iceland, he held to the west, with the intention of rounding the north end of Greenland, but on the 14th of June he descried a high and bold headland, with a castellated hill behind it, which he named the Mount of God's Mercy; and afterwards he came, in Lat. 73. 30., to a cape, which he named Hold with Hope. Steering from thence north-eastward, he had a faint view of Spitzbergen enveloped in fog; and pushing onwards as the ice and weather permitted, he reached the parallel of 81½., and saw continuous land stretching to 82. N. This land must have been a north-easterly extension of Greenland, for Spitzbergen does not go beyond 80½. N.; and granting the correctness of his latitudes, Hudson's extreme is the most northerly land known, except Mount Parry of Kane's Grinnell Land. His further progress being barred by ice, he came home, and reported most favourably of the Greenland seal fishery.

Another voyage of Hudson had for its result the discovery of Hudson's River, at whose mouth the most important city of the New World has since arisen; but his fame rests chiefly on his last voyage, on which he perished miserably through a mutiny of his men. Previous to this most lamentable end of his honourable career, he had sailed through Hudson's Straits into the bay which also bears his name, its northern and southern portals being called respectively Wolstenholme and Sir Dudley Digges. Turning to the south, past the latter, he coasted the western shore of Labrador; but at this point his own narrative closes, and for the rest we have only the doubtful story of Abbacuck Prickett, one of the mutineers, though, he avers, an unwilling one. He reports that a convenient winter harbour was not found till the 1st of November; that the crew suffered greatly from their ignorance of the climate, and became discontented, disobedient, wasteful, and selfish. On the 21st of June, when they had left their harbour, the mutiny came to a head; and Hudson was seized, bound, and driven, along with his son, into the shallop. The carpenter being overpowered, after a gallant defence, insisted on sharing the fate of his master; and six sick and infirm seamen were also forced into the boat. None of the party thus inhumanly abandoned were ever heard of again; but retribution speedily fell on the leading mutineers, who were killed at Cape Digges in an assault of the Eskimos. After great sufferings from famine, the survivors reached England, Bylot, who became a celebrated pilot, being of the number.

Sir Thomas Button, accompanied by Bylot and Prickett, prosecuted the discovery in 1612–13, taking the route of Hudson through the straits. Passing a southern point of Southampton Island, which he named Cary's Swan's Nest, he reached the western coast of the bay in Lat. 60. 40., and because it arrested his progress in that direction, he called it *Hopes Checked.* Turning southwards, he entered Nelson's River in Lat. 57. 10., and there wintered. The estuary of the river he named Button's Bay, and the adjacent country New Wales. His crew experienced the usual miseries of scurvy, but were recruited by the large quantities of birds and fish which they procured in spring, and were able to resume the voyage in the summer of 1613. In advancing northwards along the coast of the continent, a strong tide was felt off the mouth of the Missinippi or Churchill river, and being considered by the pilot to be a favourable sign, the locality was designated, after him, *Hubbart his Hope.* On the 29th of July the voyage out ended in Lat. 65., somewhere near Whale Point, and the land south of it was named *Ut Ultra.* On the homeward voyage Cape Southampton was rounded, and an island to the eastward of it discovered, and named Mansel, since erroneously written Mansfield on our charts.

In 1612 further acquaintance was made with the coast of Greenland by James Hall and William Baffin, who went thither to look for a gold mine reported to have been worked by the Danes, probably under Admiral Munck. This was sought for at Cunningham's river or fiord, in the district of Holsteinburg; but no metal was found, though traces were discovered of former diggings. Baffin, associated with Bylot, afterwards passed through Hudson's Strait; and Mr Rundall has published an unmutilated version of Baffin's journal, together with his chart, which furnish conclusive evidence of his knowledge of the art of navigation, but add nothing to Sir Thomas Button's previous discoveries. One passage, however, of the journal deserves quotation:—"Doubtless there is a passadge, but within this strayte, whom is called Hudson's Straytes, I am doubtfull, supposing the contrarye. But whether or no I will not affirm, , . . . and my judgment is, if any passadge within Resolution Island, it is but some creek or inlett, but the mayne will be up *Fretum Davis.*"[1]

In accordance with the above opinion, the same navigators sailed in 1816 up Davis Strait, and coasted the whole of Baffin's Bay, naming in succession *Woman's Islands,* in Lat. 72. 45.; *Horn Sound,* in 73. 45.; *Digges Cape,* in 76. 35.; and 12 leagues onward, *Wolstenholme Sound,* having an island in its entrance. They were next embayed during a storm at the entrance of *Whale Sound,* in Lat. 77. 30.; and after passing *Hakluyt's Island,* saw another great sound running to the north of 78°, and observed with surprise that their compass varied five degrees to the westward. This sound was named after *Sir Thomas Smith.* Descending along the western side of Baffin's Bay, *Carey's Islands* were next seen; and, on the 10th of July, the boat being sent on shore at the entrance of a fair sound, to which they gave the name of *Alderman Jones,* brought back a report of plenty of sea-morses, but no inhabitants. On the 12th, Sir James Lancaster's Sound was discovered, but a ledge of ice then lying across it prevented Baffin from crossing the true threshold of the North-West Passage. In his letter to his patron Sir John Wolstenholm, this able and adventurous navigator explains why these various sounds were not explored. Off Wolstenholme the ship drove with two anchors ahead, and was obliged to haul off shore with a low sail. At Whale Sound an anchor and cable were lost; and the wind continued to blow so strongly when he was off Sir Thomas Smith's and

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in an icy sea, and so well illustrated by Dr Scoresby, which was denominated *Fly-land* by Luke Fox, and may be called *Fata glacialia,* being as marvellous and equally beautiful as the *Fata Morgana* of the Faro di Messina. Moreover, it furnishes a solution to the story of woodlands seen from the Busse of Bridgewater, one of Frobisher's fleet, and the fable of the *Sunkenland of Busse.*

[1] Rundall, Hakl. Soc.

Whale sounds that the ship could not remain at anchor, and the crew of seventeen were wholly employed in working her during the rough weather. Baffin, however, came to the conclusion that he had been coasting a great bay, and that there was no passage, nor hope of a passage, that way,—an opinion now known to be erroneous, but singularly coincident with that of a late navigator who retraced Baffin's course. The chart of Baffin's voyage was subsequently published by North-West Foxe. Nothing further was effected in this direction till 1819, notwithstanding that the Davis Strait whale-fishery was actively carried on during the two intervening centuries; but no charts were published by the whalers, either through incapacity, or from the narrowness of commercial jealousy, and geographers continued to give fanciful delineations of James's Island, and of the position of Baffin's Bay, till a recent date. The strongly-expressed opinion of Baffin had probably much weight in turning the search for a passage from this quarter to the northern outlets of Hudson's Bay; and thither, accordingly, various expeditions were directed.

Jens Munck.

The Danes had not seen unmoved the efforts of England; and Jens Munck, who had previously made some voyages to Greenland, entered Hudson's Bay in 1619, and wintered in Churchill River, to the estuary of which he gave the name of *Munckenes Winterhaven.* The neighbouring coasts were called *New Denmark;* and in like manner he bestowed the name of his sovereign Christian IV. on Hudson's Strait and Bay, but discovered no new lands. All his people, except two, perished of famine, or its dire attendant, scurvy; but with these two he managed to navigate the smaller of his vessels back to Europe.

English north-west voyages.

The voyages of Captain Luke Foxe, or, as he delighted to call himself, "North-West Foxe," and of Captain James, undertaken independently in 1631–32, aided the search for a North-West Passage by negativing a westerly outlet from Hudson's Bay, below the highest latitudes to which they attained. Foxe in his first year went to the westward of Southampton Island, and named a small island, lying in Lat. 64. 10., *Sir Thomas Roe's Welcome,* a designation which was afterwards transferred to the channel in which the island is situated. In the following season he tried the other side of Southampton Island, and coasting the eastern shore of Bylot and Baffin's *North Bay,* attained the latitude of 66. 47., which became *Foxe's Farthest.* The various headlands of a large island lying across the western extremities of Frobisher's and Cumberland straits were named by him King Charles his Promontory, Cape Maria, Lord Weston's Portland, and Point Peregrine; the latter being the northern extremity of the island. By a deep arm of Cumberland Sound, running to the westward, and bearing the native name of *Tenudiakbeek,* there is an Eskimo route from Davis Strait to the coast near Point Peregrine, a large sheet of water named Lake Kennedy, lying midway.

For almost a century after these voyages, or from the time of Charles I. till after the accession of George I., civil wars and revolutions at home, and the wars of Marlborough abroad, engaged the attention of the nation, to the exclusion of maritime discovery, the only effort in that cause being an abortive attempt by Captain James Wood in 1676, undertaken through the influence of the Royal Society, to make the North-East Passage by way of Novaya Zemlya.

In 1719 the Hudson's Bay Company fitted out an expedition of discovery, consisting of a frigate commanded by Captain George Barlow, and a sloop by Captain David Vaughan, but placing over both Mr James Knight, ex-governor of several of their factories, who had attained the mature age of eighty years. This expedition sailed northwards between Southampton Island and the main; but not returning when expected, was at first supposed to have reached the Pacific. In 1722, however, one Scroggs being sent to look for them, found himself to be incompetent to contend with the shoals and rocks of that coast, and returned after having picked up some fragments of ships' fittings on *Marble Island,* which is identical with the *White Island* and *Brook Cobham* of Foxe. In 1747 other remains were found on the same island by Captain Smith; but it was not until 1748 that a Hudson's Bay sealing-smack discovered the wrecked ships lying under water in a cove of the island, and ascertained the fate of the crews from the Eskimos. That people reported that when the English entered the cove, with their vessels much damaged, their numbers were about seventy. At the close of the winter only twenty remained alive, though they received occasional supplies of provision from the natives, in exchange for articles of iron, which the blacksmith was constantly employed in forging. A second winter made a still greater breach in the numbers of the unfortunate outcasts, and when the Eskimos next visited them in summer, only two remained alive. These sad survivors went frequently to the top of a rock, and gazed earnestly to the S.E., as if they expected relief from thence, but seeing no friendly sail, they sat down and wept. At length one of these melancholy men died, and the other, exhausted in the attempt to bury him, fell into the unfinished grave, and therein breathed his last.[1]

In 1741–42 Captain Middleton, a shipmaster of the Hudson's Bay Company, was engaged by the Admiralty to attempt further discoveries up the *Welcome,* as the passage to the west of Southampton Island had come to be called. After wintering in Churchill River, he proceeded northwards, and discovered *Wager Inlet* and *Repulse Bay,* the south headland of which he named *Cape Hope.* Further advance being impeded by ice, he walked over high land to the north-eastern extremity of the bay, and from thence beheld a *frozen strait* running round the north end of Southampton Island towards Cape Comfort and the North Bay of Baffin. Sir Edward Parry, eighty years afterwards, proved the perfect correctness of Middleton's report; but Mr Dobbs, who had stood out as the patron of the voyage, could not brook his disappointment in the result, and became a bitter controverter of Middleton's honest and seaman-like statements. The voyages of the Dobbs and California in 1746–47, in the same direction, fell short of Repulse Bay, but, as far as they went, the reports made of them agreed with those of Middleton. Dobbs, who took an active part in sending the ships out, seems to have infused a spirit of contention among the officers, and, as a result, we have a double set of names imposed on the headlands, and two polemical narratives. *James Douglas Bay* is synonymous with Rankin's Inlet, *Chesterfield Inlet* with Bowden's Inlet, and so on. (The correct positions of the inlets and promontories of this coast have been very recently ascertained by Dr Rae, chief factor of the Hudson's Bay Company. This enterprising and skilful traveller in 1854 ascended the River Quoich, from the north side of Chesterfield Inlet, for two degrees of latitude, until he crossed the parallel of Wager Inlet, passing within about 20 miles of its head waters, and at about 80 geographical miles direct from the nearest bend of the Great Fish River.)

After slumbering for a quarter of a century, the spirit of North-West discovery was again awakened by the Hudson's Bay Company, who sent Samuel Hearne to the mouth of the Coppermine River. This fur-trader had few of the qualifications of a discoverer, except a knowledge of the customs of the country and some acquaintance with the native languages. His astronomical observations were altogether erroneous, and he placed the junction of the river with the sea in Lat. 71. 54. N., and Long. 120. 30. W.; while the true numbers, as afterwards ascertained by Sir John Franklin, were 67. 48., and 115. 47. The latter saw the sun set there on the 17th and 18th of July, while Hearne reports it to have been "some height," or, in his manuscript, "a handspike" high at midnight on the same day of the year. Hearne's narrative of his journey is interesting; but that he was able to reach the Coppermine at all was owing to the energy of his guide and leader Matonabbee, an intelligent Northern Indian chief.[1]

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[1] Hearne.

The Admiralty expedition in 1773 to Spitzbergen, under Captain Phipps, afterwards Lord Mulgrave, effected nothing in the way of discovery; but the press at this period teemed with publications on the probability of a North-West Passage; and this expedition was a feeble compliance with the public desire for an effort towards its accomplishment.

Russian voyages.

We turn to the progress of Arctic discovery on the coasts of the Russian empire; and it may simplify our statements if we premise that we know now the *Sievero Vostochnoi Noss*, or the "North-East Cape," to be the most northerly point of Asia. It lies on the 100th meridian, and reaches the 78th parallel of latitude, extending higher than *Cape Taimura*, is much to the N. of any part of the American continent, and has never been doubled in a sailing-vessel or boat. It is the Cape Cheliuskin of Middendorf and Peterman.

No ship coming from Europe has passed to the eastward beyond the *Sea of Kara* or *Korskoie*, and the whole N. coast of Asia has been discovered exclusively by Russian subjects, mostly Cossacks, employed to compel the Samöeids, Ostiaks, Tunguses, Jakuts, and Tchuktches, to acknowledge the imperial authority, and pay the customary *yassak* or tribute. In 1598 Fedor Dyakow demanded yassak from the Samöeids of the Jenisei; and in 1610 some fur-hunters descended to the mouth of that river, and traced the coast-line eastward to the *Pässida*. The Cossacks in 1630 discovered the *Lena;* and in the course of a few years thereafter, that river, the *Olekma*, and the *Lana*, were pursued down to their efflux in the Arctic Sea, the Tunguses of the district being then for the first time subjected to yassak. At the same epoch Ivanoio discovered the Indigirka, and carried the survey of the coast onwards to the Alaseia, 153 degrees E. of Greenwich. In 1644 the Cossack Michael Staduchin formed a winter establishment on the delta of the *Kolyma*, which has since expanded into the town of *Nijnei Kolymsk;* and this adventurer was the first who got intelligence of the Tchuktches who inhabit the north-eastern extremity of Siberia. The same Staduchin afterwards navigated the Polar Sea eastward to *Cape Chelagskoi* or *Erri Noss;* and in 1648 Semen Deshnew, also a Cossack, sailing from the Kolyma, rounded the north-eastern corner of Asia, and passing the strait now bearing the name of Bering, entered the *Gulf of Anadyr*, where he suffered shipwreck. The *Svätoi Noss*, or Sacred Promontory of this voyager, is the same with *Cape Chelagskoi;* but the true *Swatoi Noss*, so named by the Russians because of its dangerousness, projects between the *Indigirka* and the *Lena*, and was first doubled by the Cossack Timolei Buldakow in 1650.

In 1728 Captain Bering[2] and Lieutenant Tchirikow sailed from Nishnei Kamtschatka Ostrog, on the E. coast of the peninsula of Kamtschatka, and coasted the W. side of the straits which divide Asia from America, leaving St Lawrence Island on the right, seen dimly through a fog. Other portions of the northern coasts have been traced by traders or officials in the employ of the Russian government, among whose names those of Demetrius Laptew and of the merchant Liakhow stand out prominently. The efforts of the former were chiefly directed to doubling the *Sieveroi Vostochnoi Nos*, but he could not bring his vessel within two degrees of latitude of its extremity, and therefore he crossed the promontory on sledges, by which he reached *Lake Taimura* and the bay of that name. Liakhow also partially explored the islands that lie to the N. of the Swatoi Noss, which, by decree of the Empress Catherine, were named after him. He likewise coasted the continent to the eastward of the Kolyma. Much of the survey here briefly alluded to was very imperfectly mapped, and as the narratives were scanty and vague, it was not until Baron Wrangel and Lieutenant Anjou had accurately surveyed the coasts between the 125th meridian and Bering's Straits, that it was possible to understand what their predecessors had effected.

Arctic America.

Until the eighteenth century, expeditions of discovery from England had been equipped chiefly by private adventurers, with ulterior mercantile views, and even when the sovereign countenanced the enterprise, it was as patron merely, or as a small shareholder. Captain Middleton's voyage to Repulse Bay began a new order of things, in which naval expeditions, fitted at the national expense, sailed under the direct authority of the Admiralty. Later in the century voyages round the world were made in king's ships by Byron (1764), Wallis (1768), Carteret (1769), and on a more systematic plan, and with more important results, by Cook in 1768–71. The third voyage of this great navigator was undertaken in 1776, mainly for the purpose of ascertaining the existence or non-existence of a passage between the Northern Pacific and Atlantic oceans. His careful examination of the American coasts from the 58th parallel of latitude northwards, proved that there was no passage lower than *Icy Cape*, which was the limit of his voyage within Bering's Straits. He was, it is true, prevented by a gale of wind from examining the place of the pretended *Strait of Da Fonte*, supposed to lie between the 50th and 55th parallels; but he considered the reports of its existence to be "improbable stories that carry their own refutation with them;" a judgment which was confirmed by Vancouver's minute and accurate survey, made between the years 1790 and 1795. The Russian surveyor Gwosden had seen the American side of Bering's Straits in 1730; and Bering, Tchirikow, and De Lisle had rounded the peninsula of *Alaska*, and touched on the coast near *Mount St Elias*, and also in Lat. 55. 30. in 1741; but Cook was the first who made a continuous and effective survey of those coasts. The failure of Phipps in the Spitzbergen seas, of Cook by way of Bering's Straits, and of vessels sent on two successive seasons to Davis Strait to co-operate with him, satisfied the Admiralty of the day; and for forty years the North-West Passage was unheard of in the government bureaus.

In 1789 Sir Alexander Mackenzie, a member of the North-West Fur Company, trading from Canada, discovered the great river which continues to bear his name, and traced it to its termination in the Arctic Sea; and in 1790–3 the Hudson's Bay Company sent out Mr Duncan to seek a passage by following in the track of Middleton; but his crew mutinying when he had got as far as Chesterfield Inlet, compelled him to return. Lieutenant Kotzebue of the Russian imperial navy made a voyage, at the cost of Count Romanzoff, in 1815–17, from the Baltic to Bering's Straits, in which he discovered Kotzebue Sound, but added

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[1] Matonabbee was much attached to the English, and when La Peyrouse attacked Fort Churchill, he offered to cut off the assailing party with his Indians. Hearne, who had charge of the fort, preferred surrendering without striking a blow, which Matonabbee took so much to heart that he committed suicide.

[2] Bering was a Dane, and his family retain the orthography we have adopted. (Bäer Nachricht, &c.)

Arctic Regions.

Arctic Regions.

nothing else to the surveys of Cook on that coast. This Russian enterprise, however, together with the publications of Dr Scoresby and the personal influence of Sir John Barrow, secretary of the Admiralty, incited the British government to undertake a new series of enterprises, which have resulted in the discovery of the entire northern coasts of the American continent and of the islands beyond it up to a high northern latitude. The annexed list[1] of the ships and overland expeditions connected with this movement is long enough to show the impossibility of describing the doings of each within the compass of a few pages; and we shall therefore confine ourselves to the simplest sketch of the actual geographical discoveries.

The Trent and Dorothea, sent out in 1818 to attempt the Polar route, failed, owing to damage received by the former in the ice; but the Isabella and Alexander, which took the route of Davis Strait, were more fortunate, in being able to return without injury to England before the close of the season. By this voyage Baffin's survey of the bay which bears his name was confirmed, and the various sounds that he had described were found in the exact positions he had assigned to them. Lancaster Sound was closed to Baffin by a barrier of ice, and this was the only inlet attempted by Captain John Ross, who sailed without impediment to Long. 81. 30. W., in Lat. 74. 3. N., a short way within its headlands, Capes Charlotte and Fanshawe. But his progress on so promising a course was suddenly arrested by the vision of a mountain barrier closing the bottom of the sound, seen by few or none in the ship except himself. Without ascertaining by a nearer approach whether the Croker Mountains were firm land or merely one of the atmospheric deceptions so common in those seas, he forthwith returned to England, tracing on his way the W. coast of Davis Strait; but too cursorily, and at too great a distance, to negative the existence of passages through that line of coast.

Doubts of the reality of the Croker Mountains being entertained by most of Captain Ross's associates, and the report of that officer not being thought conclusive by the Admiralty, the Hecla and Griper were despatched, in 1819, to clear up the matter, which they did triumphantly by sailing westwards to Melville Island. After being inclosed in the ice of Winter Harbour for ten months, and making new but fruitless attempts to penetrate the icy barrier to the westward, the expedition returned to England. The success of this voyage, so far exceeding every previous attempt, the preservation of the health of the crews during the long Arctic winter, and the perfection of the commanding officer's general arrangements, placed Lieutenant Parry at once in the van of Arctic discoverers; and he was speedily raised, amid the gratulations of his country, through the grade of commander to that of captain. Reckoning in round numbers the distance between Baffin's Bay and Bering's Straits at 110° of longitude,—viz., from 60° W. to 170° W.,—Captain Sir William Edward Parry explored his way up to Cape Dundas through 54 of these degrees, or nearly a half of the whole distance; and he saw on the verge of his western horizon, Banks' Land, 2½° farther off. He also laid down the chain of islands on the N. side of his track, with the openings between them, including the entrance of Wellington Channel, and on the S. side Regent's Inlet, North Somerset, and Cape Walker. By his subsequent voyages, enumerated in the table, he effected the surveys of the upper end of Regent's Inlet, and of the eastern side of Melville Peninsula from Repulse Bay to the Fury and Hecla Strait, leading into the above-named inlet; confirming completely the accuracy of Middleton's account of Repulse Bay. Finally, having found no navigable passage to the westward in those latitudes, he attempted, in 1827, to make the Polar voyage in boats, and actually reached Lat. 82. 40. 30. N., being the highest authentic position attained by any voyager.

At the same time that Sir Edward Parry was seeking a passage through the Arctic archipelago, Lieutenant (afterwards Captain and Rear-Admiral Sir) John Franklin was prosecuting the survey of the northern shores of the con-

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[1] LIST OF MODERN NORTH-WEST VOYAGES.

1818	Trent	Comm. David Buchan.
	Dorothea	Lieut. John Franklin.
1818	Isabella	Capt. John Ross.
	Alexander	Lieut. William Edward Parry.
1819–1822	Overland (canoes)	Lieut. John Franklin.
1819–1820	Hecla	Lieut. W. E. Parry.
	Griper	Lieut. Mathew Liddon.
1821–1823	Fury	Comm. W. E. Parry.
	Hecla	,, G. F. Lyon.
1824	Griper	Capt. G. F. Lyon.
1824–1825	Hecla	Capt. W. E. Parry.
	Fury	,, H. P. Hoppner.
1825–1827	Overland and Boats	Capt. J. Franklin. Dr John Richardson.
1825–8	Blossom	Capt. W. F. Beechey.
1827	Hecla	Capt. W. E. Parry.
1829	Victory	Capt. John Ross. Lieut. James Clark Ross.
1833–1835	Overland and Boats	Capt. George Back.
1836	Terror	Capt. George Back.
1836–1839	Overland and Boats	P. W. Dease and Thomas Simpson, Esqs., Hudson's Bay Company.
1845–1850	Erebus	Capt. Sir John Franklin.
	Terror	,, Crozier.
1846–1847	North Pole (lugger)	Dr John Rae, Hud. Bay Co.
1848–1852	Plover	Capt. Thomas Moore.
1848–1852	Herald	Capt. Henry Kellett.
1848–1850	Nancy Dawson (yacht)	—— Shedden, Esq.
1848–1850	Overland (boats)	Sir John Richardson.
1849–1851	North Star	Master Saunders, R.N.
1849	Advice (whaler)	Dr R. A. Goodsir.
1850–1855	Enterprise	Comm. Robert M'Clure.
	Investigator	Capt. Richard Collinson.
1850–	Resolute	Capt. Horatio Austen.
——	Assistance	Commander Ommaney.
1850–1851	Lady Franklin	Master Wm. Penny.
	Sophia	,, Alex. Stewart.
1850–1851	Felix (yacht)	Capt. Sir John Ross.
1851	Dædalus	Capt. G. G. Wellesly.
1851–1852	Prince Albert	William Kennedy, master. Lieut. Bellot.
1852	Amphitrite	Capt. Chas. Frederick.
1852	Isabel	Comm. E. A. Inglefield.
1852–1855	Plover	Comm. Rochfort Maguire.
	Boat	Dr M'Cormick.
1853	Phœnix	Capt. E. A. Inglefield.
1852–1854	Assistance	Capt. Sir Edward Belcher, C.B.
	Resolute	Capt. H. Kellett, C.B.
	Pioneer	Lieut. Sherard Osborn.
	Intrepid	Comm. M'Clintock.
	North Star	Comm. W. J. S. Pullen.
1853	Breadalbane	Lieut. Fawckner.
1853	Diligence	Lieut. Elliott.
1853	Rattlesnake	Comm. H. Trollope.
1853	Boats	Dr John Rae, Hudson's Bay Co.
1854	Phœnix	Capt. E. A. Inglefield.
1857–1859	Fox	Capt. M'Clintock (not yet returned).

tinent. In 1819–1822, after travelling overland from Hudson's Bay to the Coppermine River of Hearne, he descended to the mouth of that stream, and traced the coast of Cape Turnagain through nearly 7° of longitude; but owing to the deep indentations of the coast-line, having actually performed a sea voyage in canoes of 550 geographic miles in the seven weeks during which the navigation was open. In 1825–7 Franklin descended the Mackenzie, and traced the coast westward to Return Reef, 158. 52. W. Long., or about 22½° from the principal mouth of the Mackenzie. In connection with this expedition, Captain Beechey, in the Blossom, had gone through Bering's Straits, and by means of his boats, had explored the American coast to Point Barrow, 120 miles beyond Cook's Icy Cape, and only 160 miles distant from Franklin's Return Reef.

While Franklin was employed to the westward of the Mackenzie, Dr John Richardson was tracing the coast between that river and the Coppermine, comprising, to Cape Krusenstern, his most easterly point, 21 degrees of longitude in a direct line, having seen in his passage through Dolphin and Union Strait a considerable portion of Wollaston Land. This officer also circumnavigated Great Bear Lake, and ascertained the geographical positions of its headlands, being aided in the sea voyage and in part of the lake survey by Lieutenant Kendall. In Franklin's two voyages, therefore, including the operations of the detachment under Dr Richardson, the Arctic coast was surveyed to the extent of 50 degrees of longitude, making, with the portion examined by Beechey, more than half the distance from Bering's Straits to Baffin's Bay, and considerably overlapping Parry's tract, but in a lower latitude; his surveys, moreover, included a very long inland navigation, comprising Winipeg, Athabasca, Great Slave and Great Bear lakes, with the Mackenzie and Coppermine rivers. A *passage* lying N. and S., connecting the tracks of Parry and Franklin, would have solved the North-West problem; as would also an easterly continuation of Franklin's discoveries.

In the years 1829–33, funds having been provided by the munificence of Sir Felix Booth, Bart., Captain Sir John Ross, accompanied by his nephew, Lieutenant James Clark Ross, passing through Lancaster Sound, surveyed the west side of Regent's Inlet, Lieutenant Ross carrying on the survey on foot southwards to Lord Mayor's Bay, and westwards to the western side of Boothia, the magnetic pole, and Cape Nikolai; also rounding Maty Island, and tracing the northern coast of King William's Island. This voyage was remarkable for the number of winters spent in a high latitude; and fears being at length raised for the safety of the party, an expedition was organized for their rescue, commanded by Captain (now Rear-Admiral Sir) George Back, funds being raised by public subscription. During the prosecution of his humane enterprise this officer surveyed the east end of Great Slave Lake, previously unknown, and the Great Fish River, to its estuary, bounded by Cape Britannia and Point Richardson, but still leaving a small space incomplete between his northern limits and the southern ones of Lieutenant Ross. Having been made acquainted, on the eve of his summer voyage, with Sir John Ross's safe return, Captain Back's further extension of the voyage was no longer desirable except for geographical purposes.

To complete the intervals left between these surveys of the northern coasts of the continent, the Hudson's Bay Company employed in 1836–39 one of their chief factors, P. W. Dease, and Mr Thomas Simpson, a junior officer of great activity and enterprise. Proceeding first from the Mackenzie, they succeeded in reaching Point Barrow, thus finishing the discovery of the coast-line on that side, and then, after passing two winters at the north end of Great Bear Lake, they descended the Coppermine, and sailing eastward far beyond Franklin's Point Turnagain, crossed the estuary of Back's Great Fish River, and traced the coast some way farther to the eastward; but owing to the rapid approach of winter, and strong contrary winds, they were under the necessity of turning back without having actually reached Captain Ross's discoveries in the peninsula of Boothia. On the homeward voyage to the Coppermine, Simpson, on whom the geographical survey devolved, laid down most of the south coast of Victoria Land. A small part of this extensive island had been seen by Franklin's party from the lofty summit of Cape Barrow, but it was somehow omitted from his map; and Simpson duly exercised the right of a discoverer by naming it, though, as it is now known to be continuous with Wollaston Land, this appellation has the priority.

In 1845–7 Dr John Rae, in the employment of the Hudson's Bay Company, by a most hazardous enterprise considering the means at his command, and after wintering in Repulse Bay, where for ten months the lives of his party were dependent on his personal skill in the chase, surveyed the bottom of Regent's Inlet up to Fury and Hecla Strait of Parry, on the east, and on the west to James Ross's Lord Mayor's Bay, thereby ascertaining that an isthmus 4 degrees of longitude wide interposed between the bottom of Regent's Inlet, or the Gulf of Boothia, as it was re-named by Ross, and the eastern part of the sea explored by Simpson.

At the beginning of this period,—that is, in 1845,—the Admiralty, after having for a time intermitted the prosecution of a North-West Passage, commissioned the Erebus and Terror to renew the attempt under the command of Capt. Sir John Franklin, who had recently returned from Tasmania, of which colony he had been lieutenant-governor for five years. The two ships were made as strong as the skill of the shipwrights, perfected by previous experience, could effect, and were crammed full of stores and provisions, not, however, amounting in all to three years' consumption, at full allowance. This expedition was seen in Davis Strait, in the same year, proceeding prosperously; but three years having elapsed without further intelligence, active measures were taken by the Admiralty in 1848 for tracing and relieving it.

Searching expeditions.

The Herald and Plover were despatched, towards the close of the year just mentioned, to Bering's Straits, with orders to remain there, and afford aid to the expedition, should it have succeeded in accomplishing the passage. In 1849 Captain Kellett, in the Plover, discovered a group of high islands in Lat. 71. 20. N., near the meridian of the Asiatic Cape North; also the loom of distant mountains, probably part of the chain which Baron Wrangel mentions as visible at times from Jakan.

Sir John Richardson, accompanied by Dr Rae, left England early in 1848, and having landed at New York, proceeded without delay to the head waters of the Mackenzie, where, having joined their boats that had been sent out to Hudson's Bay in the previous summer, they descended the river just named, and minutely examined the coast eastward to the Coppermine, which they ascended and fixed their winter quarters at the north end of Great Bear Lake. Lieutenant Pullen, despatched in the succeeding year (1849) from the ships in Bering's Straits, passed in boats along the coast from Point Barrow to the Mackenzie, but neither he nor Sir John Richardson found any vestiges of Franklin's ships, nor did they receive any intelligence of them from the Eskimos. The search was at the same time proceeding by way of Lancaster Sound under the direction of Captain Sir James Clark Ross. This officer wintered with his ships at Leopold Harbour, on the extremity of North Somerset, having previously examined various points on both sides of Barrow's Strait. In the spring he sent exploring parties in several directions; and himself headed a sledge expedition along the west side of North Somerset, down to Lat. 72. 38., within a short distance of Bellot Strait, which is said to separate North

Somerset from Boothia Felix. No traces of the Erebus and Terror were found, though it is now known that at that very time they were on or near the west coast of Boothia, or off King William's Island. Next summer Sir James, on leaving Port Leopold for the purpose of continuing the search, was suddenly inclosed in a pack of drift ice, and carried helplessly out of Lancaster Sound into Davis Strait. His ships were not released until the 25th of September, when the navigation for the season having come to a close, he reluctantly bore up for England. The want of success of the land and sea searching expeditions did not diminish the desire of the people of England to carry succour to their countrymen imprisoned in the ice; on the contrary, the popular feeling raised by the devoted exertions and pathetic appeals of Lady Franklin was expressed in terms that would admit of no denial. The Admiralty accordingly prepared again for the search on a most extensive scale, regardless of expense. The Enterprise and Investigator (late Ross's ships) were despatched on the 20th of January 1850, to enter the Arctic Sea by way of Bering's Straits, and to pursue the search eastward from thence. In the same year a large force was sent to Lancaster Sound,—viz., Captain Horatio Austen, with two stout vessels and two steam-tenders under his command; Captain William Penny, of the mercantile navy, with two vessels, also under the directions of the Admiralty; Captain Sir John Ross in the Felix schooner, equipped principally by the Hudson's Bay Company; the Albert, Commander Forsyth, sent out at the expense of Lady Franklin; and two vessels from the United States, under the command of Lieutenant De Haven, and equipped by the munificence of Mr Grinnell, a New York merchant. Such a squadron, though it did much, might, if it had been well distributed, have effected more; but, as it happened, they all, with the exception of the Albert, pressed on directly to the westward, and at the close of the season were congregated on the coast of North Devon. The Admiralty showed a want of judgment in sending officers of the royal navy and of the merchant service with independent commands to the same quarter, and prepared the way for misunderstandings and bickerings which did not fail to follow. Captain Ommaney, on the 23d of August, in one of Austen's tenders, found traces of one of Franklin's encampments on Beechey Island, but hastened on after his commanding officer without exploring the island further. The American expedition also landed at the encampment; but it was reserved for Captain Penny, who made a more leisurely and extensive search, to discover Franklin's winter quarters, and the tombs of three of his men, who had died early in 1846; yet no memorial was found of Franklin's proceedings, nor any indication of the course he intended to pursue on leaving that harbour. The American vessels, when the navigation was about to close, bore up to return home, when, being caught in a floe, they were carried by the winds and currents first into Wellington Sound, by which they became the discoverers of Grinnell Land, and the lower part of that channel; next into Baffin's Bay, and there, and in Davis Strait, they remained shut up in the ice, drifting all the time to the southward, until the approach of the following summer released them. Captain Penny during the winter explored both sides of Wellington Sound with his sledge parties in the spring, to beyond the straits formed by the chain of islands named by him Dundas and Baillie Hamilton. Captain Austen, also, by a skilfully combined system of sledge expeditions, examined the north shore of the sea named in the Admiralty charts Melville Sound; also the openings northwards on each side of Byam Martin Island, which were followed for some way. He likewise traced the coast of Prince of Wales Land on the south of Melville Sound, down to the 72d parallel of latitude on the west, and to the 73d parallel on the east. This survey embraced a visit to Cape Walker, which is the eastern extremity of Russell Island. The examination of this line of coast was most important, as it was towards Cape Walker that Franklin's instructions directed him to go, but no indications were discovered of the missing ships having touched at any part of the coast thus minutely explored. To Captain Austen the merit is certainly due of having brought the sledge equipments to a degree of efficiency that they had not previously attained on the ice of the Arctic Sea, and he was well seconded by his officers and men, who made journeys remarkable both for the number of days that they were absent from the ships, and for the great extent of coast that was traversed. This year, also, the North Star, Master Saunders, carrying stores to Lancaster Sound, was driven by stress of weather into Wolstenholme Sound, and wintering there, surveyed that indentation of the Greenland coast.

On the return of the various ships employed in Lancaster Sound to England, at the close of the summer of 1851, complaints were made by Captain Penny that he was prevented from proceeding as far up Wellington Sound as he could have done, had he received the assistance that he asked from Captain Austen: the public press took up his cause warmly; and many writers, led away by their imaginations, expressed their opinions that Franklin had sailed far north into a Polynia, or open Polar sea, the existence of which was supported by plausible reasons. This line of argument, perseveringly urged, had an injurious effect on the future arrangements for continuing the search; and notwithstanding Franklin's known strict adherence to orders, which, as we have said, were to get to the southward from the neighbourhood of Cape Walker, search in that direction was comparatively neglected by the ships which left England in 1852, being pursued only by Lady Franklin's schooner the Albert, and by her but for a short way.

The preparations in 1852 were more complete than in any previous year, and Sir Edward Belcher sailed in command of a most thoroughly efficient squadron. Pursuing the plan that had been recommended to the Admiralty by General Sabine, and practised by Captain Austen, of employing the ships merely as a base of operations, and seconded by able officers already trained to conduct sledge parties, Sir Edward explored the upper outlets of Wellington Channel, and mapped the archipelago of Parry's Islands, from Prince Patrick Island, on the west, to Polynia Islands and North Cornwall, not far from the 78th parallel, on the north, and nearly to Jones' Sound on the east. The lower part of this sound had been entered by Captain Austen on his homeward voyage; Wolstenholme Sound was fully explored by Master Saunders; and at this period three of Baffin's five sounds had therefore been partially or fully examined. The other two, Whale Sound and Smith's Sound, were also looked into this year (1852) by Commander Inglefield, in charge of Lady Franklin's screw-steamer Isabel.

Lady Franklin's other vessel, the Albert, which left England in 1851, wintered that season in Regent's Inlet, and Mr Kennedy, her commanding officer, aided by the gallant Lieutenant Bellot of the French navy, a volunteer, made a winter journey of sixty-three days, in which they discovered a strait to the north of Boothia Felix, to which the name of Bellot was given; then crossing and re-crossing Prince of Wales' Land diagonally, they touched at Cape Walker; and after rounding the end of North Somerset, regained their vessel on the 30th of May 1852. The great length of this journey, performed in the severe cold of the early months, is highly creditable to the ability and endurance of the party; but had it been directed to the examination of the lower end of Peel Sound, and the channels round King William's Island, it is more than probable that the fate of Franklin's party would then have been ascertained by the discovery of the remains of the ships, though two years too late to have found any of the crew surviving.

Mr Kennedy did not know that the north part of Peel Sound had been surveyed by Captain Austen's officers; and on looking in that direction from the west end of Bellot Strait, the islands appeared like a continuous barrier denying a passage to ships. He therefore thought it needless to search the southern part, though that was more open. Lieutenant Bellot was unfortunately drowned after the breaking up of the ice in Wellington Sound, to the great regret of all who knew him.

In 1851 Dr Rae, who, in 1850, had been frustrated by ice in an attempt to reach Wollaston's Land in a boat, proceeded thither from the Coppermine river on foot before the opening of the navigation, and traced the coast from Simpson's most westerly point of Victoria Land to Prince Albert Sound of Wollaston Land, proving that Victoria and Wollaston are parts of the same island. Crossing again to the Coppermine, he rejoined his boat, descended the river in her, and steering to the eastward through Dease Strait, turned towards the north, round the east end of Victoria Land, as far as Pelly Point. The state of the ice prevented him from proceeding farther than Lat. 70. 2. 30. and Long. 101. 18. W., in that direction, or from crossing over to King William's Island, which he was very desirous of doing. Previous to turning back, he picked up a bit of the stanchion of a ship's ice-plank, doubtless a fragment of the fittings of the Erebus or Terror.

The Enterprise and Investigator, commissioned in 1849 to take part in the search for Franklin by way of Bering's Straits, sailed from England in January 1850, the former under the command of Captain Richard Collinson, C.B., the latter under that of Commander Robert Le Mesurier M'Clure. The latter was fortunate in being able to pass through Bering's Straits a year before his senior officer, and, pushing along the north coast of the continent in the summer of 1850, discovered the south end of Banks' Land, and the strait between that island and Wollaston or Albert Land, for the parts of the coast bearing the latter name are continuous with Victoria Land. His officers surveyed the north shore of Wollaston Land as far eastward as Point Reynolds, which is situated in the same parallel of latitude with Osborn's extreme point, and at the distance of 4° of longitude, or about 65 geographical miles. The existence of a passage in this unexplored interval, through which Franklin's ships may have gone, if they did not pass southward by Peel's Sound, is still an open question. Captain (Sir Robert) M'Clure also surveyed the west coast of Albert, or rather Wollaston Land, down to Prince Albert Sound; and Lieutenant Haswell reached the north side of that inlet exactly ten days before Dr Rae arrived on its southern shore, as already mentioned. Failing in an attempt to enter Melville Sound from Prince of Wales' Strait, Captain M'Clure circumnavigated Banks' Land by the west, and the Investigator, after narrowly escaping shipwreck, was finally shut up in the Bay of Mercy at the northern point of the island. Here, in 1853, the ship was abandoned, and the debilitated crew, travelling over the ice to Dealy Island, were received into the Resolute, and tenderly cared for by Captain Kellett. No one can deny the merit of great nautical skill, resolution, and perseverance to the commanding officer of the Enterprise, who was admirably supported by his officers and crew, nor that the parliamentary grant and other rewards which they received were fully merited; but it is surely a misnomer to describe this voyage as the "Discovery of a North-West Passage." Sir Edward Parry alone, of several navigators from the eastward, was able to conduct his ship as far as Cape Dundas, from whence he looked over an *impenetrable* waste of ice, his view being bounded by the land rising over the Bay of Mercy. From that bay Sir Robert M'Clure and his followers travelled eastwards on foot, and the space intervening between the points reached by his ship and Parry's has never been crossed even by a boat, nor seen in a navigable condition. Sir Edward Parry was stopped by fast ice in the summers of 1819 and 1820; Sir Robert M'Clure found it equally impassable in 1850–51 and 1852; Captain Collinson adds the weight of his testimony to the same fact; Captain Austen, in 1850–51, was unable to advance westward beyond Cape Cockburn; and Captain Kellett got no farther than Dealy Island.[1]

To Captain Collinson belongs the credit of having made the longest voyage along the northern shores of America in a ship. A year later than M'Clure in getting round Cape Barrow, like him he failed in passing beyond the northern end of Prince of Wales' Strait; and after wintering on the west side of Wollaston Land, he carried his ship, in the summer of 1852, through Dolphin and Union straits eastward to Cambridge Bay, on the south side of Victoria Land. His sledge parties came upon the traces of Dr Rae, and learnt from one of his records that he had already examined that coast, but were not able to extend the search farther than Gateshead Island, or 20 miles beyond him. Between this and the 72d parallel of latitude, where Kennedy crossed Peel Sound, there is a space of 92 geographical miles not yet explored, in which, as we have already said, a passage from Osborn Bay, at the south side of Melville Sound, *may* exist. The west shore of Boothia Felix, from Cape Nikolai of James Ross to Bellot Strait is also unknown to the extent of about 90 miles; but that there is a strait here continuous with Peel Sound, there can be no reasonable doubt, and it has been named Victoria Strait in Kennedy's account of his voyage. Captain Collinson's voyage, though the longest in the Arctic seas, was, owing to his late arrival in the field of search, productive of but few additions to the map. The Eskimos who visited his ship in Cambridge Bay, had in their possession a piece of an iron bolt, and a fragment of a hutch-frame, which are believed to have come from the Erebus or Terror. A deficiency of coals induced Captain Collinson to return by the way he came, instead of spending another year in forcing a passage to the eastward, and after a third winter in the Arctic seas, he brought his ship safely to England.

In 1854 Dr Rae returned to Repulse Bay for the purpose of ascertaining beyond cavil the continuity of the neck of land that separates Regent's Inlet, or the Gulf of Boothia, from the bay into which the Great Fish River falls, and also in the hope of carrying the search for the Erebus and Terror along the west coast of Boothia up to Bellot Strait. Part of this design he effected, establishing the absence of a passage through the isthmus; and crossing from Pelly Bay to Inglis' Bay, he traced the west side of Boothia Felix until he connected his surveys of that coast with Sir James Ross's in 1830. Continuing his route northwards to a little beyond Cape Suisse, he was there compelled to turn back by the state of the weather, the failure of his commissariat, and the sufferings of one of his crew from frost bite. By this journey, however, in combination with his voyage of 1851, he ascertained the insular character of King William's Land, though from its distance he could not lay down all its coast-line. From a party of Eskimos that he met on this journey, he learnt that in the spring of 1850 another small party of that nation were killing seals on the north shore of King William's Land, when they saw about forty white men travelling to the southward along the west side of the island, and dragging a boat and sledges. None of the white men could speak Eskimo so as to be understood, but by signs they intimated that their ships had been crushed by ice, and that they were going where they expected to find deer to shoot. All the men, with the exception of one officer, were hauling on the drag-ropes, and were looking thin. The Eskimos sold them a piece of seal. At a later period in the same season, but before the ice broke up, some thirty dead white men were discovered on the continent a long day's journey to the west of the Great Fish River, and five more bodies lay on an adjoining island. Some of this unfortunate party must have survived till the end of May or beginning of June, when wild fowl arrive, as the neighbouring Eskimos heard shots at that period, and feathers of geese and fresh bones of birds were found by the natives at the spot. From the Eskimos Dr Rae purchased so many pieces of silver plate, and such a variety of other articles that were recognised as having been the property of officers of both ships, as to lead to the conclusion that the party who there perished were the sole remnants of the two crews. None of the Eskimos with whom Dr Rae spoke had seen the white men alive or dead, and the information they gave him, through an able interpreter, had been got by them from others of their nation.

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[1] Sir Edward Parry says,—"It now became evident, from the combined experience of this and the preceding year, that there was something peculiar about the south-west extremity of Melville Island, which made the icy sea there extremely unfavourable to navigation, and which seemed likely to bid defiance to all our efforts to proceed much farther to the westward in this parallel of latitude." (*North-West Passage*, 1819-20, p. 241.) Captain Osborn, in his narrative of M'Clure's voyage, also remarks,—"The heavy pack of Melville Strait, lying across the head of the channel, was supposed to be the reason of the ice of Prince of Wales Strait ceasing to move on to the north-east; and the *impassable* nature of the pack in the same direction in the following year confirmed this hypothesis." (P. 114.) A writer in the *Natural History Review* for April 1858 attributes the fixity of the packed ice in this quarter to the meeting of the Atlantic and Pacific tides in Banks' Strait.

In consequence of the intelligence brought to England by Dr Rae, the Hudson's Bay Company, at the instance of government, despatched Mr Anderson, one of their chief factors, down the Great Fish River in 1855, to visit the spot where the party had perished, and to communicate with the neighbouring Eskimos. Unfortunately, no interpreter could be procured, there being in fact none within 2000 miles; and the only conversation Mr Anderson could carry on with the Eskimos he saw at the mouth of the river, was by the unsatisfactory medium of signs. From them, however, he obtained many additional articles found on the deceased; and on Montreal Island he discovered the spot where the boat had been broken up by the natives for its wood and nails. By expressive and unmistakeable pantomime, the Eskimos told him that the white men had died of hunger. A minute and patient search of the whole peninsula of Point Ogle, and an adjacent island to the westward, as well as of Montreal Island to the eastward, revealed to him neither books nor scraps of paper, nor arms, nor a single human bone or grave. His supposition, that all the dead were concealed by drift sand can scarcely be acceded to; and the more obvious conclusion is, that he had not arrived at the exact place of the death of the party. The fact of an enfeebled party having dragged a ship's boat to Montreal Island leads fairly to the inference, that no land was crossed by them, and that their weary journey was wholly over ice. Their ships must have been abandoned in the unexplored space of about 90 miles diameter above mentioned, and their journey southward discovered an ice-bound strait forming a link or a barrier (according as it is permanently closed or occasionally open) in the North-West Passage, some months earlier than Sir Robert M'Clure crossed one of a similar character in a higher latitude. A regard for the fame of her gallant husband and his brave companions has led Lady Franklin to seek for written records of this discovery by a further search, and perhaps the humane promptings of a hope surviving in her breast, though extinguished elsewhere, that even yet relief may be carried to some forlorn survivor of the catastrophe.

Government having declined any further proceedings, Lady Franklin, in 1857, placed the Fox yacht under charge of Captain M'Clintock, who volunteered once more to encounter the hardships and hazards of an Arctic search. He sailed, with a crew of twenty-four, including Anton Christian, a Greenland Eskimo, intending to seek the remains of the ships in the unexamined space already several times alluded to as lying to the N. of King William's Island. That summer he was unable to cross Baffin's Bay, but being caught in the "middle ice," he drifted with it to the southward all the winter, during which northerly winds blew almost continuously. On being released in the summer of 1858, with his crew in good health and spirits he touched on the Greenland coast for supplies, and afterwards gained the west side of the bay, being, when last heard of, near Pond's Bay.

The narrative of this melancholy search, which has added so largely to the geography of the Polar seas, has led us to postpone the notice of an enterprise the most remarkable of all, and prior in point of time to some of those above mentioned. We allude to Dr Kane's wonderful exploration of Smith's Sound. That he should have sought the Erebus and Terror at all in such a direction is due perhaps to the adoption of the Russian theory of a *Polynia*, and the arguments of a party expounded in the periodical press, forgetting that Franklin would unquestionably pursue, if able, the course pointed out by his instructions, of penetrating by the first opening he could find near Cape Walker to the open channel along the continental shore. Be this, however, as it may, Dr Kane, having chosen his line of search, pursued it unflinchingly under difficulties, arising from the severity of the climate and scantiness of means, that would have appalled and driven back any one not possessed of that fixedness of purpose and fertility of resource which formed parts of his character. His voyage commenced in 1853, and he reached home, after passing two winters in Smith's Sound, and finally abandoning his ship, in 1855. According to Dr Kane's view of the structure of the coast, Greenland terminates at Cape Agassiz by the stupendous Humboldt Glacier, issuing from a *mer de glace* a little above the 79th parallel; this glacier, 60 geographical miles wide, being the boundary between it and Washington Land. The highest point of Washington Land is Cape Constitution, in Lat. 80. 56. N. This is not far S. of the land seen by Hudson in 1607, to the W. of Spitzbergen, which may therefore be considered as part of the eastern coast of Washington Land. On the western side of Smith's Sound, the extreme point seen by Dr Kane's party is Mount Parry, which was laid down approximately by reckoning in Lat. 82. 30. N., and Long. 66. W., or 82. 14. reduced lat. Ross's Inlet, the extreme rock of the Seven Islands, and the most northerly land previously correctly known, is 100 miles more to the S.; and even the somewhat conjectural position of Hudson's northernmost point falls short of Kane's Mount Parry. Smith's Sound, or Kane's Channel, as it is otherwise named, is 33 geographical miles across at its narrowest places. During Dr Kane's residence in Smith's Sound, an unbroken bridge of ice remained across the sound up to the 81st parallel of latitude. Northwards of this there was open sea between Washington and Grinnell lands, whose waters had a temperature of +36° F., while the thermometer marked −60° F. of atmospheric cold.

Physical Geography of the Arctic Polar Basin.

The residents on the shores of Hudson's Bay are aware that pools of water, recognisable from a distance by the mist rising from them, exist in the depth of winter amid the ice of that sea. Sir Edward Parry and other voyagers observed similar pools in higher latitudes, with Dovekies lingering in them all the winter; and Baron Wrangell and Lieutenant Anjou, in attempting to travel northwards over the ice from

Physical aspects.

the estuaries of the Lena and Kolyma, were stopped by open water. Middendorf also, in 1843, found an open sea at Cape Taimura. It is not surmised that the small pieces of water seen by Parry were otherwise than accidental,—that is, not having a fixed locality, but recurring in different situations in different winters; and indeed the winter drift of large ice-fields experienced by Lieutenant De Haven's vessels, by the Resolute after Captain Kellett had reluctantly obeyed the command to abandon her, and last year by Captain M'Clintock, indicates that open spaces must be left by the removal of such extensive fields. That this drift is normal, and not the casual effect of winds in one or two exceptional seasons, is proved by the annual descent in winter of ice-fields and large bergs down Davis Strait, and the similar route of several whalers that have passed a winter in the ice. But the Russian geographers and others have conjectured that, in addition to the comparatively small pools observed in the accessible parts of the *Ledovintoe More*, or Frozen Ocean, there exists at all seasons, nearer the Pole, a *Polynia*, or open sea of warmer water, whose verge was reached by Wrangel, and more recently by Kane.

Ocean currents.

Lieutenant Maury, reasoning from various facts which he adduces, infers that there must be an under-current in Davis Strait from the S., which rises to the surface somewhere in the N., and there produces an area of warm water of *considerable* extent, tempering the climate of high parallels, and being one of the beautiful compensating actions of nature. Baër also takes it for granted that there must be an under-current towards the S. in Bering's Straits, resulting from the superficial one in the opposite direction.

Sir Edward Parry, when he reached the parallel of 82. 45. N. in his memorable boat voyage from Spitzbergen, had to contend with a current setting to the S. at the rate of more than 4 miles a day, which was increased when a northerly wind blew. The natives of the E. coast of Greenland are familiar with the drift of what they call the "great ice," which, coming down from the N., often fills the strait between Greenland and Iceland, and is probably an extension of the drift experienced by Parry. At Cape Farewell the great ice occasionally forms a belt from 120 to 160 miles wide, but in general only a narrower stream, known to the whalers as the Cape Farewell ice; and in some seasons the navigation at that extremity of the land is quite free from port to port. Part of the great ice is deflected to the N. along the W. coast of Greenland, probably by the action of the under-current spoken of by Lieutenant Maury. The main surface current, however, sets out of Davis Strait, and the sounds connected with it, both in summer and winter. On the disruption of the ice off Meville Island, Parry saw it move to the eastward; and it took a similar course many years afterwards, when Captain Kellett wintered at Dealy Island. Sir James Ross's voyage of 1849 was also brought prematurely to an end by drift ice taking in summer a course out of Lancaster Sound nearly identical with the drift of the American ships in winter.

At Bering's Straits, on the contrary, the current, according to general testimony, sets in to the N.; and Commander Maguire, the latest of the Arctic voyagers in that quarter, calls it strong, and of great assistance to him in his passage northwards against contrary winds. He mentions that the whalers, even with favourable winds, were obliged to warp when going against the current. The same current, setting to the northward and eastward, was powerful off Point Barrow.

In the narrow seas bounding the American continent between Point Barrow and Great Fish River the tides are perfectly regular, though of small velocity, and producing but little rise of water, rarely amounting to 4 feet. Some of the late Arctic navigators have thought that they perceived a prevailing current setting to the eastward on this coast. Between the Mackenzie and Coppermine rivers Sir John Richardson found the flood-tide setting to the eastward; but on an indented coast the real direction of the tide can scarcely be ascertained by a passing voyager; and he remarks that a gale of wind produces a greater rise of water on that coast than an ordinary spring-tide,—three days of a strong north-wester being sufficient to flood for many miles the low-lying meadows east of the Mackenzie, and deposit long lines of drift timber at the foot of the rising grounds. In the Strait of the Fury and Hecla the tides rise 9 feet; but the stream of the current was to the eastward throughout the twenty-four hours, with in-shore eddies running the other way. This easterly current was as much as 4 miles an hour at times;[1] and the observers thought that in the summer season it was so much stronger than in the winter as to mask the small westerly stream of the ebb-tide. From Dr Sutherland's register of tides, kept near Cape Hotham, the western portal of Wellington Sound, we learn that the rise and fall varied from less than a foot to a little more than 6 feet. At Cape Becher, on the N. side of the upper extremity of Wellington Sound, the flood-tide flowed about nine hours, and the ebb only three, the fall of tide being rapid. The strength of the current, according to some of Captain Penny's officers, was 4 miles an hour. Farther to the N. (on the 77th parallel) Sir Edward Belcher observed the *ebb* running strong to the E. towards Jones' Sound. As this was an isolated observation, it may be that the ordinary current setting out of the Polar Sea overpowered the feeble westerly ebb-tide, as in the preceding instance. In this quarter also the rise of spring-tides was 7 feet, and that of the neaps 2. In Prince of Wales' Strait the flood came from the S.; and M'Clure ascertained the rise and fall to be about 3 feet at spring-tides, but scarcely perceptible at the neaps.

Lieutenant Maury affirms that a tidal wave cannot be propagated through a barrier of ice 80 or 100 miles wide, and that the ebb and flow of the iceless sea discovered by Dr Kane under the 82d parallel must have been the movements of a Polynian tide generated about the North Pole. The Eskimos reported to Sir Robert M'Clure the existence of an unbroken barrier of ice of unknown width, extending westward from Parry's Island to the meridian of Point Barrow, at the distance of 30 or 40 miles from the continent. This leaves too narrow a space for the generation of a tide, if Maury's opinion be well founded; and the origin of the coast tide must in that case be sought for elsewhere.

Middendorf records a tidal rise of 36 feet in Taimur Bay.[2] If the gulf-stream doubles the extremity of Norway, as Lieutenant Maury's chart indicates, a body of comparatively warm water may strike against the North-East Cape of Asia, raising the flood to the height mentioned by Middendorf, and be deflected into the Polar basin round that far-projecting promontory. That a current sets in that direction along the western shores of Novaya Zemlya as far as Cape Nassau, has been ascertained by Admiral Lutke. Henry Hudson also, at a much earlier date, experienced the same current, which drifted his ship to the N. in a calm. Martens could not detect an ebb and flow of tide at Spitzbergen; nor could Barentzoon in the sea of Kara, or, as it is called from its calmness, Marmora, but he found the height of water at its entrance or *waygatz* to be largely influenced by the wind. Our information, therefore, respecting the movements of the Arctic Sea tends to show that warmer currents from the Atlantic and Pacific set round the North-East Cape of Asia, and also into Bering's Straits; while there is an outward flow, carrying with it much ice, between Spitzbergen and Greenland, as well as out of Davis Strait and down Fox's Channel. How far the under-currents spoken of by Baër and Maury operate in preserving the level is not so apparent. Maury considers one of the causes of the gulf-stream to be the increased gravity of the water resulting from tropical evaporation. In like manner, the freezing of the sea within the Arctic Circle, by precipitating the saline ingredients, must augment the gravity of the deeper unfrozen water; while the lighter surface water, freed from salt, is carried southwards in form of ice. Wrangel informs us that the Great Polynia is from 16 to 18 English miles to the N. of Kotelnoi and New Siberia, and keeps at the same distance from the continent of Asia between Cape Chelagskoi and Cape North.[1] In its vicinity northerly winds always enveloped his party in damp air. During the summer the current between Svatoi Noss and Kolintschin Island is from E. to W., or towards Bering's Straits, and in the autumn from W. to E. A current to the S.E., which prevails in spring, is attributed by Wrangel to the N.W. winds of that season.

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[1] Parry's Second Voyage, p. 336.

[2] Beke, N.E. Voyage, Hakl. Soc. Map.

Winds.

Mr J. H. Coffin, in a treatise published in the sixth volume of the *Smithsonian Contributions to Knowledge* (1854), places a meteorological pole in Lat. 84. N., Long. 105. W., and states that it is encircled by a zone, 23½ degrees in breadth, of westerly or north-westerly winds; encompassed on the south, between the parallels of 60. and 66. of N. Lat., by a belt of easterly and north-east winds, as indicated by observations made at Great Bear Lake, Great Slave Lake, Fort Enterprise, two stations in Greenland, and one at Reikiavik in Iceland. Lieut. Maury's wind-chart also marks the prevailing direction of the winds in the polar basin and northern seas as being westerly, but does not indicate the easterly encompassing belt of Coffin. Baron Wrangel observes that in Arctic Siberia, though the south-east winds prevail in summer, the north-west winds are most frequent, taking the general yearly average, and are especially common in the winter time; they are cold winds in summer, and bring snow-storms in winter. The south-west wind is, however, the most piercing to the sensations in the winter, and on that account receives the name of *Shalonik* from the native Siberians. Captain M'Clintock reports that during his eight months' drift in Davis Strait the wind was northerly. At Fort Confidence, on Great Bear Lake, for seven months of winter in 1848–9, the mean direction of the wind was from S.E. ½ E., the southing becoming more decided as the spring advanced: this observation, made within the verge of the Arctic Circle, being at variance with the general position laid down by Mr Coffin. The pressure of the atmosphere at that place was greatest when the wind was S.E., decreased greatly with a due south or due east wind, and was least when the wind blew from any point to the northward of east. The force of the wind was least in mid-winter; and from December to March, both months inclusive, calms were very frequent, but became rare in April. The sky was comparatively cloudy in October and November; remarkably clear in December and the succeeding four months. In the summer of 1848 little or no rain had fallen.

The theory of opposite aërial currents, which are such important agents in transferring heat, was considered by Professor Leslie to lead theoretically to the same conclusions, with respect to the gradations of temperature in different latitudes, as the empirical formula of Meyer, which represents the mean heat at the sea-level as proportional to the sine of twice the latitude; but Leslie erred in stating the mean temperature at the Pole to be 32° or 28° F.; and on the observations of Arctic voyagers proving this to be greatly above the truth, he was led to assert that there was some latent material inaccuracy in their thermometrical records. That there were in fact great defects in the graduation of the alcoholic thermometers formerly in use, is now well ascertained, but this is remedied by the employment of absolute alcohol only, and fixing the point of − 40° F. by freezing large masses of mercury. Thermometers are now tested for the Board of Trade at the Kew Observatory; and every Arctic traveller may find the error of his thermometer for himself by plunging the bulb into freezing mercury as soon as the temperature is sufficiently low. In consequence of this easily-applied test having been neglected, there is generally error more or less in the earlier thermometric records of the recent Arctic voyages, but not nearly to the extent which Professor Leslie supposes.

The able philosopher just named also informs us that the limit of perpetual congelation forms a curve which is nearly the same as the *companion of the cycloid*, bending gradually from the equator, reverting its flexure at the 45th parallel, and grazing the surface of the sea at the Pole; the mean height of eternal frost under the equator, and at latitudes 30. and 60. being respectively 15,207, 11,484, and 3,818 feet. He is probably correct in stating that the snow-line keeps near the sea-level in the north polar regions, though the *mean* temperature of the atmosphere may be 30° or 40° below what he supposed it to be; and the explanation of the fact ought to be sought in the influence of a sun constantly above the horizon in the summer months compensating in a great degree for the obliquity of its rays, in the aërial currents above alluded to, and perhaps in a greater degree to the oceanic currents. The observations of Humboldt and Dr Hooker, and of others, show how very much the height of the snow-line, in different sides of the same range of mountains, is influenced by radiation from adjoining plains and conditions of aspect. That the reflection of the sun's rays from a snowy surface has a most powerful effect in a clear atmosphere, has been surmised by Professor James Forbes; and it will also be found, we doubt not, that there is a difference between the upper and lower limits of perpetual snow within the Polar Circle as great as on the sides of high mountain ranges. It is certain that phænogamous vegetation is not extinct in the most northern lands that have been attained.

In Dove's isothermal charts, constructed on Baron Humboldt's plan, an elliptical area of greatest cold is placed in Northern Siberia, reaching from Lat. 60. to 81., and including the whole valley of the Lena, with the western part of New Siberia, and the adjoining border of Wrangel's supposed Polynia. Round this (mesocheimal) lines of mid-winter temperatures are protracted in curves, which are far from being regular, but which have all a tendency to form ellipses. Taking these curves as expositions of facts so far as known, they indicate the mildest winters to be in the meridians of Bering's Straits and of the Spitzbergen seas, the most severe being in the parts of Asia and America farthest from these seas. The curves or ellipsoids of mid-summer (mesothæral) heat have their long axes almost at right angles to the winter ones, the summers of Bering's Straits and Spitzbergen being cool compared with those of the continental projections to the north. The district of greatest heat round which the very irregularly flexed mesothæral lines circulate embraces the Persian Gulf and Red Sea, with the intervening Arabian peninsula and the eastern coast of Nubia. The annual isothermals take of course an intermediate direction between the isothærals and isocheimals; and the mean of 32° F., or the freezing-point, passes from a point on the 60th parallel someway south of Bering's Straits, cuts off the southern quarter of Kamtschatka, part of the Sea of Ochotsk, curves regularly by Sagalien on the Amour, and, after touching the 49th parallel, ascends gradually by the south of Tobolsk to the White Sea, north of Archangel; and then, having first dipped suddenly to the

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[1] This was ascertained by Tatarinow and Pschenitza in 1811, Hendenström in 1810, Lieutenant Anjou in 1823, and by Wrangel and his assistants during his various journeys performed between 1820 and 1823.

Gulf of Bothnia, rises rapidly beyond the North Cape to the 72d parallel; whence, taking a descending curve, it grazes the north end of Iceland, cuts the south point of Greenland, and reaches its second southern apsis near the 49th parallel, in the bottom of James's or Hudson's Bay; then, rising in its course through Rupert's Land and the basin of the Mackenzie to the 63d parallel, descends through Russian America to meet the point in Bering's Sea from whence we commenced tracing it.

Though the subjoined thermometric table partakes of the inaccuracies which result from causes alluded to above, it is an abstract of the most complete series of observations that we have been able to collect. By it we are led to infer that the winter cold increases with the latitude on the same meridian within the Arctic Circle, while there is a great uniformity of summer temperature between the parallels of 70° and 75°, from Lancaster Sound to Bering's Straits. Between the parallels of 76° and 81° the summer heat of Spitzbergen, Smith's Sound, and Wellington Sound is nearly alike, and a degree or two below that of Lancaster and Melville sounds. These observations may be neither sufficiently continuous nor correct to disprove the existence of an open Polar basin, yet as far as they go they tend that way.

Table of Temperatures.

Observer.	Place.	Year.	Geographical Position.		Three Summer Months.	Nine Winter Months.	Mean of Year.
			Lat.	Long.			
			N.	E.			
Parry	Spitzbergen, on ice	1827	81¼–82¾°	17–23°	+33·0		
Forster......	Do., Hecla Cove	1827	80	16¾	+38·1		
Franklin ...	Do., at sea	1818	80	10	+34·5		
				W.			
Kane	Smith's Sound..............	1854	78½	70¾	+33·0	—16·8	— 3·2
Belcher	Northumberland Sound	1852–3	77	97	+30·8	—11·8	— 1·1
Rae	Wolstenholme Sound ...		76½	70	+37·8	— 6·8	+ 4·5
Belcher.....	Wellington Channel	1853–4	75½	92	+32·6	—13·7	— 1·7
Pullen	Beechey Island	1853	74¾	92	+36·5	— 6·3	+ 2·8
Sutherland	Barrow Strait..	1850–1	74¾	94	+35·9	— 8·6	+ 2·5
Parry	Melville Island	1819–20	74¼	111	+37·1	—10·6	+ 1·4
M'Clure	Banks' Land	1851–2	74	118	+35·5	— 8·7	+ 1·8
Parry	Port Bowen	1824–5	73¼	89	+36·9	— 6·7	+ 4·3
M'Clure	Prince of Wales' Strait...	1850–1	73	118	+37·1	— 9·6	+ 1·1
Collinson ...	Do.	1851–2	71½	117½	+38·2	— 2·2	+ 7·9
Collinson ...	Camden Bay	1853–4	70	145½	+38·1	— 3·8	+ 6·2
Parry	Strait of Fury & Hecla.	1822–3	69⅓	81½	+35·1	— 1·4	+ 5·8
Collinson ...	Cambridge Bay	1852–3	69	105	+37·5	— 7·1	+ 4·4
Richardson	Great Bear Lake	1848–9	67	118¾	+49·?	— 0·8	+ 9·0
Parry	Lyon Sound................	1821–2	66¼	83	+35·1	+ 1·2	+ 9·8
M'Murray ..	Yukon	1846–7	66	147	+56·7	+ 2·7	+14·6
Richardson	Great Bear Lake	1825–6	65¼	123¼	+50·4	+ 2·3	+17·7
	Godhaab	...	64¼	52½	+40·6	+22·2	+26·8
	Yakutsk	Many years	62	...	+61·6	— 4·1	+14·0
				E.			
Forsell	Enontekis....................	1802–6	68½	39½	+54·6	+16·7	+27·0

It is an established fact, that as we descend into the interior of the earth through the shafts of deep mines, the temperature rises,—according to some at the rate of one degree of Fahrenheit's scale for every forty-five feet of descent; but the increment varies in different localities, and cannot be considered as having been as yet perfectly ascertained over any one extensive district. The superficial crust or soil is moreover influenced by the direct impact of the sun's rays in summer, and, in winters of high latitudes, by radiation into space, and long-continued contact of a cold atmosphere. In all cases, however, the thermal effects of seasons descend like tides through the soil, becoming gradually less and less distinct as the distance from the surface increases, and finally blending and vanishing at depths which vary with the latitude and also with local causes. In severe Polar climates the result is a permanently frozen substratum, whose southern limit is placed by Baër in coincidence with the isothermal line of 32° F., its thickness increasing of course with the decrease of mean temperature calculated for a series of years. At Yakutsk in Siberia, where the mean heat of the year is +14° F., the frozen earth is 382 feet in thickness; but at York Factory, a few miles from Hudson's Bay, where the mean temperature is +25½° F., the frozen substratum was cut through at the depth of 20½ feet: at that place the superficial summer thaw penetrated about three feet. At Fort Simpson on the Mackenzie, five degrees to the north of York Factory, but possessing nearly the same mean annual temperature, the soil was thawed at the close of summer to the depth of eleven feet, beneath which lay a stratum of only six feet of permanently frozen soil, the underlying loose sandy soil being unfrozen at the depth of seventeen feet from the surface of the ground. Throughout the northern shores of the American continent, and in the islands beyond it, the summer thaw penetrates from ten inches to a foot, or a little more; but no shafts have been sunk in America within the Arctic Circle to ascertain the thickness of the permanently frozen substratum.

Spitzbergen lies on the verge of the snow-line,—some low-lying tracts of meadow becoming bare in summer, and also the steep faces of hills; so that enough of grass and lichens are produced to nourish herds of rein-deer; but the higher grounds are covered with snow, and the valleys occupied by glaciers. In Smith's Sound (Lat. 78. 79.) some patches of ground became visible in the first weeks of July on which many flowering plants flourished. *Hesperis pygmæa* and *Vesicaria arctica* were found in fruit by Dr Kane as far north as 81°, accompanied by other phænogamous plants of various families, whose fruits require a considerable number of summer days for ripening. Even dwarf, shrubby *Vaccinia*, *Empetra*, and *Salices* attain the height of Smith's Sound. The east side of that strait, and a great part of Greenland in general. has its valleys and the gorges of its fiords occupied by glaciers; and it is probable that the interior of the northern parts at least are, like Spitzbergen, covered permanently with snow, the only bare spots in summer being steep acclivities lying well to the mid-day sun, or strips of meadow land on the coast. Farther to the westward, in latitude 77° north of Wellington Sound, Sir Edward Belcher observed the lower grounds to become partially denuded of snow early in June; and in the spring of 1851 Mr Goodsir saw patches of bare earth on the 10th of June, the snow at that period being in process of rapid waste. Sir Edward Parry notes a period of seventy days, from June to September, during which vegetation goes on in the low grounds of Melville Island, latitude 74½°. Snow showers are of occasional occurrence in those quarters in every summer month, but soon after the beginning of September the snow that falls is permanent for the winter.

In no part of America within the Arctic Circle where cereals have been sown has success attended the operation, though the cultivation of barley reaches the 70th parallel on the Scandinavian peninsula. On the Mackenzie, turnips and radishes alone of the culinary vegetables could be raised on the 67th parallel. At Shredoi Kolymsk, in 67½°, on the Kolyma, radishes and cabbages without heads were the poor rewards of the kitchen gardener's toil; and a degree farther north, at Nijnei Kolymsk, the climate is so severe that in a low marsh near the village, ice, mixed with vegetable earth, remains frozen the whole year. There the river freezes in September, and the winter is nine months long. Baron Wrangel mentions the occasional occurrence of warm winds, named *teploi weter*, which blow from the south-east by south in the middle of winter, and raise the temperature in the course of twenty-four hours from 47° below zero to 35° above it. Similar warm winds recur once or twice in the winter in the higher latitudes of America, sometimes in December, more frequently in January or February; so that sometimes one, sometimes another, of these months is the coldest in the year. The great effect of these temporary winds proves how much aërial currents may influence the mean temperature of a locality.

The *northern termination of the woods*, though in some degree dependent on soil, and still more on elevation and vicinity of the sea, yet furnishes an approximate measure of the climate of various meridians. In Northern Asia the *line of woods* undulates considerably, yet its general course rises from the verge of the Arctic Circle in Bering's Straits to 71° on the deltas of the Jana and Lena. On the Lulean Alps, Scotch firs (which there ascend above the spruces, and 200 feet above the limit at which barley ceases to ripen) terminate at an altitude of 1300 feet, and the lower edge of the snow-line varies there from 3100 to 4100 feet above the sea, according to aspect. Some *Ranunculi* and similar plants grow above the snow-line in the crevices of steep rocks, where the sun's rays have power; and a few lichens (*Gyrophoræ*) ascend 2000 feet higher. At the island of Mageröe, off the North Cape of Europe, the line of perpetual congelation is about 1100 feet above the sea-level, and trees grow at no great distance from the sea on the northern coasts of Lapland and Finmark. In Greenland there are no trees; but on the west side of Hudson's Bay the line of woods commences between the 60th and 61st parallels, and, inclining to the north as it runs westward, reaches the 68th parallel on the alluvial banks of the Mackenzie, though it does not come so far north on the higher grounds. On Noatak River, which falls into Eschscholtz Bay, the wood-line is coincident with the Arctic Circle; and that curve probably represents its course from Noatak eastward to the Mackenzie, except on the Colville, where the low fertile alluvium may cause it to bend to the north. In the severe Arctic climates, trees are frozen to the centre in winter, but under the influence of the spring sun, travelling above the horizon throughout the twenty-four hours, they are thawed long before there is any material diminution of the snow which covers the frozen soil in which their roots are fixed; yet the deciduous trees show neither leaves nor flowers until the snow has wholly or nearly disappeared.

Animals.

Our restricted space will not permit us to extend those very general remarks on the climate and vegetation of the Polar regions. Certain animals, such as the Canadian lynx, the American hare, and the Moose-deer, are limited in their range by the line of woods,—the latter wandering northwards of the woody country only on river banks whereon thickets of willows grow. The goat antelope (*Aploceros montanus*) and the small Pika or tailless hare, are confined to the Rocky Mountain ridge, which they follow to within the verge of the Arctic Circle; and the magnificent Argali or Big-horn also ranges to the northern termination of the same ridge, in the parallels of 68° or 69°. The Rein-deer has been found in the most northern lands to which navigators have attained; and the Musk-ox, though more partial in its distribution, also attains a high latitude; while the Polar hare and several kinds of Lemmings are residents on all the Arctic islands which produce any kind of vegetation. These herbivorous quadrupeds are accompanied by the Wolf, Wolverine, and Arctic Fox. The Brown Bear also roams over the Arctic wastes of the continents of Europe, Asia, and America; while the White Bear is the tyrant of the Polar seas, making the seals which abound therein its peculiar prey. Some small herds of rein-deer and musk-oxen having been seen on the islands of Melville Sound in the winter, have led some to deny the migrations of these animals; but only a few can find food in the Polar islands during winter, and it is unquestionable that the rein-deer retire in vast herds southwards on the close of summer to the borders of the woody country, where the males and females congregate in the rutting season. In the spring the females, travelling alone, seek the sea-coast to bring forth their young. At that season the *Cenomyces*, *Corniculariæ*, and *Cetrariæ* which clothe the more barren districts like a carpet, become soft and tender amid the melting snow, and furnish fitting food for the does and their young. The grasses and carices also, which grow freely in the alluvial meadows on the coast, are only then shedding their seeds, and still retain some sap in their culms, the sudden autumn frosts having arrested their fructiferous functions, which are not completed till the snow is disappearing on the approach of midsummer. The same may be said of the berry-bearing plants, the *Empetra*, *Vaccinia*, and *Rubi*, whose frozen fruits remain pendant over winter, and when uncovered by the melting snows, supply bears and geese with stores of food.

The Polar regions are the native country of many geese, ducks, and aquatic birds. The Canada goose is the only North American member of that genus which breeds below the Arctic Circle, and many bands even of them travel as far as 68°; while the Barnacle, Brent, Laughing-Goose, and Snow-Goose go to the extreme north to breed. Ptarmigan and Dovekies may be said to be constant residents in the highest latitudes; but the bulk of both these species go southwards for their winter food, though a few dovekies linger behind in the open pools of the Polar Sea. The Raven and Snowy Owl are the only birds of prey that find food within the Arctic Circle in the winter time.

Whales and seals must not be overlooked in any notice, however brief, of the animals of the Polar regions. Taken in conjunction with marine and fresh-water fish and the rein-deer, they are the productions which render the hyperborean lands and seas habitable for the Eskimos. Like the rein-deer, the Right Whales produce their young in the solitudes of the icy seas, but have their equatorial limits between the 30th and 45th parallels.[1] This range of the Right Whale may be called a zoological district, and it is not dissimilar in extent to the ranges of the Snow and Barnacle Geese, which leave their Polar native places to pass the winter on the elevated Mexican plateaux.

Eskimos.

The Eskimos are a people fitted peculiarly to dwell within the Arctic Circle. They occupy the whole of the sea-board of Arctic America, continent and islands, the entire coast of Greenland, and both sides of the peninsula of Labrador. In Greenland, Labrador, and Hudson's Bay only, have Europeans fixed themselves on the Eskimo lands; and though in one or two districts the American red races have, through the more early possession of fire-arms, been able to restrict the southern range of the Eskimos, they have nowhere dwelt among them in America, except on Bering's Sea, where there is a fusion of races. The Eskimo not only subsists in the high latitudes, but has much enjoyment in his routine of duties, which vary with the seasons, and he even prefers his frigid wastes to what we consider more favoured lands. He may be said to be wholly independent of vegetable food, his chief luxury of that kind being the *nerooks* or half-digested lichens which he finds in the paunch of the rein-deer. Occasionally, also, he eats, when the chase fails, a few bistort roots, a little scurvy-grass, or whortle or crow berries in the autumn; but these make no important part of his diet. The nation is, in fact, more strictly carnivorous than any other that we know of; and as a diet consisting exclusively of animal food requires to be very plentiful, the skill and energy of the Eskimo hunter are fully taxed. In summer, at the epochs of the rein-deer migrations, he lays the passing herds under contribution in various ways. He snares them, traps them in pounds and pit-falls, spears them while crossing lakes or rivers, or stalks them, and shoots them with arrows. The skins, especially those of the young, furnish warm clothing for himself and family, the women being skilful in converting the hide into shamoy, or in dressing the fur; the back sinew, split into fine fibres, makes excellent thread; and the antlers and bones are shaped into knives, spear-heads, and fishing-hooks, or are used in the framing of sledges. Twisted into lines, the sinews, or sometimes thongs of the skin, are employed in making nets. The flesh of the rein-deer, dried in the sun or stored in a natural ice-cellar, is reserved for winter food; geese and other birds yielding abundant provision during the season of the autumn deer-hunt. In September, after the deer have passed southwards, the Eskimo families assemble on certain promontories to hunt the whale, and, if successful, they spend a luxurious winter, the blubber and oil of the whale, as well as its flesh, being pleasing to their palates. The oil also supplies their lamps, so essential in the dark winter months. The lamps are made of pot-stone, and the same material is excavated to make cooking-kettles; but these heavy utensils are less valued since the more portable copper kettles of Europe have become known in Eskimo-land. Of the whale's intestines, sails for the women's boats (*oomiaks*) are made, the gut being neatly sewed together in stripes; and of the same material waterproof shirts are formed, to be worn by the men when seated in their small *kajacks*. The ribs and other bones of the whale are used in framing sledges or canoes when drift-wood cannot be had, and also for rafters to the turf roofs of houses. These houses, whether framed of wood or bone, are half sunk in the ground, and are thickly covered with earth, so as to exclude the cold atmosphere; and, with the same view, the passage by which they are entered is long, low, and subterranean. In these *iglöacks* the height of the winter is passed; but when the return of the sun brings length of day, though as yet the air continues very cold, the winter houses are evacuated, and the families travel seaward on the ice to hunt for seals. By a skilful application of his knowledge of the habits of that wary animal, the expert Eskimo hunter brings a daily supply to his family. The seal-flesh is the most favourite food of the people, and its skins are dressed to make durable waterproof coverings for the kajacks and oomiaks, or cut into thongs for lines, which being slit circularly from the skin, are made of considerable length without knots. The skins of the lesser seals also are stripped off in the form of a bag, and the various apertures being very effectually and neatly plugged, are blown up to form an excellent buoy, used in hunting whales or large seals and morses. The Eskimo women are, moreover, very skilful in manufacturing waterproof boots of the seal-skin, or jackets for summer wear. During the spring seal-hunt the family is encamped on the ice in huts most elegantly built of blocks cut from the compact snow, and which endure until the ice begins to break up. In autumn, when the snow is neither deep enough nor sufficiently compact to serve for a building material, the Eskimo knows how to substitute slabs of ice—the cold acting the part of a cement. The only domestic animal the American Eskimo possesses is the dog, which he employs both for the draught and the chase. Formerly it is probable that the Eskimos crossed Bering's Straits, and occupied the coast as far as the Kolyma, or even farther towards Europe. The Namollos of the Gulf of Anadyr are, according to Sauer, a tribe of Eskimos; and traces of Eskimo dwellings have been discovered along the northern shores of Asia as far as the 160th meridian. The more powerful Rein-deer Tchuktche, supposed to be of Tatar origin, are considered as the invaders of the Namollo territory. Throughout the vast linear range of the Eskimos the variations in the language are merely dialectic. The Samöeids have much physical resemblance to the Eskimos, which, as far as such evidence goes, points to a common Mongol origin; but neither the Tchuktche, the Yeniseians, Yukahivi, Samöeids, nor Laps seem to have the nautical skill of the Eskimos, to be able to hunt the whale on the high seas, or to obtain a living on an ice-bound ocean. The domestic habits of the nations just named rather resemble those of the American red races in high latitudes, especially their modes of cradling their infants, and are to be attributed to the precautions that experience has taught them to use against the severity of the climate. The Eskimo kajack is peculiar to the nation. Olaus Magnus mentions that in the year 1505 he saw two suspended in the cathedral church of St Halvard at Aslo, which were reported to have been brought from Greenland by King Haco when he visited that country with a hostile fleet.

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[1] Maury's Chart, *Phys. Geogr. of the Sea.*

Minerals.

In Arctic America, part of Baffin's Bay, the east end of Barrow's Strait, and the continental coast and adjoining islands of Melville Peninsula, the S. end of Boothia, and from thence to the Coppermine, the rocks are mostly granitic, ancient trap, or metamorphic. Farther to the W., and in the islands more to the N., there are considerable tracts of Silurian limestone, and also carboniferous limestones and sandstones; and as far N. as 76½°, at Prince Patrick's Island, liassic fossils have been found. The coal beds of Melville Island belong to the true coal formation, and the beds are supposed to be low in the series; but there is a tertiary coal at Disco in Greenland, on Cape Bathurst on the 127th meridian, and on the Garry Islands at the mouth of the Mackenzie, very similar to the coal higher up the Mackenzie, at the influx of Bear Lake River, and which, from the fossil plants it contains, was judged to be of the miocene age. Moreover, a pleistocene drift seems to be scattered over the horizontal Silurian and Devonian beds, to the height of 500 feet above the present sea-level.

Fossils.

But perhaps the most interesting of all the deposits of past times are vast multitudes of animal remains, in forms very similar to, and in some cases not to be distinguished from, those which are still inhabitants of the face of the earth. The bones brought from the extraordinary ice-cliffs of Eschscholtz Bay, on the verge of the Arctic Circle, were those of the *Elephas primigenius;* the *Equus fossilis,* in no respect different from the bones of the existing horse of the same medium size; the *Cervus tarandus;* the *Ovibos moschatus,* both of them equally like the bones of the existing species; *Ovibos maximus,* of larger size than the musk-ox, but of the same genus; *Bison priscus* (?) vel *americanus* (?); *Bison crassicornis; Cervus alces.* The elephant tusks have been for many years an object of traffic with the natives, who find them in abundance on the Kuskokwim River, on the 60th parallel, and several of the inlets communicating with Bering's Sea and Strait; and an entire skeleton of an elephant was found far inland in the elevated country near the sources of the Yukon, but none has as yet been discovered to the E. of the Rocky Mountain chain. The two fore extremities of a Mastodon, found far to the S., not a great way from the W. side of Lake Winipeg, are the only fossil bones that have been met with in Rupert's Land. The Eschscholtz Bay deposits, full of interest as they are, sink into insignificance when compared with the vast masses of fossil bones on the islands N. of the Asiatic Sviatoi Noss, lying between the 73d and 76th degrees of north latitude. Some of these islands, which are of considerable extent, seem to consist mostly of organic remains, which occupy more space than the solidly frozen matrix in which they lie, and from which, as it thaws annually under the direct influence of the summer sun, the bones drop or are quarried by the natives. Ever since that coast was discovered by the Yakutsk hunters the removal of bones has been going on; and in the year 1821, 20,000 lb. of fossil ivory was procured from the island of New Siberia alone, some of the tusks weighing 480 lb. The skull, flesh, and skin of the *Rhinoceros tichorinus* have been obtained from thence, and the discovery of the entire carcase of a mammoth at the mouth of the Lena in 1779 has been repeatedly commented upon in popular works. The charnel-house smell, and the remains of hair and horn in the Eschscholtz ice-cliffs, tell a similar story of the slow progress of decay since these vast and curious assemblages of animals were entombed in these two localities, lying 50° of longitude apart. The elephant and rhinoceros do not exist on the American continent at the present day, nor in Siberia. The horse was introduced into the former by the Spaniards; and of the other species enumerated above, the musk-ox at the same geological epoch existed in Europe, Professor Owen having identified a skull found in England with the American species. The conditions of sea and land when such accumulations were possible are subjects of conjecture and speculation on which we cannot enter here.

ANTARCTIC POLAR REGIONS.

Our knowledge of the North Polar seas and lands is the result of the search for a strait leading to the Pacific; but the exploration of the Antarctic regions is mainly due to quests after a *Terra Australis incognita.* The belief in the existence of an Antarctic continent can be traced back to the year 1576, when Juan Fernandez sailed from the coast of Chile on a W.S.W. course, and was reported to have arrived, after a month's voyage, at a *tierra ferme*, a pleasant, fertile land inhabited by highly civilized white people, dressed in woven cloth. If this story be not altogether apocryphal, it may be explained in part by supposing that Fernandez reached the coasts of New Zealand. At this time reports were in circulation respecting the Saloman Islands, discovered by Alvaro Mendana de Neyra in 1567, but which that seaman was unable to find on a second voyage made in 1595. The Saloman Islands were supposed so to abound in silver that in one place an entire mountain was composed of the precious metal. Mendana, however, did not realize the hopes that had prompted his enterprise: he and many of his companions died at Santa Cruz or Egmont Island, and the chief pilot, Pedro Fernandez de Quiros, conducted the shattered remnant of the squadron to Manilla. This same Quiros was the first who sailed professedly to seek the *Tierra Austral.* His voyage, performed in 1605–6, had for result the discovery of Pitcairn's Island, the New Hebrides, and various other islands; and the passage of two vessels of the squadron, led by Luis Vaes de Torres, through the strait between Australia and New Guinea; but neither Quiros nor his second in command, Torres, went far to the south. Seven years previous to Quiros' voyage, or in 1599, Dirk Cherrits, in endeavouring to enter Magelhaen's Strait, in company with some ships belonging to Rotterdam, was separated from them in tempestuous weather, and driven southwards to latitude 64°, when he saw a high snowy land, since known by the name of South Shetland, and ascertained to extend southwards across the Antarctic Circle. Other voyages to the S. followed; but Captain Cook is the first navigator who is known to have actually entered within the circle just named. His voyage in 1773–4 was undertaken, as he states, to ascertain whether the unexplored part of the Southern Hemisphere be only an immense mass of water, or contains another continent, as speculative geography seemed to suggest. Of the discoveries that our great navigator made exterior to the Antarctic Circle this is not the place to speak; and it is merely necessary to say that he saw no land to the S. of Southern Thule or Sandwich Land, on the parallel of 60. S.; and that he entered within the Antarctic Circle only thrice, and for short distances,—namely, near the meridian of 40. E., between 100. and 110. W., and between 135. and 148. W.; the most southerly point attained to by him being 71. 10. S., on the 107th meridian, and on the 30th of January 1774. The Russian Bellinghausen discovered Petra Island in January 1821; Weddell in 1823 proceeded 3 degrees farther S. than Cook; Biscoe in 1831–3 discovered Enderby and Kemp islands, lying between the meridians of 45. and 60. E. Balleny in 1839 discovered Sabrina Land and the small islands which bear his name; and Dumont D'Urville saw Adelie Land in 1840. These lands are mostly exterior to the Antarctic Circle; the S. end of South Shetland, Balleny, and Petra islands being the only lands that actually cross it. South Victoria, containing Mount Terror, 10,880 feet high, and the active volcano Mount Erebus, 12,400 feet high, is the discovery of Rear-Admiral Sir James Clark Ross. The farthest point of south latitude reached by this persevering and enterprising officer was 78. 4. S.; and the Parry Mountains, the most southern known land, were seen extending about as far S. This southern land was traced from N. to S. for about 460 miles, and found everywhere barricaded by a high ledge of ice, on which a heavy surf was beating; so that landing was impossible, except on some small islands, which consisted of igneous rocks. The surface was everywhere thickly covered with snow, and there was not the smallest vestige of vegetation; but on the islands there were inconceivable myriads of penguins, whose deposits had formed a deep bed of guano. Cockburn Island, one of the South Shetland group, and not above a mile in diameter, but rising 2760 feet above the sea, lying in Lat. 64. 12. S., Long. 59. 49. W., is the most southern land on which vegetation has been detected. Its flora contains nineteen species, all belonging to the orders of mosses, algæ, and lichens. The cliffs were streaked with the yellow *Lecanora miniata*; the *Ulva crispa* grew on the beach in decaying organized substances; and the minute mosses in the fissures of the rocks. One of the algæ inhabited a pool of fresh water hardly two spans across, and sheltered by a projecting rock; the earth at the bottom, perhaps half an inch below, was hard frozen, and the water itself just thawing in the unusual warmth of the day which had raised the thermometer to 40° Fahrenheit. *Collema crispa* grew on the borders of the pool, and with it a green microscopic *Conferva lecanora.* The sea-weeds *Iridæa micans* and *Adenocystis Lessoni*, gathered on the shores of the island, were all floating. Vegetation could not be traced above a ledge of rocks which girt the island at the height of 1400 feet. The lichens ascended the highest. This land, therefore, lying 3½° from the Antarctic Circle, on the outside, has a climate approaching closer to the absolute and perpetual snow-line than Arctic land approaching 17° nearer to the Pole. No terrestrial quadruped inhabits the lands within the Antarctic Circle, the marine cetaceans and seals being the only mammals that enter its area or approach it within many degrees of latitude. Organized specially to inhabit the chilly Antarctic waste of waters, the almost scaly Penguins resemble the Walrus and Seals in being able to travel long and far beneath the surface of the ocean, in seeking their food in its depths, and in scarcely quitting it except for the purposes of incubation. Indeed one species, the *Solitary Penguin*, carries its egg with it in a fold of skin when it roams far in search of food. The existence of such a creature, and of the *Dodo*, *Moa*, &c., furnishes an argument of certain species having been created solely for limited districts.

A glance at the north and south circumpolar maps will show the great contrast between the Arctic and Antarctic areas,—the one mostly of land, the other of sea. Aërial and marine currents operate in both in modifying the climate, and meet with less interference in the south; yet the summer temperature of the Antarctic Circle is the inferior one. Sir James Ross ascertained the mean temperature within the Antarctic Circle in 1841, for January, February, and March, to be 27°·3,—that of February, passed in the highest latitude, being only 24°·3 Fahr.; while the temperature of the surface sea-water for the first two months, passed between Lat. 66½. and 78., scarcely varied from 29°·2 Fahr. (J. R—N.)

POLARIZATION OF LIGHT. See Optics, part vii.

POLE, Reginald, cardinal, and Archbishop of Canterbury, a younger son of Sir Richard Pole, Lord Montague, was born at Stoverton Castle in Staffordshire, in the year 1500. At seven years of age he was sent to a Carthusian monastery at Shene, near Richmond in Surrey; and thence, when he was about twelve years old, removed to Magdalen College in Oxford, where, by the instruction of the celebrated Linacre and Latimer, he made considerable progress in learning. In 1515 he took the degree of Bachelor of Arts, and was admitted to deacon's orders some time afterwards; in 1517 he was made prebendary of Salisbury; and in 1519 dean of Wimborne and of Exeter. We are not surprised at this young nobleman's early preferments, when we consider him as the kinsman of Henry VIII., and that he was bred to the church by the king's special command.

Being now about the age of nineteen, he was sent, according to the fashion of the times, to finish his studies at Padua in Italy, where he resided some time in great splendour, having a handsome pension from the king. In 1525 he returned to England, where he was most graciously received at court, and universally admired for his talents and address; but preferring study and sequestration to the pleasures of a court, he retired to the Carthusian convent at Shene, where he had continued about two years, when the king began to divulge his scruples of conscience concerning his marriage with Catharine of Spain. Pole foresaw that this affair would necessarily involve him in difficulties; he therefore determined to quit the kingdom, and accordingly obtained leave to visit Paris. Having thus avoided the storm for the present, he returned once more to his convent at Shene; but his tranquillity was again interrupted by the king's resolution to shake off the Pope's supremacy, of which Pole's approbation was thought indispensably necessary. How he managed in this affair is not very clear. However, he obtained leave to revisit Italy, and his pension was continued for some time.

The king, having now divorced Queen Catharine, married Anne Boleyn; and being resolved to throw off the papal yoke, ordered Dr Richard Sampson to write a book in justification of his proceedings, which he sent to Pole for his opinion. To this Pole, secure in the Pope's protection, wrote a vehement answer, entitled *Pro Unitate Ecclesiastica*, and sent it to the king, who was so much offended with the contents that he withdrew his pension, stripped him of all his preferments, and procured an act of attainder to be passed against him. In the meantime Pole was created a cardinal, and sent in quality of nuncio to different parts of Europe. Henry made several attempts to have him secured and brought to England, but all of them proved abortive. At length the Pope fixed him as legate at Viterbo, where he continued till the year 1543, when he was appointed legate at the council of Trent, and was afterwards employed by the Pope as his chief counsellor.

Pope Paul III. having died in 1540, Pole was twice elected his successor, and, we are told, twice refused the papal dignity,—the first time, because the election was made in too great haste; and the second, because it was done in the night. Cardinal Maria de Monte obtained the triple crown; and Pole, having kissed his slipper, retired to the convent of Magazune, near Verona, where he continued till the death of Edward VI. in the year 1553. On the accession of Queen Mary, Pole was sent as legate to England, where he was received by her Majesty with great veneration, and conducted to the archbishop's palace at Lambeth, Thomas Cranmer being at that time prisoner in the Tower. He immediately appeared in the House of Lords, where he made a long speech; and this being reported to the Commons by their speaker, both these Houses concurred in an humble supplication to be reconciled to the see of Rome. They presented it on their knees to her Majesty, who interceded with the cardinal, and he graciously condescended to give them absolution. This business being ended, the legate made his public entry into London, and immediately set about the extirpation of heresy. The day after the execution of Cranmer, which he is falsely said to have advised, he was consecrated archbishop of Canterbury. In the same year, 1556, he was elected chancellor of the university of Oxford, and soon afterwards of Cambridge, both which he visited by his commissioners. He died of a double quartan ague in the year 1558, about sixteen hours after the death of the queen, and was buried in the cathedral of Canterbury.

As to his character, the Catholic writers ascribe to him every virtue under heaven; and even Bishop Burnet is lavish in his praise, attributing the cruelties of Mary's reign to the advice of Gardiner. In this Mr Hume agrees with the bishop, and represents Pole as the advocate of toleration. By every impartial account, he seems to have been a man of mild manners and of real worth, though undoubtedly a zealous member of the Church of Rome. His Life was written by T. Phillips, 2 vols., 1767; a Review of the Life, by Dr Gloster Ridley, and animadversions upon it, by Dr T. Neve, 1766.

POLE (πόλος, *a hinge*), was applied formerly to the extremities of the axis of the celestial sphere in the ancient astronomy; and hence it has come to signify the extremities of the axis on which the earth turns. From this primary signification all the various uses of the word have been derived. It came to be applied to those points which would become poles of rotation if any great circle of the sphere became the equator. In *Physics* it signifies, in general, any tendency towards polarity; and in *Geometry* it is equally loose.

POLE. See Perch.

POLEMARCHUS. See Archon.

POLETÆ (πωληταί, *those who let*) were ten officers at Athens, who, like the Roman censors, let out the taxes and other revenues to the highest bidders, and sold confiscated property.

POLEVOY, Nikolai Alexievich, a voluminous Russian author, was born at Irkutsk in Siberia in 1796. His first notoriety was gained in the character of an infant prodigy. Learning seemed to come to him by instinct. At the age of six, he picked up a knowledge of reading from an elder sister. Although sent to work soon afterwards in his father's brandy distillery and pottery, he busied his little head with nothing else but literature. The composition of newspapers and dramas became the amusement of his leisure hours. No book fell in his way which his mind did not eagerly devour, and his memory did not easily retain. Thus by the time that he had reached the age of fifteen he was a practised author, had read a thousand volumes, and could repeat long scraps of his readings off by heart. Equally remarkable for its enthusiasm was the manhood of Polevoy. Adopting the literary profession at Moscow in 1825, he entered upon a career of almost unexampled activity. The *Moscow Telegraph* was conducted, and its best material supplied, by his own hand. Plays and romances followed in rapid succession from his pen. An elaborate *History of Russia* at the same time advanced till it had reached the twelfth volume. Still more intense did his ardour become when he had removed to St Petersburg. Not content with editing several journals, his prolific mind threw off tragedies, comedies, farces, tales, essays, and translations from Shakspeare. He soon, in fact, outran both his readers and critics, and produced books which were doomed to neglect. The result was, that his fame began to decline, and his health at the same time began to give way. He died in 1846, with a body which had been worn out by incessant exertion, and with a reputation which had not fulfilled its early promise. Among the most important works of Polevoy are *Sketches of Russian Literature*, in 2 vols. 8vo, St Petersburg, 1839; *Dramatic Works and Translations*, in 4 vols., St Petersburg, 1842–43; and *Life of Peter the Great*, in 4 vols., 1843. (See Knight's *English Cyclopædia of Biography*.)

POLI, Giuseppe Xaverio, the "Neapolitan Pliny," was born at Molfetta, in the kingdom of Naples, in 1746. He passed through a course of training which was peculiarly fitted to develop his talent for natural history. At the university of Padua, Morgagni the anatomist was his professor, and Scarpa the anatomist was his friend and fellow-student. In 1776 his promotion to the chair of geography in the military academy at Naples encouraged his scientific zeal. Still more useful was the appointment which he shortly afterwards received to visit the educational establishments of France, Germany, and England. He seized the opportunity of making a collection of shells in all the different districts which he visited, and of gathering hints on natural history from the various eminent foreigners whom he met. Accordingly, after Poli had returned home and had been installed in the chair of experimental philosophy at Naples, the result of this long course of education began to appear. In 1791–95 the first two volumes of his great work *Testacea Utriusque Siciliæ*, illustrated with beautiful steel engravings, were published. He was engaged in preparing the remaining volume when he died in 1825. It appeared not long afterwards.

POLICASTRO, a town of Naples in the province of Principato Citra, on the shore of the gulf of the same name, 22 miles S. of Diano. It has a Gothic cathedral, and was once a place of much importance; but it was taken and sacked by the Turks in the sixteenth century, and has never since recovered its former prosperity. There is a good harbour; and the inhabitants are actively engaged in fishery. Pop. 7000.

POLICE.

Few political questions have been discussed, from time to time, with greater conflict of opinion, or with more of controversial keenness, than have those which relate to the functions, the limitations, and the control of Police. The very definitions of the word which we meet with in our ordinary dictionaries and legal text-books, indicate, by their vagueness and elasticity, how various are the points of view from which police arrangements may be regarded, and how numerous are the links which connect a subject, familiar even to triteness under some of its aspects, with not a few of the most complex problems of the thorny science of government.

urrent efinitions.

Johnson tells us that by "police" is meant "the regulation and government of the city and country, so far as regards the inhabitants" (adding that the word is a French one); which is little more than an abridgment of the passage in which Blackstone says,—"By the public police and economy, I mean the due regulation and domestic order of the kingdom, whereby the individuals of a State, like members of a well-governed family, are bound to conform their general behaviour to the rules of propriety, good neighbourhood, and good manners; and to be decent, industrious, and inoffensive in their respective stations."[1] This, certainly, is a comprehensive definition; elastic enough to include alike the police systems of countries where individual liberty is jealously guarded, and those which exist where statecraft has victoriously established its most repressive agencies.

ntham's finition.

Bentham's definition will contrast favourably with these, as respects both precision and limitation. Police, he says, "is, in general, a system of precaution, either for the prevention of crimes or of calamities. . . . Its business may be distributed into eight distinct branches,—1. Police for the prevention of offences; 2. Police for the prevention of calamities; 3. Police for the prevention of endemic diseases; 4. Police of charity; 5. Police of interior communications; 6. Police of public amusements; 7. Police for recent intelligence and information; 8. Police for registration."[2] There is here, we think, a definition clear and practical, and little open to exception, save in the phrase "police for recent intelligence," which is vague enough to cover a system of espionage, always more fruitful of evil than of good; and although by no means unattempted in this country, invariably condemned as soon as detected.

Conflict of local and central administration.

But in Britain the chief arena of conflicting opinion on this subject lies rather in the control of police than in its functions. The claims of local self-government come here into contact with those of central administration, and the questions recur, "Is it wise to sacrifice something of executive efficiency for the better maintenance of the old constitutional safeguards?" And if it be, "How can the sacrifice be made as small as possible?" Nor is it uninteresting to remember that in all these current discussions about "dangers of centralization," and the like, we have but mediæval questions under a new phase. The citizens and burgesses who, now-a-days at very short intervals, call meetings, sign petitions, and appoint deputations, to protest against the subtle designs of Boards of Health and of Secretaries of State, are but imitating, in modern fashion, those early burghers who made the walled town a sturdy rival to the feudal castle, and who were in the habit of keeping their weapons at least as sharp as their words.

To attempt, even in briefest form, a historical review of the police institutions of all the prominent countries of Europe would greatly exceed the needful limits of this article. For such an account there are ample and little-used materials, and it might be made a useful contribution to our political literature. But here it must suffice to look mainly at the experience, in this matter, of France and of Britain. The one will present us with the most elaborate police machinery that human ingenuity has yet built up, by dint of long-continued application, and under little check from without; the other, until a very recent date, with a series of mere hand-to-mouth expedients, each of them postponed to the last moment, adapted to meet some pressing emergency, and watched in its working by a jealous public opinion. On the one hand, we shall have to keep in view the plain truth, that a nation may pay too dearly even for the repression of crime, and may after all far overshoot the mark; on the other, grave facts will be frequently suggesting the readiness with which petty and tortuous interests assume the mask of a care for liberty, and the necessity that instruments of police,—those especially which strike at the roots of crime, and not merely at its spray,—should have free scope and be held in a firm grasp, if they are to be used effectively.

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[1] Blackstone, *Commentaries*, iv. 13, § 5.

[2] Bentham, *View of a Complete Code of Laws*, c. vi. (Works, by Bowring, iii. 169).

I. The Police of France.

The rise of police in France.

In France, as elsewhere, the organization of police for the repression of crime has its beginnings amidst the strife of conflicting powers. Manorial lordships and clerical privileges of sanctuary are found to present tough obstacles to the due punishment of evil-doers, and those to whom the task is committed have to cast about for some effectual means of surmounting the difficulty. If the same body of men, whose claim to accord the privilege of sanctuary has become a covert to the vilest criminals, is found inflicting atrocious punishments on its own dependants for slight offences, an opening is made for innovation, of which a resolute hand can hardly fail to make good use. When Blanche, regent of France and mother of St Louis, at the head of some servants, hastily gathered at the news of the sufferings which the Chapter of Notre Dame was inflicting on men, women, and children, for default in a village tax, struck with her staff at the door of the Capitular prison,[1] she did something more than bring relief to its suffocating tenants. That blow had many echoes.

But we must pass rapidly over the initiative stage of the police of Paris. It will suffice to say that, until the end of the fifteenth century, the maintenance of the peace of the city, the pursuit and custody of criminals, and the suppression of vagrancy, were the functions of the provost of Paris. Towards 1450 much of the real power of that officer, in the police department, had passed into the hands of his lieutenants (*lieutenant civil du Châtelet; lieutenant criminel du Châtelet*), although the ultimate control lay still with him. Paris was divided into sixteen districts, each presided over by a commissary of police, with a certain number of sergeants (*sergents*) under him.

State of France under Charles VII.

The state of France at this period might well seem almost desperate. The long struggle with the English invaders was indeed almost at an end; but the departing foes left behind them devastated provinces and half-deserted towns. In many parts of the country, barbarism seemed to have resumed its reign. The bands called flayers (*écorcheurs*) were still striking a terror into the minds of the scanty population, the traces of which remained for centuries afterwards in oral tradition,[2] and may be seen still in the popular literature of the time. In Paris itself, wolves ranged the streets by night. Deserted, but not yet dismantled houses, stood in groups, closely shut up, but without claimants.[3]

Establishment of a royal control over the police of the kingdom.

To re-organize the police at such a time must have been a formidable task. Charles VII. took one resolute step, by vesting in the provost of Paris a general jurisdiction over the vagrants and malefactors of the kingdom. There was a great outcry; but some degree of order ensued, and the highways became passable. "The traders in various parts," says a chronicler, "began to resume their journeys; the peasants set to work to rebuild their cottages, to clear their fields, to trim their vines, and to weed their gardens. Towns and districts were restored and re-peopled. After having been so long in tribulation and sorrow, it seemed that God had at length extended to them his mercy and pardon."[4] This first step was followed up by the royal appointment of tax-assessors, who, in 1448, in addition to their ordinary functions, were directed to choose at least one man for each parish (*propice pour estre archer*), to be equipped as a bowman. The purpose was to get the nucleus of a militia; but the *Franc-archer* seems to have been occasionally policeman as well as militiaman. He was always a favourite subject of the jokers and the satirists of the day.

Police measures of Francis I.

About 1520 Francis I. created a special officer, called Provost-Marshal (*Prévôt des Maréchaux*), for the city and district of Paris, and gave him power both to apprehend and to punish vagrants and disorderly persons, without appeal. Thirty constables were placed under his orders. Francis I. also doubled the number of the commissaries of police, and that of their sergeants. The night-watch and town militia were at this period, as they had been for a long time before, distinct bodies, in which the towns-people were obliged to serve by rotation; but numerous exemptions had reduced both of them to inefficiency. Francis I. annulled most of the exemptions. Henry II. imposed a watch-rate on the traders and artizans, releasing them from their compulsory service, and replacing them by paid watchmen. He also established a municipal guard, composed of three companies,—bowmen, constables, and *arquebusiers*, or men with fire-arms.[5] These also were paid from municipal funds.

Retrospect at the main obstacles to good police

Drunkenness, ill-regulated lodging-houses, and the opportunities offered to thieves by shows and crowds in the public streets, are matters which we find pressing on the attention of the police functionaries of Paris in the fourteenth and fifteenth centuries, much as they do on those of our own towns in the nineteenth. As early as 1372, regulations occur for the regular closing of taverns, the responsibility of lodging-house keepers, and the restriction of street minstrels.[6] But here, as elsewhere, the regulations look more formidable on the record than the offenders in many cases found them to be in practice. Sturdy beggars and disbanded soldiers flocked to the capital in crowds, and the municipal force found itself ill able to make head against them. Even as late as 1560 it counted but 500 men of all ranks.[7]

Sale of royal pardons.

The repression of crime was also especially impeded by a monstrous abuse which had grown up at periods of financial embarrassment,—that, namely, of selling royal pardons for money. So far was this abuse carried, that we find instances of the release of criminals, at various stages of the procedure against them, by mere verbal order of the king, carried to the provost or his lieutenant by a chamberlain, a secretary, or a court usher. On strong remonstrance from the Parliaments, edicts appeared laying the blame on the importunities of courtiers, and forbidding the future release of persons in custody, save on the production of letters-patent passed in council, and sealed with the royal seal. But the evil was rather checked than cured.

Police of markets and of public health.

The police of markets and of public health is an interesting branch of this topic, the history of which in France is copious and remarkable. In our own country a considerable change has taken place of late years in public opinion on such matters. Measures of precaution which, not very long ago, were by turns ridiculed as puerile, or denounced as tyrannical, have commended themselves to legislative attention as both wise and essential. It has come to be increasingly apparent that the free use of weights and measures forms no part of the true doctrine of free trade, and that the liberty of wholesale poisoning is a very undesirable development of the liberty of the subject. A view of French practice in this department can hardly fail to be instructive, both when erroneous and when wisely directed. And it should be noticed, that the regulations made immediately for Paris were substantially those which governed the other cities and towns of the kingdom. In some particulars, very similar regulations will be found in the English statute-book, but with less of system and coherence.

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[1] Lebœuf, *Histoire du Diocèse de Paris*, ix. 360–367, as quoted by Frègier, *Histoire de l'Administration de la Police de Paris*, i. 119.

[2] Michelet tells us that an English captain of one of these bands, named Matthew Gough (*Gallicé* "Mathago") is known to this day in some parts in the shape of a *marionnette*, which is a standing bugbear to children. (*Histoire de France*, v. 213, note.)

[3] "Les gens du Roy s'informaient curieusement de ces maisons abandonnées, des morts, des testaments, des heritiers afin d'en tirer quelque chose. Ils alloient parmy Paris, et quant ils véoient huys fermés, ils demandoient aux voisins d'entour: Pourquoi sont ces huys fermés? Ha! sire, respondoient, ils les gens en sont trespassés. Et n'ont-ils nuls hoirs qui y fussent demouré? Ha! sire, ils demourent ailleurs," &c. (*Journal d'un Bourgeois de Paris*, edit., 1827, as quoted by Michelet, *ut supra*, v. 216.)

[4] Mathieu de Coucy, 532, 533; Michelet, *ut supra*, 257.

[5] Isambert, Jourdan and others, *Recueil des Anciennes lois Françaises* (Ordonnances de 1539), xii. 660; Frégier, *ut supra*, i. 194.

[6] *Registres du Châtelet* (Ordonnances de Police, 12 Fév. 1367; 29 Mars, 27 Oct., 1372); Frégier, *ut supra*, i. 261, 262.

[7] Frégier, i. 275.

As early as 1350 we find a royal ordinance of police which provides public weighing-offices, regulates the localities and the hours of open markets, and establishes an inspection of millers, bakers, and butchers. The last named proved to be an especially troublesome race. They took an active part in the disturbances occasioned by the quarrels of the dukes of Burgundy and Orleans and made themselves formidable partisans of the Burgundian faction, a service which was rewarded by special privileges accorded to the fraternity. Hence arose a sort of monopoly in course of time, and much employment for the police.

Police arrangements for cleaning, paving, and draining, 1399–1557.

The trade corporations.

The cleansing of the city was another troublesome department of duty. During the fourteenth and fifteenth centuries there were repeated enactments directing its discharge by the inhabitants, the owner or chief tenant of each house being bound to keep his own share of the street or highway free of encumbrance and dirt. But these were so little operative, that at length (in 1506) a cleansing rate was established. In order to make the novelty work as smoothly as possible, a committee of rate-payers was organized to co-operate with the commissaries of police.[1] It seems strange to read that, when contagious diseases were prevalent, this rate was tacitly suspended, and the cleansing left to the goodwill of each inhabitant. The reason assigned is, the probability that such an impost, added to existing privations, would excite disturbances.[2] Other regulations, however, of a sanitary kind, as, for example, the removal of noxious trades, were at such times enforced with more than usual strictness.[3] The earliest police enactment respecting sewers—such as they were,—and their appurtenances, is of the time of Charles VI.; but there are long anterior municipal regulations as to the provision of *latrines* to every house, on pain of confiscation of rents. Under Francis I., the houses themselves were forfeited if the law continued to be neglected.[4] The paving of streets, and the survey of houses in course of construction, are also the subject of many enactments (*e.g.*, 5th April 1399,[5] 28th July 1500, 16th Feb. 1533, 10th May 1538, March 1557-6[6]). Here the chief difficulties of the police seem to have arisen from the stringent rules of those wardenships and corporations of arts and trades (*jurandes et communautés des arts et métiers*), the procedures and influence of which, especially but not exclusively in France, form so striking a feature in the later portions of mediæval history, and in the earlier epochs of the history of modern Europe.[7] This conflict of authorities resulted in the increase of the powers of the provost and his officers.

Elective police magistrates appointed.

In 1577 a new development was given to the administration of police in Paris, by the power accorded to the inhabitants of each of the seventeen districts (the number had then recently been so augmented) to elect two police magistrates, empowered to hear and determine petty charges, involving only a small fine. The appeal from this summary jurisdiction lay to the weekly general meeting of police functionaries, presided over by the provost or one of his lieutenants. In addition to their judicial duties, these new magistrates acted, jointly with the commissaries of police, in the inspection of markets, workshops, and lodging-houses.[8] A further step towards the suppression of the baronial and manorial jurisdictions was taken in 1639, by the transfer of their powers in matters of police to the Châtelet.

Workhouses provided for able-bodied vagrants, and hospitals for the infirm, 1612–1618.

It was also in the reign of Louis XIII. that new measures were originated with a view to the suppression of mendicity. Workhouses in the faubourgs St Victor, St Marcel, and St Germain were provided for the reception of all vagrants. The first was assigned to able-bodied men, who were employed in grinding wheat, in pounding cements, in brewing, and other hard labour; the second to women and children, whose task was knitting, button-making, and other feminine occupations; the third was made an hospital for the infirm.[9] Within a week, a very large portion of the Paris mendicants were safely housed: sturdy beggars entirely disappeared from the streets; and for some years the plan was vigorously carried out; but eventually it proved to be a failure.

In the *Histoire Générale des Larrons* we have an authentic and singularly graphic account of the criminal and vagrant classes of the French, and especially of the Paris population, as they were under Louis XIII. They were organized much on the plan of the incorporated trades; had their system of apprenticeship, and of "freedom" on proof of competency; and their common fund, fed by a *pro rata* contribution from the proceeds of robberies. There are but few of the stratagems which excite attention for their ingenuity in the criminal reports of the nineteenth century, that were not practised with frequent success in the sixteenth and seventeenth centuries.

Police system established by Louis XIV.

Those extensive changes in the administration of police which the power and energy of Louis XIV. enabled him to introduce, with so much temporary profit to the predominance of the royal authority, tended undoubtedly to check ordinary crime, and to strengthen the hands of the judicial magistrates. But this increased vigour of the laws was obtained, as we shall see presently, at the cost of frightful abuses. The manorial and other exceptional jurisdictions were now wholly absorbed in the functions of the Châtelet. To meet the increase of its business, the single bench was divided into two, each with its separate provost and staff, but both collectively forming one body. A lieutenant-general of police was created, whose functions absorbed those of both the existing lieutenants, by whom the police duties of the provost had long been discharged. The double bench of the Châtelet lasted only for ten years, the inconveniences of the division having been found to exceed its advantages. But the office of lieutenant-general of police lasted from the 26th March 1667, when its functions were first conferred on M. de la Reynie, until the memorable 14th July 1789, when its last holder, M. Thiroux de

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[1] Delamare, *Traité de la Police*, iv. 208; Frégier, *ut supra*, i. 518.

[2] Ibid.

[3] Delamare, i. 658.

[4] Isambert, xii. 651; Delamare, i. 568–570, as quoted by Frégier, i. 521.

[5] *Ordonnances des Rois de France*, viii. 319.

[6] Delamare, iv. 174, 175, 183, 186; Frégier, i. 531.

[7] In France these bodies retained many of their privileges until 1776. See the edict for their suppression in Isambert and others, *Recueil des Anciennes Lois Françaises* (from A.D. 420 to 1789), xxiii. 370–386.

[8] Frégier, *ut supra*, ii. 5.

[9] Ibid. 55 (quoting *Réglement sur les Hopitaux affectés aux Mendiants*, Aug. 27, 1612, in the Lamoignon MSS. preserved in the archives of the prefecture of police, x. 727. M. Frégier's book, we may add, is one of great labour and of great value; but it is impossible to praise its arrangement. The periods which form its leading divisions are arbitrary and unmeaning; what, at first glance, looks like an approach to chronological order proves on examination to be chaotic, and the baffled reader seeks in vain for an index. The neglect of clearness of dates becomes in many parts of the book quite ludicrous. In other respects, M. Frégier's work is praiseworthy and we are much indebted to it. Its continuation (on a better plan) from 1789 to the second empire would be a public service.

Crosne, hastened to place his post at the disposal of the conquerors of the Bastille as soon as they had established themselves in the Hôtel de Ville.

Character of De La Reynie, first lieutenant-general of police.

De La Reynie filled the office of lieutenant-general for thirty years, a period twice as long as that of the most tenacious of his successors. If we bear in mind what those thirty years were, the fact of itself almost paints the man's portrait. Able, supple, stern, and unscrupulous, we feel little surprise at meeting with him in that instructive chapter of French history which narrates the revocation of the edict of Nantes. In that fatal business he was a commissioner, and one of the most rigorous. Apart from that, the ordinary regulations of criminal procedure, in the preparation as well as the execution of which he had doubtless his share, are animated from the first page to the last by the principle that vigorous repression is everything,—the possible risk of condemning the innocent nothing. Scarcely was the accusation lodged, when the accused person began to be treated as guilty.[1] Of the many remarkable trials in which De La Reynie presided or held a prominent place, that perhaps of a female poisoner named La Voisin, is best remembered, from its having elicited a smart reply from the Duchess of Bouillon. The prisoner in this case (who was burnt in the Place de Grève in February 1680) had accused certain persons of high rank, of whom the duchess was one, of having "made a compact with the devil." "Have you ever seen the devil?" asked De La Reynie of the duchess in the course of her examination. "Sir," said she, "I see him now; he is very ugly, very stupid, and is disguised as a councillor of state." The incident, and the scene of it, throw light on many other things, in the France of 1680, than the quickness of a woman's tongue.

Sumptuary laws of Louis XIV.

The sumptuary laws still in force, and frequently renewed at this period, gave occasion to innumerable ordinances of police, and were amongst those laws which were most easily abused to the injury of inoffensive persons. That such laws, in any form, should emanate from a monarch whose taste for ostentation and extravagant expenditure amounted to mania, is but a proof the more how strikingly near together were the periods of ripeness and rottenness in the tumid monarchy of France.

De La Reynie was succeeded by the Marquis of Argenson, who was lieutenant-general from 1697 to 1718. In his dealings with the remnant of the Protestants, he presented a marked contrast to his predecessor. He was succeeded, within four years, by Machault d'Arnouville (June 1718 to 1720); by the Count d'Argenson (January to July 1720); and by Taschereau de Baudry (July 1720 to April 1722). The administration during this period presents little occasion for remark; but on the return of the Count d'Argenson, in April 1722, an active crusade was undertaken against the press. No book or writing was to be published without preliminary censorship by the police. The whole trade of printing was already under strict regulation, its development limited by law, and its practice hampered by many restrictions. These were now increased and made more stringent. The conditions of the cataloguing, valuing, and selling of libraries, booksellers' stocks, and the plant of printing-offices, were minutely prescribed.[2] It was in this storehouse that the unlucky functionaries of Charles X. sought their precedents.

The lieutenant-general of police from 1724 to 1754.

The succeeding lieutenants-general of police were Ravot d'Ombreval (1724–25), René Hérault (1725–39), Feydeau de Marville (1739–47), and Berryer (1747–54). The first of them has the miserable distinction of having been almost wholly engrossed with the affairs of the Protestants. Hérault effected considerable improvements in the lighting and watching of the streets of Paris. Feydeau de Marville organised himself by some vigorous efforts to check the growth of mendicancy. But no head of police, nor any other functionary in high place, seems to have reached, even in idea, some of the principal causes of the evil. Trade continued to be hampered by the old restrictions, and mere palliatives, often severe in their operation upon wretched but inoffensive people, some of whom could not find work, however earnest in the search, were resorted to, as of old.

The police of mendicancy.

When, as we have seen, the work-house and hospital system was first established (1657), the mendicants who were housed were from 5000 to 6000 in number. Every one that worked was entitled to a third of the produce of his labour. But in 1720 able-bodied mendicants were no longer received. They were sent back to their respective townships. Almsgiving was forbidden. Inhabitants of Paris were prohibited from lodging any persons of whose means of livelihood no satisfactory account could be given to the police. The provinces soon complained. A new system was then tried in the capital by opening registers for able-bodied paupers, who were brigaded, and employed on roads and other public works. But the evil outstripped the remedies. It had been deeply rooted in the days of Louis XIV., a period as remarkable for the multiplicity of its laws and regulations respecting the poor as for the profuse squandering of the national resources. In the succeeding reigns the "standing army of misery," as a recent historian has called it, became more formidable still. In 1767, according to the minister Necker, 50,000 mendicants were actually taken into custody.[3] At this period the receptacles for such captures throughout the kingdom were but thirty-three in number. Incredible as such a statement would seem to be on less sufficient authority than that of Necker, there is yet conclusive evidence that, ten years later, after a series of deficient harvests, mendicancy had enormously increased.

De Sartine's administration of the police department.

At the time of which Necker writes, De Sartine was lieutenant-general of police, having succeeded Bertin, who had filled the office from 1754 to 1759. De Sartine remained at the head of the police until the 30th August 1774. He was a man of considerable ability, but will long be deservedly gibbeted in history for having prostituted his office to the basest uses. The systematic reports by which he ministered to the crapulous tastes of Louis XV. give us a view of kingcraft at its lowest possible pitch of degradation. Such a court, in juxtaposition with the "army of misery," might well be the prelude to a "reign of terror." If other proof be wanted, it will be found in the details of that Ordonnance d'Instruction Criminelle of August 1670, which remained in force, with very slight modification, at the eve of the revolution. Preliminary torture, perforation of the tongue and of the lips, mutilation quartering, burning alive, and breaking on the wheel, will all be found prescribed in this memorable edict, coupled with a provision that the judge might increase the punishment enacted, if he thought fit so to do.[4]

The Ordonnance d'Instruction Criminelle.

De Sartine's term of office is also marked by that calamity at the public celebration of the marriage of the Dauphin (afterwards Louis XVI.), which seems to have been partly caused by the conflict of authority between the lieutenant-general and the provost of trades (*prévôt des marchands*), and which certainly led to a better demarcation of their respective functions. The accident cost the lives of a hundred and thirty-two persons.

The inquiry before the Parliament of Paris into the causes of so lamentable a disaster, resulted in divesting the provost of all share in the control or responsibility of public festivities, except within the town-hall and on the river. The lieutenant-general alone was made answerable for all needful precautions on such occasions beyond those limits.[1]

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[1] Voltaire, *Commentaire sur le Livre des Délits et des Peines* (Œuvres Complètes, xxxix. 89, 93).

[2] Peuchet, *Collections des Lois de Police*, § Arrets de Réglement, Feb. 28, 1723, &c.; Frégier, *ut supra*, ii. 334.

[3] Necker, *Administration des Finances*, iii. 164, et seq.

[4] Isambert and others, *Recueil*, *ut supra*, xviii. 415, et seq.

Changes in the functions of the lieutenant-general and the provost.

The lieutenancy of the successor of De Sartine, M. Lenoir, was marked by very different characteristics. His first tenure of office lasted but a few months, Turgot having replaced him by a follower of his own, Remond d'Albert, early in 1775. But the fall of that eminent minister led to Lenoir's resumption of office in 1776, and he retained it until August 1785. The improvement of the public markets, and the better lighting, watching, and cleansing of the streets, were among the unostentatious but effective labours of this officer. No such vile scandal as the reports of De Sartine can be alleged against Lenoir; but the monstrous abuses which placed the powers of the police at the disposal of private vengeance and family hatreds were as rife as ever. Temporarily checked under the ministry of Malesherbes, that of the Count of Vergennes gave them back their full swing; to the content even of that marvellous "*ami des hommes*," the old Marquis of Mirabeau, whose chief complaint against the police (the strings of which few men had pulled so frequently), was, that "the ruinous expense of commissions of this sort is frightful."[2] Of Lenoir's successor, M. Thiroux de Crosne, nothing very notable seems to be recorded, save the significant manner of his resignation.

Police organization at the outbreak of the Revolution.

The electoral committee sitting at the town-hall amidst its multifarious labours on that famous 14th of July, nominated a town-council, consisting of sixty members, and divisible into six sub-committees, to one of which the business of police was specially confided. The administration thus improvised speedily submitted to the National Assembly a decree, which it adopted, and which, with the king's sanction, was promulgated on the 6th of November, under the title of *Letters-Patent on the Provisional Police of Paris.* When it is perceived that by these letters-patent the duties of this department were distributed among *sixty* petty committees (under the general authority of the municipal body) it will not be surprising that as early as June 1790, the arrangement was considerably modified. The mayor of Paris and the sixteen "administrators," who are first named in the new law as members of the municipality were formed into six executive committees, one of which became the "committee of police." The primary assembly, however, of each of the forty-eight sections into which Paris was divided, exercised certain minor functions, resembling, as it would seem, those of the former commissaries. But it need hardly be said that, after a very brief period, duties of police occupied little of the time either of assembly or of committee.

After the 9th Thermidor (27th July 1794) the National Convention vested the control of the various branches of police in a committee of twenty members, afterwards reduced to three, which became, under the constitution of the year III., the central executive,[3] and retained its authority until the creation of the prefecture of police in March 1800. From this last-named period may be dated the organization of the French police as, in substance, it now exists.

Definitions
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The definition of the objects and functions of police, as previously laid down in a law of the National Assembly of the 16th and 24th August 1790 (division xi, Des juges en matière de police) remained in force. It runs thus:—

"The objects of police intrusted to the vigilance of the municipal officers include—

"1. All that concerns the safety and convenience of traffic in the streets, quays, squares, and highways; in the cleansing and lighting of the city; in the safe repair of dangerous structures; and in the removal of public nuisances.

"2. The repression and punishment of offences against the public peace, such as affrays, riots, and disturbances in the streets and other public places.

"3. The maintenance of good order in fairs and markets, at public festivities, and in places of public resort, such as churches, coffee-houses, &c.

"4. The inspection of weights and measures; and precautions for insuring the wholesome condition of articles of food exposed for public sale.

"5. The prevention by suitable precautions, and the mitigation by needful assistance, of accidents and calamities, such as fires, epidemics, contagious cattle diseases, and the like.

"6. The duty of obviating or remedying casualties resulting from the acts of lunatics or of dangerous animals.

"7. The supervision of theatres and other public amusements."

The principles thus laid down still form, professedly at least, the basis of police intervention in the matters which they cover. They were further developed when the official organization of the department was settled by the consular decree of 1800, the main provisions of which are as follows:—

Consular regulation of the department of police (1800).

"The prefect of police shall discharge his duties under the immediate authority of the ministers; shall correspond directly with them in relation to matters which lie within their respective functions; he may republish from time to time the police laws and regulations, and may frame and issue directions to insure their execution.

"His duties shall include the delivery of passports, of residence licenses (*permis de séjour*), and of tickets of security (*cartes de sureté*); the repression of begging and vagrancy; the supervision of public-houses and of prostitutes; the dispersion of crowds; *the police of religious worship, of printing, and of bookselling;* that of theatres, of powder-mills, saltpetre-works, and storehouses of arms, and the pursuit of deserters; that of the highways, of public health, of fires and inundations, of river accidents, of the exchange, of commerce, of taxes, of the food markets, and of prohibited wares; and the protection of public monuments." And to this list, long as it is, is added an *et cetera.*

"It shall also be his duty to regulate the expenses of officers of health and of veterinary surgeons, the removal of sick persons and of corpses, the recovery of drowned persons, and the pounds or green-yards (*les frais de fourrière*).

The defrayment of police charges.

"The prefect shall charge the costs of his department on the revenue of the commune of Paris; his budget shall be presented to the town council, and have the sanction of the home minister.

"The commissaries of police and of the exchange, the inspectors of highways and wharfs, and peace officers of all kinds, are placed under his orders, as is the National Guard on due requisition. Finally, the entire control, under the home minister, of the lighting and cleansing of the city is vested in his hands."

In the following year the district assigned to the prefect of police was enlarged, by being made co-extensive with the department of the Seine, with the addition of the communes or townships of St Cloud, Sevres, and Meudon, which form part of the department of the Seine and the Oise.

During the fourteen years which elapsed between the

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[1] Peuchet, *Collection des Lois de Police*, 2d série, ii. 18, et seq.; Frégier, ii. 366.

[2] Lettre du Marquis au Bailli de Mirabeau, June 9, 1777, *Mémoires de Mirabeau* (Fils adoptif), iii. 27.

[3] Constitution de l'An. III., art. 184.

The prefecture of police under Napoleon.

Administration of the Paris police by M. Pasquier.

establishment of the new prefecture and the first abdication of Napoleon, the office was filled by two prefects only; namely, by Count Dubois from March 1800 to October 1810, and by Pasquier (afterwards the chancellor and Duke Pasquier of Louis Philippe, but better known as "Pasquier the Inevitable"), from October 1810 to May 1814. The tenure of each of these officers was marked by a signal public disaster. It was during the prefecture of Dubois that the terrible calamity at the Schwarzenberg palace occurred in the emperor's presence, and it led to the prefect's resignation. His successor was of a family long eminent in the legal magistracy. The father of M. Pasquier, a counsellor of the Parliament of Paris, had perished in 1794 on the revolutionary scaffold. To the lot of his grandfather, more unhappy still, it had fallen to take a leading official part in the legal murder of Lally. A more remote ancestor, as advocate-general under Henry IV., signalized himself by his resolute curbing of the Jesuits.[1] But no incident in a remarkable pedigree seems to have approached for singularity that strange event which saw the prefect of police, at a moment of entire apparent tranquillity, surrounded in his own house (13th October 1812), and hurried, without a struggle, into one of his own dungeons. Ridicule, however, was M. Pasquier's chief penalty for having suffered himself to be so surprised. The weight of the master's anger at this "political debauch" (so Napoleon designated it) fell on Frochot, prefect of the Seine. Pasquier retained his office until the 13th May 1814.

The police under the Restoration.

The first prefect under the Restoration, but with the altered title of Director-General, was M. Beugnot, a converted Bonapartist, who resembled his predecessor in being a favourite butt of the Paris wits, although in little else. The cause in his case was a stringent regulation respecting Sabbath observance, which he issued shortly after entering on his functions; and speedily followed up by a sort of manifesto on the duties of his department, wherein he compared the police to a "drop of oil," which, duly applied, kept the springs of government from rusting.[2] Count Beugnot held the directorship but a short time, and had a crowd of successors. In the year 1815, indeed, the police of Paris was administered by six successive directors or prefects. The most notable of these was M. Decazes (afterwards duke, and grand referendary of the Chamber of Peers), who in this capacity had the ill-omened task of arresting and examining Labedoyère and Ney. From the prefecture (the old title had been restored after the Hundred Days) Decazes passed to the ministry of general police, of which we shall have to speak presently.

The prefecture of Gisquet, 1831–36.

From the end of 1821 to the end of 1836 there were ten prefects. The administration of M. Gisquet, the last of these ten, was on many accounts remarkable. Characterized by ability, firmness, and power of combination, he made himself a very formidable antagonist to the republicans and oppositionists of all shades. But he overdid his part. Owing his appointment entirely to the favour of Casimir Perier, he permitted his anxiety to carry out that minister's policy to lead him into acts, or into the toleration of acts by inferior agents, that were directly provocative of the crimes it was his duty to prevent. The minister's policy was of that dangerous kind which thrusts forward pretensions beyond its strength. He was, it is true, opposed not only by men who were combating for rational and responsible liberty, but by others who were striving with might and main to bring chaos back again. Such opponents mistook reckless turbulence for political courage, and heated their imaginations until any sort of weapon seemed a fair one, so long as it was to be used against the powers that were. Gisquet's most honest acts of duty were doubtless sometimes distorted into crimes. But with all due allowance for the violence of party passions, it remains certain that the functions of police were grossly abused.

The police and the press under Louis Philippe.

M. Gisquet has, indeed, under his own hand proved the essential points of his assailants' case. When he entered on the prefecture, he found a police prosecution pending against two journals—*Le National* and *La Tribune*—for having charged the authorities with "brigading and paying bludgeon-men," in 1831, on occasion of the anniversary of the taking of the Bastille. The defendants pleaded that the truth of the charge would be substantiated by certain reports addressed to the prefect on the 13th and 14th of July. The tribunal (*Cour Royale*) decreed that those reports should be produced. When summoned to obey this decision of a court of judicature, pronounced in strict conformity with the code, M. Gisquet refused obedience, assigning as his motives "that such a production would have the inconvenience of acquainting the enemies of order with the means of repression at the disposal of government; and the danger, more serious still, of revealing the names of certain secret agents, who, by such an act, and in direct breach of the compact made with them, would be handed over to the hatred and vengeance of their enemies."[3] *The decree was neither annulled nor enforced;* or, in other words, the prefect of police was placed above the law.

Such facts and such arguments, synchronizing as they did with the violent straining of the law against the press on every possible occasion, might well elicit from Armand Carrel his memorable protest:—"It shall not be said that a system which could institute the innumerable and absurd prosecutions for which our lawyers blush; which could plan the piecemeal confiscation of our property by fines and costs; a system under which writers are branded, whilst yet untried, by being coupled with swindlers, or are quietly killed off by the pestilential miasma of St Pelagie, may aggrandize itself yet more by incorporating the 'jurisprudence of the self-evident fact' (*jurisprudence du flagrant délit*). . . . *We* should be guilty if we suffered it. . . . . The life of a man slain furtively at the corner of a street, in the tumult of an insurrection, may be counted a small affair; but the life of a man of honour, murdered in his own house by M. Pèrier's sbirri, whilst resisting in the name of the law, would be much. His blood would cry for vengeance. If the ministry is daring enough to play for such stakes, it may fail to win." That such a man as Carrel should have the opportunity of writing thus within a year or two of the foundation of the "monarchy of the barricades," is a small fact which enfolds as much of history as do many large volumes that bear the name. M. Gisquet's defence of his administration is a book of remarkable ability, and it extends to four volumes, but the reader will seek in vain, from end to end, for an answer to Carrel's description of the political police of 1831–32. Nor will it in 1858 need any arguments to prove that the significance of these bygone events did not cease with the monarchy of the Orleans branch. We have recently seen an eminent statesman standing at the bar of a police court to answer charges based upon repressive laws dating from the worst days of the Restoration; and have seen him condemned (for an act which has made his name illustrious wherever liberty is valued) by a sentence involving the possibility of transportation like a felon. The names are changed, but the story is the same. The end, however, is not yet.

The municipal duties of police under the administration of Gisquet.

If we turn from the police of politics to the region of municipal affairs, the prefecture of M. Gisquet presents many commendable features. He has himself described this municipal portion of the duties as employing nineteen-twentieths of the staff, and, if fully attended to, at least

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[1] Léonard Gallois, *Dictionnaire Historique de tous les Ministres*, 364.

[2] Ibid., 33.

[3] Gisquet, *Mémoires*, i. 178.

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ten hours daily of the prefect's time. But be this as it may, there is no doubt that he found leisure to make important ameliorations in matters of public convenience and of public health. He had, from his first entrance into office, the monition of the swift-coming cholera.

One of the many secondary incidents of the three days of July which appealed impressively to the eye in the streets of Paris for a long time afterwards, was the enormous encroachment of stall-keepers on the streets, quays, and bridges. The number of these was reckoned in 1831 as ranging from 25,000 to 30,000, the suppression of which would seem to have needed an army of police; yet some considerable approach to such a result was obviously essential to the safety and salubrity of the streets, and to the satisfaction of the reasonable complaints of rent-paying and tax-paying shopkeepers. M. Gisquet set to work, ingeniously enough, by instituting a series of inquiries among the stall-keepers themselves, the scope of which they could not appreciate, but which had the effect of putting many of them on the side of the police. Beginning by the expulsion of those who were not domiciled in Paris, and then of those who had learnt a trade, and so on, he gradually reduced the number to little more than one-tenth of its previous extent, without uproar, and under conditions which seemed to ensure that the authorized were in a large measure the deserving.[1]

In like manner, important improvements were introduced into the management of the markets; the police of the river, the wharves, and the canals; and the lighting and draining of the city. Some injurious monopolies were suppressed, and some needless interferences with trade, compensated by no adequate public service, were terminated. By using a wise discretion in such matters, M. Gisquet was the better able to deal vigorously with crying abuses in respect to the adulteration of food. So gross were some of those which he had to suppress, that the narrative forms a notable chapter in the annals of mercantile roguery.[2]

Staff of the Paris prefecture.

The extent and cost of the staff attached to the prefecture of police under the government of Louis Philippe may be briefly indicated thus:—

Divisions.	Specific Functions.	No. of Persons employed.
PREFECT'S OFFICE	Correspondence; reports; registration; foreign refugees	19
SECRETARY'S OFFICE	Framing of regulations and public announcements; archives; police appointments and pay; public festivities and amusements	30
CRIMINAL AND PASSPORT DEPARTMENT	Arrests and preliminary examinations; supervision and inspection of prisons, houses of correction, and penitentiaries; supervision of criminals at large, and of vagrants; records of criminal jurisprudence; delivery and *visa* of passports; matters relating to lodging-houses	323
MARKETS, PUBLIC BUILDINGS, AND PUBLIC HEALTH DEPARTMENT	All matters relating to the cleansing, lighting, and draining of Paris; survey of dangerous structures; street and highway traffic; provisioning of the city, and matters affecting public health	425
ACCOUNTANT'S DEPARTMENT	Accounts of receipts and expenditure	12
WATCHING DEPARTMENT	Patrol; nightly watch and detective department	...
COMMISSARIES' DEPARTMENT	Local inspection of the forty-eight quarters of Paris; intermediate agencies between the central prefecture and the local application of its orders	211
Porters, messengers, and menial servants		60[3]

ice con- ing rds.

At this time there were also attached to the prefecture a Consulting Board of Health, consisting of eighteen physicians, chemists, and apothecaries; a Consulting Board of Architects, composed of thirteen persons, professionally conversant with building; and a Medical Board (ten in number) specifically employed in the inspection of prostitutes.

The strength of the watch and detective department cannot be accurately stated; doubtless for reasons which hinge upon the intimate connection between the police of ordinary crime and that of political subserviency. On the much-debated question of "secret agents" M. Gisquet has a great deal to say. He shows very convincingly that a police must be open to information; and that information may be given from good motives. He shows just as clearly, although without intending it, that the ramifications of the secret service are so complex, its disguises so multifarious, and its social leprosies so spreading, that a writer who could much exaggerate them must be endowed with uncommon gifts.

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When M. Gisquet entered on his functions (15th October 1831), the expenditure of the prefecture, so far as it was charged on municipal funds, amounted to nearly eight millions of francs (L.333,330); the staff was considerably increased in several departments during his administration, but was pruned in others of less importance, and was kept well in hand. When he quitted office (6th September 1836), the expenditure had been reduced to 7,189,500 francs (L.299,562); the receipts from market-dues, and other like sources, had been considerably increased; and an improved system of accounts established.[4] In this department M. Gisquet's previous experience as a banker stood him in good stead; and the improvements appear to have had enduring results.

The "Sommiers Judiciaires."

Amongst the new measures introduced by this prefect was, he tells us, the systematic compilation of biographical records of contemporary *politicians*. In the nineteenth century such a compilation must be costly as well as curious, but it does not appear whether the expense of it was defrayed from municipal or from other funds. Another and remarkable collection of records had existed already in the archives of the prefecture for some 120 years. Here are registered the names, identifications, convictions, punishments, or acquittals of every person who, during that long period, had been accused before any tribunal throughout France of crime or misdemeanour, and the utmost pains are taken to continue it in the completest form. In 1833 it had long occupied a standing body of clerks (fourteen in number) and an array of ponderous volumes (400 in number), besides an alphabetical index containing about 500,000 names. Even then it was difficult to consult it, on account of the thousands of *Martins*, *Dubois*, *Dupuis*, &c., with which it teemed. M. Gisquet employed a sufficient staff to copy the whole of these records on slips of card-board, each assigned to one individual. The task was accomplished in four years, and thenceforward two clerks did the work of the previous fourteen.[5] The collection bears the title of *Sommiers Judiciaires*, and is in daily use in the criminal courts. If, however, we may judge from passing transactions, this collection is now (November 1858) in a fair way

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[1] Gisquet, *Mémoires*, i. 214-217.

[2] Ibid., iv. 204-283.

[3] Ibid. i., 222-231.

[4] Ibid., iv., 305-312.

[5] Ibid., iv., 264-269.

French Police.

to include the names of some of the most illustrious as well as of the most degraded Frenchmen.

Here, then, we leave a branch of the subject which is far from being exhausted. The police of Paris is undoubtedly the most remarkable institution of its kind which has ever existed. It would be instructive to trace it further, and to bring it into connection with the recent statistics of crime. That section, however, has still more importance for the present purpose, in relation to our own country; and to treat of it in relation to both countries is here impracticable. But there is another section of the Paris police hitherto unnoticed, which is one of eminent difficulty and delicacy. It must not be passed over without some mention, however inadequate.

Police of female prostitution.

Few things in the external aspect of London strike a Frenchman with more surprise than the audacity with which female prostitution thrusts itself upon the public gaze. The wonder is none the less, even if the visitor be one to whom the corruption of Paris or of other continental cities is no mere hearsay. There, at all events, this scandal has limits beyond which it dares not venture; and vice, whatever its extent, is rarely permitted to insult those who do not seek it.

The police regulation of this opprobrium of civilization dates in France from the thirteenth century. The first steps followed close upon the earnest but futile efforts of St Louis for its total suppression, by the public exposure and ultimate banishment of those engaged in it. Such measures failing of their desired effect, prostitutes were tolerated, but permitted to reside only in certain streets, forced to wear a prescribed dress, and to close their houses at fixed hours.[1] No direct measures appear to have been taken until the fifteenth century against the guiltiest class of all,—the traders in the recruiting of those miserable ranks. In the sixteenth, the curb in this direction was tightened. Procurers and procuresses were pilloried, branded, and then banished.[2]

The assembly of the States-General, held at Orleans in the middle of this century, recommended a revival of the frustrated efforts of the thirteenth for the total proscription of prostitution. Owners of houses in which it was permitted incurred fines equal to three years' rent, and on repeated conviction, forfeited their houses. But the sin was too extensive and too deeply rooted to be thus extirpated. Clandestine prostitution was found to have its special evils; and a tacit toleration, under stringent rules of the old sort, returned. Under Louis XIV. (that portentous legislator against immorality and luxury), asylums were opened under the designations, "Refuge," "Maison des Filles de la Madeleine," and "Maison du bon Pasteur;" and the hospital of the *Salpetrière* was assigned partly as a penitentiary and partly as a house of correction. A swoop was made by the police once a week upon such of the prostitutes as were deemed most disorderly; and these, lodged meanwhile in a house of detention, were brought monthly before the magistrates. Some were discharged, others sent to the Salpetrière, and others to the hospital of Bicêtre for medical treatment. Here we seem to have the beginning of the existing system of periodical supervision.[3]

In October 1831 the number of persons of this sort inscribed on the police registers was 3479; in 1836 it was 3800. About two-thirds of the number resided in houses or apartments which they themselves rented, and nearly the whole of the remaining third in houses called *mâisons de tolerance*, 194 in number. These houses are licensed; and the licenses, it is stated, are never given without "the assent of the neighbours;" by which, we suppose, must be meant that of a definite number (*la permission n'est jamais accordée qu'après un'enquête et qu'avec l'adhèsion des habitants du voisinage*). Its conditions prescribe various regulations as to quietness and seclusion; limit the number of the inhabitants, and provide for the weekly visit of the medical officer. As respects the first-named two-thirds, the condition of inscription on the register is, that they present themselves for a like purpose once a fortnight. M. Gisquet states, as the result of his official experience as prefect, and of his acquaintance with the archives of his department, that, irrespectively of the other results of the system, it has reduced the ravages of disease by one-half within fourteen years.[4]

French Police.

The conditions of registration.

If this part of the punishment of vice were limitable to the vicious, the legislator might have reason to hesitate ere he interposed. But it is otherwise ordained. Nor can it be doubted that a system which may seem, on the one hand, to carry with it an implied sanction of practices which the law of a Christian country must always and utterly condemn, does, on the other hand, present itself as a stigma not less degrading than was the pillory of the fifteenth century, or the open cart of the seventeenth.

Connection between prostitution and crime.

In another of its aspects police intervention appears to be in some measure indispensable. Between the class in question and the predatory classes there is an indissoluble tie. Some sort of supervision lies therefore at the threshold of the pursuit of criminals. The means of detective police have recently been everywhere strengthened, as is well known, by the employment of photography. But a quarter of a century ago, a remarkable "gallery of female portraits" had already been commenced at the Paris prefecture, which led to a kind of exceptional police court, by no means to be recommended as a model, to the extent there attained,[5] although, under proper restriction, it may be justifiable and salutary.

Than this question of the treatment of prostitution there can be none which presents greater difficulties to the prudent legislator. To thrust it out of sight will no more remove the evil than the closing of the hatches of a ship on fire will save the ship. The experience of Paris in relation to it may offer much to avoid, but can hardly fail to contain something to imitate. The day will come when a thorough inquiry, in competent hands, into the results of that experience, will be a recognised necessity. The problem is to check a growing evil, without, on the one hand, opening a door to new evils, or, on the other, undermining in any way those first principles of morality, for the weakening of which no improvements of police could make amends. And the problem is a pressing one.

The police of the home department of France.

It will have been seen that, under the old monarchy, the police of Paris was intimately connected with that of the kingdom at large. But there has always been a police of vaguer and wider scope, more or less developed according to the tendencies of the government of the day, and more immediately in the hands of the ruling power, whether monarchical or ministerial. Usually this secret police had been attached to the ministry of the home department, and had thus been in the same keeping with the direct control of the rural police of the kingdom. The *gendarmerie*, justices of peace, mayors, sub-prefects, are all controlled by the prefects of departments, who, in their turn, are accountable to the home minister.

The creation of a separate "ministry of police" was the

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[1] *Ordonnances des Rois de France* (1254), i. 74.

[2] Delamare, *Traité de la Police*, i. 522–525; Frégier, *Histoire de l'Administration de la Police*, i. 263, 264.

[3] Delamare, *ut supra*, i. 527; Mercier, *Tableau de Paris*, c. 238.

[4] Gisquet, *ut supra*, iv. 317

[5] Ibid., iv. 319.

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act of the Directory in 1796. Cochon (afterwards *Comte de l'Apparent*) was the first regular minister of the new department, although Merlin of Douay appears to have been its chief organizer. M. Cochon had to maintain a hard struggle. The conspiracy of Babeuf and his fellow-socialists was followed closely by that of Lavilleheurnois and his fellow-royalists. The latter had paid the minister of police the undesirable compliment of inserting his name in the cabinet they proposed to form, had they succeeded in restoring the monarchy. This circumstance increased the animosity of his enemies, both in the councils and in the Directory, and hastened his expulsion from office. Lenoir de la Roche for a very brief period succeeded him. Sotin was made minister of police on the eve of the "18th Fructidor," to the success of which he contributed. In 1799 Fouché obtained the department, with which his name is now historically identified.

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Fouché began in the spirit of a thorough-paced demagogue. His long familiarity with political clubs and popular insurrection supplied him with formidable weapons wherewith to destroy his old friends. No denouncer of anarchy or apologist of power could outstrip his zeal in the service of the Directory, until sudden enlightenment showed him that the Consulate would be more for the public good. His assistance on the 18th of Brumaire was rewarded by his continuance in a ministry, the functions of which he took care to complicate in a fashion that might well abate the courage of an aspiring rival. Napoleon never placed real confidence in him. Fouché had just enough of honesty to save him from taking any useless pains to disguise his egotism, or to varnish the innate coarseness of his manners. But he was too able and too useful to be cashiered. The experiment made in that way after the peace of Amiens was of short duration. The Pichegru conspiracy restored the ministry of police, which for that brief period had been incorporated with the ministry of justice, under the special direction, however, of Réal, who was virtually independent of the minister, and placed Fouché again at its head. But Napoleon took care to assist the restored minister by attaching to his department certain counsellors of state. A special police was also established, under the inspector-general of gendarmerie, who had to communicate directly with the emperor. Fouché's second ministry did not last long, and had a stormy close. His third ministry began on the morrow of Napoleon's return from Elba, and the *services* he rendered led to his retention of office for a time under the second restoration. The best trait in his history is the exertion he made at this period to lessen the proscriptions, of which the infuriated royalists were then so lavish. He resigned his office at the end of September 1815 (to avoid his dismissal); three months afterwards he was banished by the law of the 6th January 1816.

Decazes, the successor of Fouché, conducted the ministry of police with moderation. He mitigated several of the odious laws of 1815, especially those which fettered the press and multiplied the restrictions of individual liberty. When increasing freedom had its natural result in an attack on the continuance of a police ministry, he resisted the movement; but in December 1818 it was suppressed as an independent office.[1]

II. The Police of England.

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The ancient police of England may be dated from Alfred. It grew out of his subdivision of the shires into hundreds and tithings. Every man in England must belong to some tithing (or like division, under another name); the inhabitants of every tithing are collectively pledged for the preservation of its peace and security, and are mutually responsible for the apprehension of every accused person within the district. If the offender take flight into another district, he becomes a man "unpledged," and therefore virtually an outlaw. Whatever we may think of William of Malmesbury's famous story of the golden bracelets, hung by Alfred's order in the public roads, there is conclusive evidence that these rigid preventive measures brought about a state of internal tranquillity that was in striking contrast with previous experience, and in all probability scarcely less in contrast with the changes which ere long ensued.

Saxon laws of frank-pledge.

The hue-and-cry, 3 Edw. I.

Statute of Winchester.

If we pass on to the reign of Edward I. we find the main difficulty complained of as obstructing the peace of the realm to be the lack of effective pursuit of felons. The isolation of districts, after the rigid method of the Anglo-Saxon times, must have soon evinced itself to be a measure, so far as it may have been found possible to maintain it, of which the mischievous exceeded the salutary consequences. The effort now was to increase the efficiency of the hue-and-cry. Thus we find it enacted in a statute of 3 Edward I., that "the whole commonalty be ready and equipped to pursue and arrest felons at the order and summons of the sheriff, and at the cry of the country, as well within franchise as without. (*Purveu est que tuz communaument seind prez et aparaillez al maundement c a la somonse des viscontes ou au cri del pays, de suire e de arester les felons quant mester serra ; ausi bien dedenz frounchises comme dehors*). Ten years later, the statute of Winchester commands that, "in great towns being walled, the gates shall be closed from the sun-setting until the sun-rising; and that no man do lodge in suburbs, or in any place out of the town, from nine of the clock until day, without his host will answer for him; and the bailiffs of towns every week, or at least every fifteenth day, shall make inquiry of all persons being lodged in the suburbs; . . . . and if they do find any that have lodged any strangers or suspicious persons against the peace, the bailiffs shall do right therein." It was further provided that highways between market-towns should be cleared from trees and bushes to a breadth of 200 feet from hedge to hedge; that every man between fifteen and forty years of age should have arms; and that constables shall be appointed to make view of such arms from time to time, and to present defaulters "to the justices assigned, and after by them to the king, and the king will provide remedy."

Keepers of the peace, 18 Edw. I.

This statute of Winchester was again sent throughout England fifteen years afterwards, "to be read and proclaimed four times in the year;" and three knights were assigned to each shire to watch over its execution, as "keepers of the peace." In the 1st Edward II., the keepers were directed to appoint two citizens in cities, two burgesses in boroughs, and two lawful men in every market-town, for the due enforcement of the statute.

Statute of labourers, 25 Edw. III.

By the 25th Edward III. (the "statute of labourers"), justices are to hold sessions four times a year, and at all other times needful for the conservation of the peace; and in staple-towns the mayors and two constables are directed to keep the peace, and to arrest all evil-doers in the staple, for trespass, debt, or breach of contract, and to imprison or otherwise punish them, according to the laws of the staple.

Justices of peace.

As early as the 35th of Edward I., the term "justice of peace" occurs on the Patent Rolls ("*Pur ceo que nostre feal e loial peres de Maulay est entendaunt a nostre service en office de* justice de la pes, *vous mandons*," &c.); but it was not until the 34th of Edward III. that these officers had power to try felons; although their functions had been gradually enlarged in lesser matters by several successive statutes (*e.g.*, 2 Edward III., the "statute of Northampton," c. 3.; 4 Edward III., c. 2). By the 5th Henry IV., c. 10, it is enacted that—"Because divers constables of castles within the realm of England have been by the king's commission appointed justices of the peace, and under colour of such commission they take up people to whom they bear ill-will, and imprison them in their castles, until they pay fine and ransom for their deliverance; it is ordained that no person shall be imprisoned by any justice of the peace, but only in the common gaol, excepting by those lords who have gaols within their franchise."

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[1] Thiers, *Histoire de la Revolution Française*, iv. 344, 345; Thiers, *Histoire du Consulat et de l'Empire*, iii. 588, 590; Léonard Gallois, *Dictionnaire de tous les Ministres*, 124–125, 175–176, 232–239, 301, 326, 441; Pelet, *Napoléon au Conseil d'Etat*, c. ix.

Borough justices.

In the reigns of Henry VI., Edward IV., and Henry VII., various royal charters conferred upon the mayors and certain aldermen of the principal cities and boroughs, and their successors, the office of justices of the peace within their several jurisdictions. The parochial and township constables formed the only police that existed. As to any remedial measures aiming at the removal or diminution of the causes of crime, no trace is to be found until a period comparatively recent. The main dependence of the legislature appears to have been placed on the tender of impunity to accomplices, and the offer of rewards to informers.

Crown approvers, 3 & 4 Will. and Mary, c. 8.

Rewards to persons apprehending criminals.

Thus, by the 3d and 4th of William and Mary, c. 8, persons guilty of robbery in the highways or fields, &c., who, being out of prison, shall so discover any two offenders as to lead to their conviction; and persons not concerned in the offence who shall apprehend and prosecute to conviction any highwayman, shall receive of the sheriff L.40, within a month after the conviction; and any sheriff making default in such payment is made liable to a penalty of double the sum. If the person seeking to apprehend the robber be killed in the encounter, his heirs or executors are entitled to the reward. The apprehender is also empowered to claim the horse, harness, arms, and money taken with such highwaymen, notwithstanding any vested right in the crown or in the lord of a manor, or any claim by the owners and lenders for hire of any such horse, &c.; the only right saved being that of owners feloniously deprived. The 10th and 11th of William III. extended the provision respecting accomplices to burglary and various other felonies; and a statute of Anne extended the L.40 reward to cases of burglary and housebreaking.

Fielding on the causes of the increase and impunity of crime.

But all these inducements were little operative. The administration of the laws was almost entirely in the hands of unpaid and very partially responsible magistrates. Some of those in London had fallen into practices which gave them the current appellation of "trading justices." The only police-office in the metropolis was that at Bow Street, which had grown up in a casual fashion, under the authority of the secretary of state, and without any parliamentary sanction or support. But it chanced that the necessities of a great writer led him to accept the office of "Bow Street magistrate," at a time so critical as to induce him to employ his powers of authorship, as well as his knowledge of law, in the public service. Henry Fielding took the first steps towards an efficient police by forcing on the attention of the public, as well as of men in authority, what seemed to him to be the causes of the growing evils. "First, with regard to private persons," he says, "there is no country, I believe, in the world, where that vulgar maxim so generally prevails, that what is the business of every man is the business of no man; and for this plain reason, that there is no country in which less honour is gained by serving the public. Secondly, ... so far is the power of apprehending felons from being universally known, that many of the peace-officers themselves do not know that they have any such power, and often from ignorance refuse to arrest a known felon until they are authorized by a warrant from a justice of peace. Thirdly, ... the person of an informer is more odious than that of the felon himself; and the thief-catcher is in danger of worse treatment from the populace than the thief." ("The force of this opinion," he elsewhere adds, "may be seen in the following instance: We have a law by which every person who drives more than six horses in a waggon forfeits as many horses as are found to exceed that number. This law is broken every day, and generally with impunity; for though many men yearly venture and lose their lives by stealing horses, yet there are very few who dare seize a horse, where the law allows and encourages it, when by such seizure he is to acquire the name of an informer.") And, "lastly, as to the reward, ... the prosecutor's title to it is too often defeated by the foolish lenity of juries."[1]

Fielding's plan of police.

The proposal which Fielding laid before the Privy Council, by way of remedy, consisted mainly in the establishment of a paid police force, to be under the orders of the acting magistrate at Bow Street, and to be composed of picked men who had served the office of constable. At this time (1753) there existed in London "a most notorious gang of street-robbers, in number about fourteen, who divided themselves in parties, committed such daring robberies, and at the same time such barbarities, by cutting and wounding those they robbed, in every part of this metropolis, as spread a general alarm through the town, and deterred his Majesty's subjects from passing and repassing on their lawful occasions after nightfall. These outrages induced his Majesty to issue a proclamation, and offer L.100 reward for apprehending each of these violators of the public peace. And though this was humanely intended as a remedy for this dreadful evil, instead of answering the end proposed, it soon begat a greater, by inducing a set of villains to decoy unwary and ignorant wretches to commit robberies, and then to make a sacrifice of them for the sake of the reward, while the real offenders not only escaped justice, but increased their barbarities even to murder."[2] Henry Fielding's new force succeeded in capturing the particular gang referred to at the beginning of this extract, after a desperate struggle, in which one constable and one of the robbers were killed on the spot. Considerable head was made against highwaymen, and many gangs of housebreakers were dispersed.

Contemporary objections to Fielding's police.

The plan had scarcely been initiated, when the rapid decline of Henry Fielding's health forced him to resign his office to his brother, afterwards Sir John Fielding, who followed in the same track with great, though, as it proved, but temporary success. Moderate as were the innovations thus made on the old criminal law, they did not fail to be denounced as a "revocation of the darling and essential privileges of freeborn Englishmen;" and a glowing picture was drawn of the ultimate result of such tamperings with the constitution, when this island "would be no more the seat of liberty; slavery would introduce indolence, indolence poverty, and poverty contempt; freedom, arts, and sciences, would then have their rotation, winging their vagrant flight up the Baltic, shunning their once-loved streams of Ilissus, Tiber, Thames, and Seine, and fixing their residence on the long-neglected banks of the Volga; infusing all their spirit among the rude inhabitants of the North; civilizing the unpolished Muscovite, and giving the descendants of the Czarian family an opportunity of gloriously unfolding their imperial eagle in the very centre of the southern nations, and of becoming the sovereign arbiters of Europe;" and so on, ending with an outline of our familiar acquaintance, "the British lion, ingloriously slumbering in the net of captivity."[3]

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[1] Fielding, *An Enquiry into the Causes of the late Increase of Robbers*, &c. (1751), pp. 102, 103.

[2] Sir John Fielding, *An Account of the Origin and Effects of a Police set on foot in 1753*, pp. 15, 16.

[3] *Observations on Mr Fielding's Enquiry into the Causes of the Increase of Robbers*, pp. 84, 85.

English Police.

Ietropoli-an police-ffices esta-lished in .792.

Forty years afterwards, crime had become again so rampant as to necessitate more vigorous measures. By the 32d George III., c. 53, seven additional police-offices were established, each with three stipendiary magistrates (at a salary of L.400 each, afterwards increased to L.600) and two clerks. The magistrates were empowered to determine summarily, in a multitude of cases, respecting offences against the public revenue and game laws, against highway acts, and against the various laws of master and servants; to license and regulate public-houses; to punish vagrancy; to suppress nuisances; to instruct parochial constables in their duties; to issue search-warrants for stolen property; to regulate the billeting and recruiting of soldiers; and to take preliminary examinations in all charges of felony and misdemeanour not specifically provided for. The only power conferred by the act which directly addressed itself to the prevention of crime, relates to the apprehension of persons of ill-repute found in the avenues to public places, under circumstances indicative of an intent to rob. The expense of each office was restricted to two thousand pounds a year.

Colquhoun on the po-ice of Lon-lon, *circa* 1800.

In his elaborate *Treatise on the Police of the Metropolis* (of which the 6th edition was published in 1800), Dr Patrick Colquhoun, one of the magistrates first appointed under the act of 1792, indicates, as the main deficiencies which the experience of eight years had brought saliently out, the want of an entire re-organization of the system of constables, and of an adequate fund for rewarding informers. "If criminals," he says, "at war with the community, are to be detected; if risks are to be run to effect this purpose; if it is to be done, as it must frequently be, at the hazard of the loss of health, and even of life, by watching desperadoes in the night-time; if accurate informations are necessary either to discover where stolen property is deposited, or where the delinquents are to be found, a fund must be provided, or the public cannot be protected."[1]

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At this period six police constables only were attached to each of the metropolitan offices, making 40 in the whole; 68 other constables were under the orders of the chief magistrate at Bow Street, as patroles for the principal metropolitan roads; 41 formed the civil force of the Thames police establishment (organized in July 1798); 40 stipendiaries were employed in the city of London under the corporation; and there were in addition 843 parochial officers—beadles, constables, or head boroughs—serving without stipend. The nightly watch and patrol comprised in the city of London 803 men, generally aged, often infirm, and the honest among them very frequently half-starved,—their wages varying from 8½d. up to 1s. 6d. for each night; and in the other metropolitan districts (Westminster, Southwark, and part of Kensington included) 1241 men, very similar in age and physical condition, but, in the more opulent districts, somewhat better paid. These watchmen and patroles were under the control of more than 70 different boards or trusts, the powers and procedure of which were regulated by about 120 several acts of Parliament.[2]

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Those who knew London at this period, or during the following quarter of a century, will remember that the turning out of the "nightly watch" was, once in a way, a sight worth seeing, although for quite other reasons than those which are said to have brought Henry VIII. into Cheapside one night to witness a similar spectacle. To connect, in idea, such an assemblage of the halt, the lame, and the purblind, with the terror of thieves and the repression of outrage, required vivid powers of imagination. That crime increased, no statistics need be cited to prove. The establishment of the police-offices, and that, most especially, of the Thames police-office, had produced excellent results; but in the absence both of an efficient executive force and of a central superintending authority, it failed, and could not but fail, to make head against the ever-increasing temptation of augmented wealth and a rapidly-growing population.

Parliamentary inquiries into police.

Repeated inquiries took place before committees of the House of Commons. The utter inefficiency of the existing police force was clearly shown. The necessity of an improved system of licensing and controlling public-houses was proved; and it was made not a whit less apparent that "coffee-shops" may be so conducted as to stand quite as much in need of regulation as do beer-houses. "Another proper call for additional powers to the magistrates," writes a competent witness in 1822, "is furnished by the coffee-shops,—an extraordinary nuisance which has recently risen up in this great city. These places are the resort of the vilest thieves and prostitutes, and have hitherto gone on with impunity, because, as neither beer nor spirits are retailed in them, they are not required to be licensed." The monstrous impunity with which systematic trade in stolen goods was carried on and extended likewise forced itself upon attention. But the inquiries of 1812, 1816, 1817, and 1822 led to little more than an increase in the salaries of magistrates, and gradual accretions to their jurisdictions, as the police acts were severally renewed. On one of these occasions, also, Sir Robert Peel laid down as a formal rule the practice that had been usually but not invariably followed since the days of Lord Sidmouth, of appointing as police magistrates none but barristers.

Sir Robert Peel's Police Act of 1829.

The committee of 1828, however, has left its plain mark in the annals of police legislation, inasmuch as it paved the way for Sir Robert Peel's act of 1829 (10 Geo. IV., "An Act for improving the Police in and near the Metropolis"), by which a large approach was made towards that cardinal point in police reform,—the separation of the incongruous functions of thief-taker and judge, and an effective constabulary force was established under the control of two commissioners. This act, it is true, left many petty, detached, and independent bodies of peace officers in certain districts of the metropolis, irrespectively of the city of London, to which it did not at all apply. And to this extent it contained the seeds of future embarrassment in the proper working of the new constabulary. But if the state of parties in 1829 be borne in mind; if it be remembered how greatly Sir Robert Peel's political position was hampered by the results of his manly conflict for the Catholic Relief Bill, and how imperfectly public opinion was enlightened to the true importance of the police measure, even after all that had been done and said in relation to it, the surprise will rather be, that he effected so much, than that he did no more.

Parliamentary inquiry in 1838 into the working of the new police.

In 1838 the working of the new system came fully under the review of a parliamentary committee. The inquiry amply justified the measure of 1829, and the wisdom of extending it. Notwithstanding the loud prophecies of the worse than Egyptian bondage that was sure to follow so dangerous an innovation, no evidence was forthcoming that liberty had suffered by the suppression of the old watch-boxes, and of the woollen nightcaps by which they were wont to be tenanted. The committee reported its opinion—(1.) That the several constabulary forces (including that of the city) of the metropolis should be consolidated; (2.) That all executive duties of police should be entrusted to the commissioners; (3.) That the police-offices should be so regulated as to assimilate them, more than heretofore, to courts of justice; (4.) That, within the jurisdiction of the Police Act, one magistrate, sitting alone, should be empowered to deal with all cases; (5.) That police justices should be empowered to determine cases of simple larceny up to a value of forty shillings; (6.) That they should likewise be empowered to determine certain petty and constantly-recurring questions of a civil nature, especially affecting the most numerous classes of the population, and not previously provided for; (7.) That a revision of the police districts should be made, with a view to their better adaptation to the growth of the metropolis. There were many other recommendations on points of detail, but those we have cited comprise the matters of chief importance. In the following session bills were introduced in accordance with the principal recommendations of the committee; and again there was an active opposition.

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[1] Colquhoun, *Treatise*, &c., 6th edit., p. 510.

[2] Ibid., pp. 397, 414.

Maintenance of the separate control of the police within city of London.

The main contest was as to the consolidation of the police of the city with that of the outlying districts. It resulted in the introduction and ultimate passing of a corporation police bill, modelled in its details on that of the government, but retaining the separate control. The city force was to be placed under a commissioner, intrusted with like powers within the city to those which the metropolitan commissioners possessed without it.

The metropolitan police acts of 1839.

The chief provisions of the acts of the 2d and 3d Vict., c. 47 and 71 (the former entitled "An Act for further Improving the Police in or near the Metropolis;" the latter, "An Act for Regulating the Police-Courts in the Metropolis"), carrying into effect the above-cited recommendations of the committee of 1838, from the 2d to the 6th inclusive, give large powers for the pursuit and recovery of stolen goods; for the better regulation of hired carriages, and highways; and for the suppression of nuisances of various kinds. They raise the maximum salary of the magistrates to the sum of L.1200; and empower the Queen in council to alter the number and situation of the police-courts, as well as of the magistrates.

19 & 20 Vict., c. 2 (Feb. 28, 1856).

Finally, by the 19th and 20th Vict., c. 2, entitled "An Act to Amend the Acts relating to the Metropolitan Police," it is provided that one commissioner only shall be appointed after the passing of the act, at a salary not exceeding L.1500 per annum; power is given for the appointment, under the sign-manual, of two assistant commissioners, each at a salary not exceeding L.800 per annum; and it is enacted that all powers theretofore vested in the joint commissioners shall thenceforth be exercised by the sole commissioner.

Present organization and staff of the metropolitan police.

On the 1st January 1858 the metropolitan police force consisted of 17 superintendents, at salaries varying from L.200 to L.440; 140 inspectors, at salaries varying from L.81, 18s. to L.200; 630 sergeants, at weekly pay, amounting, in the lowest class (610 of the 630), to L.63, 14s. per annum, and in the highest class to L.109, 4s.; and 5296 constables, with pay ranging from L.49, 8s. up to L.78 per annum. Both sergeants and constables receive coals in addition to their pay and clothing, at the rate of 40 lb. weekly to each married man throughout the year, and 40 lb. weekly to each single man during six months, and 20 lb. weekly during the remainder of the year. The aggregate expenditure for pay and clothing amounted to L.349,315, 19s. 3d. The total expenditure of the department during the year ending 31st December 1857 was as follows:—

I. *Metropolitan Police Force*, 1857.—*Expenditure.*

Office salaries and expenses (including law charges, L.191, 3s. 6d.)……	L.11,367	0	8
Pay, clothing, and equipment of the force……	349,315	19	3
Retired allowances, and contribution to superannuation fund……	28,510	1	7
Medical and funeral expenses……	3,087	7	8
Horses and vans……	8,502	2	11
Police-station and section-houses……	18,779	16	10
Fuel and light……	13,649	18	6
Survey and protection of dangerous structures…	2,609	14	7
Miscellaneous expenses……	8,389	19	1
Total expenditure……	L.444,212	1	1

Establishment and staff of the metropolitan police-courts.

At the same period—namely, the close of 1857—the establishment of the metropolitan police-courts consisted of one chief magistrate at L.1500; 22 magistrates at L.1200 per annum each; 23 clerks, at salaries varying from L.75 to L.500 per annum; and 52 ushers, jailers, and messengers, at wages averaging L.82 per annum. The total expenditure on account of the courts, for the year, was as follows:—

II. *Metropolitan Police Courts*, 1857.—*Expenditure.*

Salaries and wages……	L.39,376	0	4
Retired allowances and pensions……	4,882	1	3
Purchase and repair of premises, rent, taxes, &c…	6,118	17	2
Fuel, light, and miscellaneous expenses……	1,883	18	6
Police Gazette……	3,142	9	9
Total expenditure……	L.55,403	7	0

Portion of the metropolitan expenditure borne by the Treasury.

When the police force was first organized (under 10 Geo. IV., c. 44), the contribution from the Consolidated Fund, in aid of the police rate, was limited to L.60,000 per annum. This sum continues to be the contribution of the Treasury, as respects the original district. For the extended district a contribution is made equal to one-third of the proceeds of the rate levied on that district.

The police rate of the metropolitan district.

The total sum charged in 1857 (by half-yearly warrants) upon the parishes within the original district was, at sixpence in the pound (upon a rental of L.9,811,926), L.245,298, 3s., to which, as we have seen, L.60,000 were added from the Consolidated Fund; the total sum charged in like manner upon the parishes within the extended or additional district (upon a rental of L.1,822,953) amounted to L.45,573, 16s. 6d.; to which was added from the Consolidated Fund, L.15,191, 5s. 6d.; making in the aggregate L.366,063, 5s.

The smallest contribution by rate, it may be worth while to note, is that of the liberty of Twyford Abbey in Middlesex, being L.13, 6s. (upon a rental of L.532); the largest i that of the parish of St Marylebone, being L.24,984, 6s. (upon a rental of L.999,372).

Special contributions from the Treasury.

Besides the sums which have been specified, there are paid out of votes of Parliament, in pursuance of provisions in the acts of the 2d and 3d Vict., c. 47, of the 17th and 18th Vict., c. 94, and of the 19th Vict., c. 2, the following sums,—viz., to defray the increased charge arising from the addition of the duties of the horse patrol and the Thames police, L.20,000; to defray the salaries of commissioner, assistant-commissioners, and receiver, L.4100; to defray certain superannuation charges, L.4080, 19s. 6d. Other sums received from public offices and departments for special services, severally rendered to them by the police, amount to L.24,701, 16s. 8d.; and like sums received from trading companies and private persons amount to L.8194, 0s. 10d. The total receipts from all sources stand thus:—

Abstract of the total receipts.

III. *Metropolitan Police Force*, 1857.—*Receipts.*

Police rate (6d. in the pound)……	L.290,871	19	6
Treasury……	103,380	5	0
Public departments for special services……	24,701	16	8
Companies and private persons……	8,194	0	10
For conveyance of prisoners……	819	17	7
From owners of dangerous structures……	1,691	2	4
Stoppages from police pay for lodging……	5,218	14	11
Miscellaneous receipts……	687	17	2
Total receipts……	L.435,565	14	0

Metropolitan Carriages Act (16 & 17 Vict., c. 33 of 1853.

By the 16th and 17th Vict., c. 33 ("An Act for the better Regulation of Metropolitan Stage and Hackney Carriages, and for Prohibiting the use of Advertising Vehicles"), the inspection and regulation of public carriages is made one of the duties of the commissioners of police; the certificate of the commissioners being the condition precedent of the licensing of any such carriage by the Boards of Inland

Revenue. The expenses of this department are borne by the board out of the proceeds of licenses, and amounted in 1857 to L.11,828, 15s. 5d.

The receipts of the police-courts during 1857 were :—

IV. *Metropolitan Police-Courts*, 1857—*Receipts.*

From the Consolidated Fund (under 2 & 3 Vict., c. 71, § 11)	L.28,025	9	1
Out of vote of Parliament, 1857–8	30,308	2	10
Fees, penalties, and forfeitures at the various courts	11,291	2	9
Contributions to the superannuation fund	1,112	3	3
Total receipts	L.70,736	17	11

The whole amount received for fees and penalties is paid over to the Exchequer, and the whole expense (L.55,403) defrayed by the Treasury; but of course about one-fifth of the cost of the police-courts is virtually self-defrayed from the former source.

Cost of city of London police.

The total cost of the police force within the city of London was in 1857, L.43,945, 6s. 9d., defrayed from corporation funds. The aggregate number of police of all ranks employed was 552.

Apprehensions, discharges, convictions, and committals.

The number of apprehensions by the metropolitan police, and their results before the magistrates, will be seen by the following comparative table, which comprises (1.) the three years ending 1836, and (2.) the three years ending 1856:—

VI. *Metropolitan Police,—Apprehensions and Results* 1834-36, *and* 1854-6.

Years.	No. of Persons taken into Custody.	No. Discharged by Magistrates.	No. Summarily Disposed of, or Held to Bail.	No. Committed for Trial.	Years.	No. of Persons taken into Custody	No. Discharged by Magistrates.	No. Summarily Disposed of, or Held to Bail.	No Committed for Trial.
1834	64,269	34,499	26,302	3,468	1854	75,614	39,514	30,941	5,159
1835	63,474	32,544	27,817	3,113	1855	68,505	34,850	29,796	3,859
1836	63,384	29,776	30,453	3,175	1856	73,240	36,551	33,451	3,238
Total of the 3 years, 1834–36	191,127	96,819	84,572	9,756	Total of the 3 years, 1854-6	217,359	110,915	94,188	12,256
Yearly average of those years	63,709	32,273	28,190	3,252	Yearly average of those years	72,453	36,971	31,396	4,085

Proportion of discharges to apprehensions.

The proportion borne by the discharges to the apprehensions (1854-56) is, it will be perceived, no less than 51 per cent. in the metropolitan district. This appears to be a much higher percentage than obtains in other districts. In Liverpool, for example (as will be shown presently), it was, on an average of the same three years, 42·8 per cent.; in Manchester, 35·3 ; in Dublin, 31·4 per cent.

Degree of instruction of persons apprehended.

The subjoined table shows the degree of instruction, as far as could be ascertained by the police functionaries, of the whole number of persons taken into custody within the metropolitan district in the year 1856 :—

VII. *Metropolitan Police,—State of Instruction of Persons taken into Custody*, 1856.

Could neither read nor write	15,482
Could read only, or read and write imperfectly	53,540
Could read and write well	3,837
Possessed of superior instruction	381
Total number of persons apprehended	73,240

Classification of offences within metropolitan district.

Any elaborate classification of the cases included in the preceding tables would require space not here available; but limiting the statement to the summary convictions and the committals of 1854-56, the nature of the offences may be thus briefly indicated :—

VIII. *Metropolitan Police,—Class of Offences for which Prisoners were Committed for Trial*, 1854–6.[1]

Nature of Offences.	1854.	1855.	1856.	Total of Three Years.
1. Offences against the person	266	241	224	731
2. Offences against property, with violence	250	207	376	833
3. „ „ „ without violence	4232	3132	2300	9664
4. Malicious offences against property	12	1	11	24
5. Forgery, and offences against currency	377	251	289	917
6. Offences not included in the above classes	22	27	38	87
Total number of Committals	5159	3859	3238	12,256

IX. *Metropolitan Police,—Class of Offences for which Persons taken into Custody were Summarily Convicted, or Held to Bail*, 1854–6.[1]

Nature of Offences.	1854.	1855.	1856.	Total of Three Years.
1. Offences against the person	6,440	6,114	6,314	18,868
2. Offences against property, without violence	6,234	6,299	8,659	21,192
3. Malicious offences against property	1,435	1,504	1,742	4,681
4. Drunkenness	1,726	1,642	1,608	4,976
5. Offences against Police Act—sewers, &c.	534	447	337	1,318
6. „ „ Betting-Houses Act	2	......	1	3
7. „ „ Common Lodging-Houses Act	10	7	......	17
8. „ „ Hackney Carriage Act	391	314	434	1,139
9. „ „ Highway and Turnpikes Act	38	23	24	85
10. „ „ Juvenile Offenders' Act	246	270	390	906
11. „ „ Militia Act	36	22	15	73
12. „ „ Railway Acts	20	20	33	73
13. Vagrants and suspicious characters	2,584	2,189	2,592	7,365
14. Offences not included in the above classes	11,245	10,945	11,302	33,492
Total number of Summary Convictions, &c.	30,941	29,796	33,451	94,188

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[1] We have abridged these returns from the voluminous and valuable tables published in *Miscellaneous Statistics of the United Kingdom, presented to both Houses of Parliament* (1857) pp. 84–88.

Ancillary duties of metropolitan police.

The number of fires reported by the metropolitan police during the same three years was 1468, and the number extinguished by the force before the arrival of the engines was 115; the number of public-houses and beer-shops summoned was 3441, of which 2666 were convicted, and 775 dismissed; the number of stage and hackney carriages, carts, and waggons summoned was 9362, of which 8184 were convicted, and 1178 dismissed.

Borough and town police of England.

Under the Municipal Corporations Act (5 and 6, Will. IV., c. 76), or under local acts, 171 cities, boroughs, and towns in England and Wales maintain a police force, which, on the 29th September 1857, amounted in the aggregate to 5251 officers and constables of all ranks. The city or borough police is a charge upon the borough funds, aided in a majority of instances, by a police rate. One-fourth, however, of the cost of pay and clothing is repaid from the public revenues to all cities and boroughs having a population exceeding 5000, and to all boroughs of lesser population, provided the police force be amalgamated with that of the county; but such repayment is in all cases subject to the certificate by the home secretary, upon annual report from her Majesty's inspector, that the force maintained is efficient as respects both its numbers and its discipline.

Cost of the borough police.

The total cost of the borough police throughout England and Wales in 1857 was L.337,853, 2s. 11d., of which sum L.60,970, 8s. 4d. was borne by the Treasury. The largest local force—both numerically and in respect to population—is that of Liverpool, which is composed of 956 officers and men of all ranks, and is in the ratio of one policeman in every 393 of the population. Then follows Bristol, with 301 police, or one in 459 of the population. Manchester comes next, with a force of 554 persons, or one to 547 of the population. At the opposite extremity of the scale come some of the smaller manufacturing towns of Lancashire and Northern Cheshire, the Cornish boroughs and some quiet easy-going towns in various parts of the country; as, for example, Saint Albans in Hertfordshire, which has 7 policemen to a population of 49,000; and Beverley in the East Riding of Yorkshire, which (if the judicial statistics presented to Parliament in 1858 are accurate) has but one such functionary in 8915 of population. But this great variety of condition in respect of police will be best appreciated if we tabulate a few examples out of the official statistics of the 171 towns and boroughs which are before us:—

Relative strength of borough police.

X. *Borough Police of England and Wales,—Strength and Cost*, 1857.[1]

Name of Borough or Town.	Number of Police Force.	Number relatively to Population.	Total Cost.			Contribution from the Treasury.		
			L.	*s.*	*d.*	L.	*s.*	*d.*
Liverpool	956	1 in 393	59,920	17	2	13,709	18	8
Bristol	301	„ 459	14,404	17	7	3,346	18	1
Manchester	554	„ 547	37,323	14	10	7,767	10	6
Birmingham	355	„ 646	21,852	3	3	4,752	15	3
Cambridge	34	„ 824	2,133	12	9	424	0	11
Ipswich	34	„ 961	1,952	14	1	447	2	4
Winchester	13	„ 1,054	857	12	8	187	4	9
Canterbury	14	„ 1,272	1,066	6	2	...		
Oldham (Lancash.)	36	„ 2,400	2,060	8	7	...		
Oxford	10	„ 2,784	623	15	6	...		
Stockport	15	„ 3,588	2,504	19	0	...		
Helston (Cornwall)	1	„ 4,000	[not returned]			...		
Bodmin	1	„ 4,327	45	9	5	...		
St Albans	7	„ 7,000	366	0	8	75	14	1
Beverley	1	„ 8,915	...	...		...		

Police certificate system.

The blanks in the last column of this table indicate that in the case of those boroughs respectively the state of the police force was unsatisfactory to the inspector, and that the certificate of the secretary of state was in consequence withheld. There can be no doubt that this plan of government inspection and certificate is the hinge on which the efficiency of the borough police mainly turns. The certificate is often granted conditionally, when the deficiencies pointed out by the inspector, whose reports are communicated to the respective local authorities, appear to be in the way of remedy. Thus, in December 1857, Sir George Grey, in transmitting Colonel Woodford's report to the watch committee of Salford, states that he had granted the certificate "in the confident expectation that the observations of the inspector as to some defects in the condition and discipline of the borough police force will receive due attention;" on the like occasion, to the watch committee of Newcastle, "trusts that the recommendation of the inspector of a moderate augmentation of the force will receive due attention;" while that of Halifax is informed that the secretary of state "will not feel himself justified in certifying . . . that your police has been maintained in a state of efficiency in point of numbers and discipline for a longer period than from 21st September last" (*i.e.*, twelve weeks of the year); adding, however, that "if your police force is maintained (as he has no reason to doubt), at its present state throughout the ensuing year, he will have great satisfaction in granting the certificate to which it will be fully entitled.[2]

Necessity of government inspection in measures of sanitary police.

Some similar provision for a systematic and efficient government inspection is greatly needed in respect of sanitary measures in boroughs. The owners of what in our large towns is designated "cottage property," have of late years associated themselves for the express purpose of resisting sanitary improvement. In some of the towns which stand most in need of such improvement this class of persons has succeeded in attaining a prominent influence in the town councils. In the municipal elections of November 1858, this influence has been repeatedly observed. By such means, even in large towns like Manchester, sanitary associations, acting upon principles which have had the direct sanction of the legislature, after searching inquiry, find themselves opposed by the local influence of the corporations and functionaries, whose duty it is to further the very measures they impede. Nor is it without precedent to find men placed on committees which have to deal with specific questions of this sort, who are known to have a pecuniary interest in obstructing the due action of those committees, and who are so placed for that express reason. In large and wealthy towns public opinion will, in the long run, be too strong for petty and tortuous interests. In small and poor towns, local opinion stands in much need of being reinforced from without.

Cellar dwellings.

Take, for example, the question of "cellar dwellings," the inhabiting of which is absolutely incompatible with vigorous health, and the bare existence of which, in English towns in 1858, is a proof of the gross neglect in past years of the rudiments of sanitary police. In Manchester some real improvement in this respect has been effected,[3] although not without great difficulty. But how does the case stand in the neighbouring town of Bolton?

In August 1855 it was ascertained that about 6000 persons, or one-twelfth of the entire population of Bolton, dwelt in cellars, the number of which was about 1600. It follows, therefore, that each cellar was tenanted on the average by nearly four human beings. This was the fact in 1855, twenty-three years after the fearful lesson of 1832, repeatedly enforced by other like warnings of later date. The attention of the town council was pressingly claimed to a state of things so dangerous and so disgraceful. It set to work at length, but in a very lethargic fashion. In politer phrase, its members "showed their anxiety to proceed gradually and with caution." In the year 1856 they closed 128 of these places; *in* 1857, *forty-nine; and in* 1858, *thirteen.* At the end of 1858, a "Cottage Owners' Association" interposed in the municipal elections, with the view of securing the return of councillors for whom even this rate of "interference with property" was too rapid. The reader may calculate with little difficulty the period of time requisite for the removal, if left entirely in such hands, of an evil which the law of the country has emphatically condemned, and which a medical member of the town council in question (to whom the honour of effecting the little that has been effected is mainly due), stated, on the professional experience of a long practice, to "involve an immense loss of human life."[1]

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[1] *Judicial Statistics* (for the year 1857), presented to both Houses of Parliament (1858), pp. 3, 4.

[2] *Papers relating to Police Certificates* (19th April, 1858), S. P. 213.

[3] *Proceedings of the Council of the City of Manchester for* 1857, pp. 285–294.

mproved elations of lasses in he manu- acturing owns.

The large improvements which have been effected in the borough police of England, under the legislation of the last quarter of a century, are nowhere more striking than in the manufacturing towns of the north, much as yet remains to be done in a like direction in many of them. The rapidity of growth of the manufacturing system; the utter unscrupulousness as to means with which the aggregation of working-people was, in its early stages, urged on; and the then almost entire neglect of moral and educational agencies by a large proportion of those who were suddenly raised from obscurity to influence, had brought about in these towns a state of society which was especially and eminently perilous. Class animosities had become chronic. The masses of the working population saw the functions of of the magistracy and the machinery of the law habitually employed to keep down the weak, and to aggrandize the strong. Disaffection and turbulence could not fail to spread.

The appointment of stipendiary magistrates, and of factory inspectors, in combination with improved means of education, and with a well-ordered police, subject to strict rule and constant publicity, have in this respect completely changed the face of things. If a prosperous Lancashire manufacturer is presented at court, it does not now occur to royalty to inquire, as William IV. did on a like occasion, "Are you quiet in Manchester now?" Royalty has seen with its own eyes that the crowded population of our manufacturing towns can throng their streets on a great occasion with orderly but manly demeanour, uttering no cries but those of loyal attachment.

y police Man- ester.

The police force of Manchester was organized in 1839. For the first four years the number of apprehensions was continually and largely on the increase; and the proportion of persons discharged on appearing before the magistrates was enormous. In 1841, for example, with a population of 235,000, the number of persons taken into custody was 13,345; of whom 10,208 were discharged by the magistrates, 2138 were summarily convicted, and 999 were committed for trial. Of the latter, 824 were convicted and sentenced. The discharged, therefore, were no less than 76·49 per cent. of the number taken into custody, exclusive of 1·31 per cent. acquitted on trial. Such a result could only occur under considerable abuse of the large powers conferred by the Borough Police Act; an abuse, however, which may be partly excused by the novelty of the organization. By zealous attention on the part of the late exemplary chief constable, Captain Willis (now one of the government inspectors of police), a remarkable change has been brought about. The character of the force itself was raised. A certain degree of elementary education was gradually exacted. Great pains were taken to habituate the constables to cautious and discriminating conduct, especially in dealing with charges of a trivial nature, and with such as grew out of disputes and street broils. Intelligent and superior constables were kept constantly on duty at the stations, and were held responsible for strict inquiry into the nature of the charges, before the persons charged were placed in confinement. The importance of a conciliatory bearing towards the inhabitants at large, within the limits of duty, was impressed upon every member of the force. Thus, in 1851, with a population of 303,382 the number of apprehensions was reduced to 4890 (against 13,345 in 1841), and the proportion of cases discharged by the magistrates to 37·50 per cent. (against 76·49 per cent. in 1841). The precise figures of 1851 run thus:—Apprehended, 4890; discharged, 1834; summarily convicted, 2176; committed for trial, 880; convicted and sentenced 722. There can be no better proof of the increased discretion and judgment evinced both by the police constables in taking, and by the sergeants and inspectors in receiving, the persons charged with offences.[2]

The following tables show (1.) the population, police force, apprehensions, and disposal of persons apprehended, within the city of Manchester, for each of the seven years 1851–57 inclusive; and (2.) the degree of instruction of the persons so apprehended during the same period:—

XI. *Manchester Police,—Persons Apprehended, and their Disposal*, 1851–7.

Year.	Population.	No. of Police.	Persons Apprehended.	Discharged	Summarily Convicted.	Committed for Trial.	Convicted and Sentenced.
1851.....	303,382	466	4890	1834	2176	880	722
1852.....	316,487	477	5166	1783	2494	889	730
1853.....	322,873	481	5362	1941	2627	794	623
1854.....	328,897	529	5955	2416	2584	955	805
1855.....	330,690	532	6054	2041	3077	936	748
1856[3] ...	337,915	546	4470	1463	2372	635	505
1856–7..	345,986	554	7797	2861	4144	792	602

XII. *Manchester Police,—Degree of Instruction in Persons Apprehended*, 1851–7.

Years.	otal Number Apprehended.	Could neither Read nor Write.	Could Read and Write Imperfectly.	Could Read and Write Well.	Of Superior Instruction.	Percentage.		
						Of the Uninstrncted.	Of the Imperfectly Instructed.	Of the Well Instructed.
1851.....	4890	1866	2851	172	1	38·2	58·2	3·5
1852.....	5166	1882	3067	213	4	36·43	59·36	4·2
1853.....	5362	1967	3217	177	1	36·68	59·66	3·31
1854.....	5955	2236	3574	144	1	37·54	60·	2·43
1855.....	6054	2131	3761	162	...	35·19	62·12	2·67
1856[3]...	4470	1743	2623	103	1	38·99	58·68	2·32
1856–7..	7797	3229	4413	154	1	41·41	56·59	1·97

Offences of publicans.

The following table shows the number of public-houses and of beer-houses within the city of Manchester, and the number of offences reported against them respectively by the police, in each of the years 1854, 1855, 1856, and 1857:—

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[1] Proceedings of the Town Council of Bolton, Nov. 25, as reported in the *Manchester Guardian*, Nov. 26, 1858.

[2] *Criminal and Miscellaneous Statistical Returns of the Manchester Police*, 1843 to 1857, *passim*.

[3] The return for 1856 is for *nine months* only (ending 30th Sept.) in consequence of that provision in the Constabulary Act which directs the preparation of the returns at the end of September in each year.

XIII. *Manchester Police,—Complaints against Taverns and Beer-Houses*, 1854–7.

	1854.	1855.	1856. (9 mos.)	1857.
Public-Houses:—				
Number in the city................	485	487	489	485
Offences on week-days reported	8	9	5	7
Offences on Sundays reported....	132	110	64	116
Total No. of offences reported	140	119	69	123

	1854.	1855.	1856. (9 mos.)	1857.
Beer-Houses:—				
Number in the city................	1576	1581	1552	1573
Offences on week-days reported	207	169	155	169
Offences on Sundays reported....	659	452	337	576
Total No. of offences reported	866	621	492	745

Each year shows a relative decrease of both classes of houses, as compared with the population of the city. In 1857 the proportion of licensed victuallers to the population was as 1 to 713, against 1 to 691 in 1856; and that of beer retailers as 1 to 219, against 1 to 217 in 1856.

Police statistics of Liverpool.

The table next subjoined shows the total number of persons apprehended by the police of Liverpool, and the results of the hearing of each case by the magistrates, in each year from 1854 to 1857:—

Year.	Total No. of Apprehensions.	Discharged.		Summarily Convicted.		Committed.		Tried.		
		Number.	Percentage to Apprehensions.	Number.	Percentage.	Number.	Percentage.	Convicted.	Acquitted.	Percentage.
1854	25,111	11,529	45·8	13,127	52·2	455	1·8	376	71	1·5
1855	25,689	10,188	39·6	15,053	58·6	448	1·8	352	70	1·4
1856[1]	19,336	8,335	43·1	10,526	54·4	475	2·5	374	92	1·9
1857	24,375	10,914	44·7	12,254	50·3	1207	5·0	870	222	3·6

The Liverpool returns of 1858 (which are before us, but only in an incomplete form) show a decrease of 2386 in the number of apprehensions; and also a marked decrease in juvenile crime, ascribable to the effect of the reformatories hereafter noticed.

Police of the English counties.

We now advert to the condition, as respects police, of the English counties. This branch of the subject was fully investigated by the commissioners appointed in 1836 "to inquire as to the best means of establishing an efficient constabulary force in the counties of England and Wales." The commissioners were Mr C. Shaw Lefevre (afterwards Speaker), the late Sir Charles Rowan, and Mr Edwin Chadwick. They reported in 1839. After an elaborate exposition of the nature, ramifications, and extent of crime with which their inquiry had acquainted them, the commissioners report that "the primary functions of 'watch and ward' . . . . have entirely fallen into desuetude, which is ascribable to the dereliction of the constitutional principle of local responsibility to the supreme executive for the prevention of crime. As a consequence of this state of things, we find private watchmen extensively employed by individuals and by associations for self-protection. . . . . The men hold themselves engaged for the service of those who directly appoint and pay them, and question as little as they can the propriety or legality of any services required of them." Elsewhere they state that "There are upwards of 500 voluntary associations for promoting the apprehension and prosecution of felons, besides very numerous voluntary associations in various parts of the country for the repression of vagrancy and mendicity. Amongst the rules of some of these associations for self-protection, we find rules for mutual assurance by the payment of a part of the loss sustained by depredation. In several of the farmers' associations are rules binding the members, in the case of horse-stealing, to take horse and join in pursuit of thieves, upon an alarm of a theft having been committed;" and they add:—"Hereafter such associations and such rules may be cited to prove that the community in which they arose was relapsing into a state of barbarism."

This aspect of the question was forcibly illustrated in the evidence of the late Rev. Thomas Spencer, of Hinton, near Bath:—"In our part," he said, "if a person's property is safe, it is owing to the good conduct of his neighbours, or to accident, or to the means he may himself use; but it is not owing to any legal protection that he has. I feel that we are, as it were, without the pale of the law; that every man that would be safe must be his own watchman, his own constable, and his own magistrate; that unless he himself takes all the precautions to make his house and property secure, there is no other remedy; that unless he himself shall watch his property, and take up the offender,—shall take him to the constable,—shall order the constable to go with him to the next town, and be at the expense of the constable doing that,—and shall promise the constable to be responsible for putting the man into custody until he can be brought before a magistrate; shall appear before the magistrate, and reason with him, and probably give him an indemnity, if the case be one of doubt; in fact do all the work, the man will escape; whatever be his crime."[2]

State of rural police during the riots of 1830-31.

The commissioners also cited some remarkable circumstances which occurred during the agricultural riots of 1830 and 1831, as showing the utter want of any adequate provision for cases of emergency. For example, "When a report was brought into the town of Newbury in Berkshire, on the 19th of November, that a mob was coming from Brimpton, and special constables were about to be sworn in, the town-clerk and the clerk to the magistrates for the division were quarrelling about jurisdiction; that is, whether the constables should be sworn in for the county, or for the town of Newbury. The Newbury people stuck up for the rights of the town, and would only be sworn before the town magistrates. This fermented a division. *Luckily, the mob . . . . had been beaten and dispersed.*" And in answer to the question, "Were any organized parties sent from the town?" the answer was,—"Parties were sent out, but there was no organization, no system. Those who chose to go, went. In one instance, a party went out, and after they had gone some way out of the town, some of them asked, 'Where are we going to?' It turned out that no one knew, and that each believed he was acting under the guidance of some of the others."[3]

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[1] Here also the return for 1856 is for *nine months* only (ending 30th Sept. in consequence of that provision in the Constabulary Act which directs the preparation of the returns at the end of September in each year).

[2] *Report of Constabulary Force Commissioners*, pp. 97–99.

[3] Ibid., pp. 106, 107.

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Such evidence is but a fair specimen of the general character of the testimony which was gathered, as respects both the repression of ordinary crime and the control of riot. Apart from the ulterior peril of habits of lawlessness, with their possible but indefinite consequences, it must be apparent that such a state of things could not but be costly. In dealing with felonies, every inefficient step at the outset entailed expenses which increased at every subsequent stage, and by leading to frequent impunity, sowed the seed of new crimes; whilst, in dealing with popular commotions, every hour that passed without measures of repression, at once temperate and firm, gave the opportunity for devastations not to be covered by sums that would suffice to maintain an efficient constabulary for many years; to say nothing of the social results, more serious still, which must ever attend on broils in which master is armed against servant, and neighbour against neighbour.

At the date of this inquiry a paid and trained constabulary force had been tried experimentally, and upon a small scale, in many parts of the country. A paid watch, without training, had repeatedly failed. In places where the associations for prevention of robberies were most successful the success was partial, and very frequently had the effect of making the state of things just beyond their limits worse than it had ever been before. Nor was even this degree of efficiency maintained until the establishment of the metropolitan office enabled rural districts, willing to take advantage of the Lighting and Watching Act (3 and 4 Will. IV., c. 90), to obtain the services of practised constables. The change of circumstances which then resulted in many parts of England was strikingly narrated in evidence before the commissioners; as, for example, in the case of Barnet in Hertfordshire, in that of Beckenham in Kent, in that of thirty of the thirty-two parishes which form the Blofield union in Norfolk, and in that of Stow-on-the-Wold in Gloucestershire.[1]

ature and peration the heshire onstabu- ry Act of 29.

But the most extensive trial of a paid constabulary force in rural districts was that which had been made in Cheshire, under the provisions of an act of the 10th George IV., c. 97 ("An Act to enable the Magistrates of the County Palatine of Chester to appoint Special High Constables for the several Hundreds or Divisions, and Assistant Petty Constables for the several Townships of that County"). The whole force established under the act consisted of only three high constables and twenty-four petty constables, and the total expense was L.1274, exclusive of certain fees and perquisites. Small as the force was, petitions were got up in various townships complaining of its cost and "uselessness," and in some townships reductions were made.

At this period a state of things existed in Cheshire, and especially in the hilly districts near the county town, the unadorned account of which reads more like a picture of some of the worst parts of Ireland in their worst days, than of an English county towards the middle of the nineteenth century. Nightly gangs, composed of known persons, yet unbroken for years; individual robbers whom five athletic constables were unable to arrest; habitual plunder, so systematized as to be looked upon by the sufferers as a sort of dispensation of Providence, which it was idle to think of resisting;—such are the features which were conclusively brought out in evidence.[2] Under circumstances like these, it is not surprising that almost all that was achieved by the Local Constabulary Act lay in preventing the districts in which crime was already least formidable from becoming worse; whilst those—the hundreds of Bucklow and Broxton, for example—in which it had never been fairly grappled with, were left at the mercy of events; each farmer hoping that if he did not make himself especially obnoxious to his predatory neighbours, his share in the common loss would be lighter than that of somebody else. It is right to remember that the criminal facilities of some parts of Cheshire were increased by special and temporary incidents; such as those arising from the vexatious character of the old salt duties, from the want of an efficient coast-guard for the prevention of "wrecking," from the long lines of canal, and the like. Nor is it uninstructive to notice that an inquiry which was made into the incubation of certain petitions, not unsuccessful, against an effective increase of the constabulary, elicited the facts, that they had been hawked about by persons having a pecuniary interest in the retention of the old methods, signed by convicted offenders, and actively supported by the keepers of beer-houses. On the whole, two things appeared to be clear: the one that the Cheshire Constabulary Act had failed of its proper effect; the other, that the failure tended to strengthen, not to weaken, the arguments for a county police, composed of trained men, and so controlled as to combine the advantages of uniformity of system with those of local supervision and local responsibility.

The recommendations in which the commissioners of 1839 summed up the results of their inquiry are too elaborate for insertion here, even in epitome. It must suffice to describe the new laws, on the ultimate passing of which the report, and the discussions thence arising, had naturally great influence. Public opinion has not endorsed, nor is it likely to endorse, *all* those recommendations; but that the zeal and ability of the commissioners have laid the country under great obligation, is an obvious fact.

One of the most thoughtful and most incisive of recent writers has told us that whereas our ancestors made laws which have lived for centuries, and promise to live for centuries to come, men in these days do not expect "that any law enacted during the last session will escape without either revision or repeal the next,—beyond which it would be invidious to ask how many members of our legislature have projected their minds."[3] If the reproof was amply justified twenty years ago, what is to be said now? But if piecemeal legislation be excusable at all, it is so in relation to matters of police, in which the new and the old are at once so various and so intimately linked together, that incautious handling might easily destroy whilst seeking only to amend. Here the legislator has to deal with measures in the gross, the whole issue and effect of which, in their particular application, depend on the wide-spread concurrence and hearty fellow-working of all classes of the community. The inventor who should contrive for daily necessities machinery so intricate as to require the constant interposition of the maker to keep it in order, would fail of his object, however admirable the mathematical or mechanical skill embodied in his invention. Frequent amendments in the familiar mechanism would be less embarrassing to the workers. The lawgiver may in like manner overshoot his mark by changes too elaborate and too sudden. In the series of enactments which have at length gradually brought us to a general constabulary system, we have at all events no fault of this kind to complain of.

The rural police acts, 1839-40.

The first step was the passing of the Rural Police Act (2 and 3 Vict., c. 93, amended by the 3 and 4 Vict., c. 88), which empowered the magistrates of any county in England and Wales to appoint chief and petty constables for such counties, in such numbers and under such apportionment to the several districts as they might deem advisable; permitted the magistrates of several adjoining counties to unite in such appointments if they thought fit; and also gave discretional powers for the amalgamation of the police of boroughs with that of the counties in which they were situated or to which they were adjacent.

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[1] *Report of Constabulary Commissioners, ut supra*, 129–137.

[2] Ibid., 110–129.

[3] *Guesses at Truth*, by Two Brothers, ii. 10.

These acts, it will be seen, were simply permissive. Essex was one of the first counties to adopt them. Its constabulary was organized in February 1840, and it had the good fortune to obtain a most able and energetic chief constable in the person of Captain J. B. M'Hardy (of the Royal Navy), who had been for many years an inspecting commander of the coast-guard. At this time the new act was in bad odour in many parts of England, and especially, as it would seem, in Kent, Suffolk, Hertfordshire, and Cambridgeshire. The remarkable success which attended Captain M'Hardy's exertions in Essex, at the head of a force composed of 200 men (14 superintendents, 20 inspectors. and 166 constables in three classes), obliged the neighbouring counties, Kent excepted, to follow the example. All these eastern and south-eastern counties were overrun with vagrants, who in large numbers had for years levied a considerable tax on small farmers and cottagers, over and above the amount of casual relief administered to them under the poor-law. In Essex the plan of making the police, under discreet regulations and careful supervision, assistant relieving-officers "for casuals," was tried with excellent effect. This measure checked vagrancy when all other expedients had failed. Hampshire soon followed; and here, as in Essex and the contiguous counties, both crime and vagrancy were remarkably diminished.

During the fourteen years 1840–1853, eighteen English and four Welsh counties adopted the constabulary for the whole of each county; and seven other English counties for parts only. Fourteen English and eight Welsh counties still continued the system of parochial constables.

Superintending Constables Act, 5 and 6 Vict., c. 109.

Conflicting evidence as to the working of this act.

With a view, however, to some increased efficiency in the counties last named, in which the adoption of the Police Act was successfully opposed, the act of the 5th and 6th Vict. c. 109 (Superintending Constables Act), enabled the magistrates of any county to appoint a head constable to each petty sessional division of a county, or to some selected divisions, whose duty it should be to exercise a general supervision over the parochial constables within his district. Much and somewhat conflicting evidence as to the operation of this act was taken by the select committee on police of 1853. Mr Oakley, governor of the county gaol of Somerset, for example, said:—"It increases the evils by inducing the parish constables to set themselves in opposition to the superintending constable. . . . . The superintending constables being altogether uncontrolled, and without supervision, themselves fall into habits which render them unfit for the proper performance of their duties."[1] On the other hand, Lieut.-Col. Clifford, a magistrate of Herefordshire, and chairman of the court of quarter sessions, stated his belief that "the prevention of crime is entirely met by the comparatively small number of superintending constables we now have there;" and that the "superintending constables are as efficient as possible."[2]

Recommendations and opinions of the police committee of 1853.

On this part of the question the committee reported its conclusions as follows:—"The superintending constables have proved useful as police-officers to the extent of their individual exertions and services;" but such an appointment, it adds, "provides no remedy for the inefficiency of parochial constables; and it is the opinion of your committee that any system of police mainly dependent on the aid of parochial constables must prove ineffectual for the protection of property, more especially that of the poorer classes; for the prompt detection and pursuit of offenders, the maintenance of order, and other duties of a police force, for which their necessary avocations and local connections entirely disqualify them."[3]

On the more general question of the working of the rural police acts, the committee resolved:—"1. That the . . . Rural Police Act (from the permissive character of its enactments), has failed to provide such a general and uniform constabulary force as, in the opinion of your committee, is essentially required for the prevention of crime and security of property. 2. That in the districts in which the Rural Police Act has been adopted, its efficiency for the prevention of crime, by rendering the detection and apprehension of offenders more prompt and certain, has been proved to the satisfaction of your committee; that it has tended to the maintenance of order, and to the improved habits of the population; that vagrancy has greatly decreased, and, more especially in combination with the casual relief order of the Poor Law Board, has been in some places almost entirely suppressed; and the effectual protection afforded to property peculiarly exposed to depredation has, in the opinion of owners and holders of land, rendered its occupation more desirable. The adoption of the rural police, therefore, in the opinion of your committee, has proved highly advantageous to those districts, whether tested by moral, social, or economical considerations." The committee further recommend that provision should be made for the equitable adjustment of the police rate between the various divisions of a county, in cases wherein great differences existed as respects the density and employments of the population; that the smaller boroughs should, for police purposes, be consolidated with districts or counties; that the police of the larger boroughs should be brought under like management with that of the adjoining district or county; and that the wisdom of some contribution by government "towards defraying the cost of an improved and extended system of police, without essentially interfering with the local management of that force, deserved the consideration of the House;" and the report concluded with the emphatic recommendation, "That legislative measures should be introduced without delay by Her Majesty's government rendering the adoption of an efficient police force on a uniform principle imperative throughout Great Britain."[4]

County and Borough Police Act, 19 and 20 Vict., c. 69.

In conformity with this recommendation, the act of the 19th and 20th Vict. c. 69, became law three years afterwards ("An Act to render more effectual the Police in Counties and Boroughs," July 21, 1856). Its principal provisions are these:—1. If a constabulary be not already established for the whole of a county, the justices in general or quarter sessions, are to cause the same to be established; if already established in part of a county, then it is to be extended to the residue. 2. Constabulary establishments existing in particular divisions of a county are to be consolidated into a single county police force. 3. But Her Majesty may, by order in council, require separate police districts to be established in counties. 4. Her Majesty in council, on representations from borough authorities, may arrange the terms of consolidation of such boroughs with counties, for police purposes, and may from time to time vary such terms. 5. County constables are to have the like powers in boroughs as are possessed by borough constables in the counties. 6. No constable shall receive any fees for his own use, or shall vote at municipal or parliamentary elections. 7. Powers are given to grant pensions and superannuations. 8. An annual statement as to crime in counties and boroughs is to be made to the secretary of state. 9. Her Majesty is empowered to appoint three inspectors of county and borough police, whose reports shall be laid before Parliament. 10. On due certificate of efficiency, one-fourth of the charge of police pay and clothing in any county or borough is to be paid by the Treasury; but no such payment is to be made to boroughs of less population than 5000. The remaining provisions tend chiefly to the maintenance of existing powers until the new act shall have been brought into full operation. Finally, nothing in the act is to apply to any part of the metropolitan police district, or to the city of London.

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[1] *Minutes of Evidence before Select Committee on Police* (1853), Q. 3284.

[2] Ibid., Q. 3872–4.

[3] *Second Report of Select Committee on Police* (5th July 1853), iii.

[4] *Report, ut supra*, iii., iv.

Operation of the County and Borough Police Act of 1856.

From this statute, the establishment of a uniform system of police is to be dated. Until the end of 1856 no provision had been made in many extensive districts of the country for the protection of life and property, other than that of the old parochial system, which left those duties to the untrained, unpaid, and frequently unwilling officer, and often failed to equip him with the most essential appliances for the pursuit, apprehension, and safe custody of criminals.

On the 29th September 1857 the county constabulary was returned to the secretary of state as comprising 7301 officers and constables; and its cost, for the twelve months then ended, as L.441,569, 7s. 3d. (a sum which is about L.600 less than the cost of the metropolitan police, and about L.50,000 less than the cost of the metropolitan and city of London police together). It must be noted, however, that as in several counties the police was not fully organized until the year had considerably advanced, this amount will not cover the ultimate annual cost of an average year. The payments from the public revenue towards the cost of the county constabulary amounted during the same period to L.71,112, 1s.

The following table exhibits the establishment, the relative strength as compared with the population, and the total cost of the constabulary in each of the English counties; independently, of course, of all city and borough police, separately maintained. The county returns are not yet complete enough to afford any adequate basis for the exhibition of direct results in respect of the prevention, detection, and punishment of crime:—

XIV. *County Police of England,—Strength and Cost, year ending 29th September* 1857.

County or Division.	No. of Police.	No. relatively to Population.	Cost.			County or Division.	No. of Police.	No. relatively to Population.	Cost.			County or Division.	No. of Police.	No. relatively to Population.	Cost.		
		1 in	L.	*s.*	*d.*			1 in	L.	*s*	*d.*			1 in	L.	*s.*	*d.*
Bedford	70	1,600	6,833	16	0	Huntingdon .	48	1,350	1,642	10	4	Stafford	367	1,372	19,790	9	8
Berks.........	114	1,084	15,281	15	6	Kent...........	231	2,221	11,084	16	9	Suffolk, E.	114	1,669	6,517	4	5
Bucks	102	1,550	5,279	0	10	Lancaster.....	657	1,440	50,605	11	4	Suffolk, W ...	81	1,400	5,903	18	3
Cambridge..	70	1,252	4,626	1	5	Leicester	96	1,765	7,555	14	2	Surrey	133	836	8,073	1	5
Isle of Ely. .	52	1,126	3,382	6	10	Lincoln........	210	1,614	7,181	0	8	Sussex, E.	92	1,442	5,677	19	11
Chester......	173	1,744	6,127	5	3	Monmouth ...	49	2,252	3,640	8	11	Sussex, W. ...	72	1,444	5,012	5	4
Cornwall....	179	1,687	4,840	12	0	Norfolk	221	1,485	15,521	3	4	Warwick	138	1,260	6,918	7	4
Cumberland	73	2,317	5,686	16	6	Northampton	94	1,709	4,748	8	3	Westmoreland	20	2,395	1,057	19	2
Derby.........	156	1,590	7,251	12	10	Northumberland	61	2,811	3,351	13	6	Wilts	201	1,206	14,091	6	4
Devon........	300	1,402	9.261	0	5												
Dorset	121	1,209	7,343	2	2	Nottingham ..	108	1,861	6,711	4	10	Worcester.	146	1,550	10,109	10	9
Durham	199	1,380	12,455	7	1	Oxford.........	89	1,580	3,879	1	7	York, E.R. ...	70	1,803	4,190	11	4
Essex	241	1,197	17,480	14	7	Rutland.......	2	11,491	269	11	11	York, W.R. ...	487	1,651	29,515	13	4
Gloucester...	254	1,267	16,265	17	5	Salop	58	3,320	4,401	18	9	York, N.R. ...	105	1,924	7,518	5	0
Hereford....	45	2,173	2,369	18	11	Somerset	277	1,240	16,294	11	11						
Hertford.....	92	1,500	7,463	10	5	Southampton	297	922	22,512	3	4	Total	7301	...	441,569	7	3[1]

The relative strength of the county police ranges, it will be seen, from one in 836 of the population in Surrey, to one in 11,491 of the population in Rutlandshire. Its relative cost also differs considerably, but within smaller limits, depending partly upon the density or sparseness of the population within a given area, the extent and nature of ordinary employment, and the character of the adjacent counties, boroughs, and other districts. Thus, for example, it will be seen that 73 constables in Cumberland cost nearly as much as 173 constables in Cheshire; 114 constables in Berkshire cost L.15,281; whilst 121 in Dorsetshire cost but L.7343.

Total strength and cost of police in England and Wales, 1857.

By way of summary, it may be stated that the total cost of the police force, of all kinds, within England and Wales, during the year ending 29th September 1857, was as follows:—

Description of Police.	No. of Officers and Constables.	Total Cost.			Defrayed by the Treasury.		
County............	7,301	L.441,569	7	3	L.71,112	1	0
Borough....... ..	5,251	337,853	2	11	60,970	8	4
Metropolitan.....	6,083	442,212	1	1	103,380	5	0
City of London..	552	43,945	6	9	...		
Totals.........	19,187	L.1,265,579	18	0	L.235,462	14	4

Summary jurisdiction.

The extent to which criminal adjudication begins and ends as a mere matter of police, in various counties, would, if it could be brought out fully and clearly, afford no mean indication (as one element among many) of their relative position, both politically and socially. The value of such a statement would, however, materially depend on its including an accurate definition of the offences summarily punished. In this particular our English statistics have been seriously deficient. Under the new constabulary law a considerable improvement may be hoped for in this, as in many other respects. Full statistics are the more important, on account of the large extension which many recent enactments have contributed to give to the summary jurisdiction of justices. By the statute of the 7th and 8th of Geo. IV., c. 29, for example, many petty thefts, as of house fixtures, of fish from inclosed waters, of growing fruit or vegetables, and the like, were subjected to fine and imprisonment, without the intervention of a jury; as were also, by another act of the same session (c. 30), other petty offences of the nature of wilful damage and trespass. By the 9th Geo. IV., c. 31, that extensive and somewhat indefinite class of offences, assaults, was brought within the same jurisdiction. Every police act, whether general or local, has made large additions to this category. In like manner, the Juvenile Offenders Act of 1847, and the Criminal Justice Act of 1855, have severally transferred to summary jurisdiction numerous offences which were theretofore punishable as felonies, and liable (up to the year 1853) to the penalty of transportation.

The stronger may be the conviction of thoughtful men that these steps are right and salutary, the more important must it be to bring their consequences under full and enlightened publicity. What, in this respect, the country owes to the newspapers, is incalculable, but insufficient. It needs to be supplemented by the deliberate and systematic summary of results from time to time.

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[1] *Judicial Statistics of England and Wales* (1858), vi., vii., 3, 4.

Classification of the summary convictions of 1857,

It has been shown already that the police returns of 1857 are unavoidably incomplete. But so far as they go, they give better data than have been hitherto available. Here, however, they can be but briefly noticed in relation to a leading point or two. The total number of cases summarily adjudicated in England and Wales in 1857 was 369,233; the discharges were 135,474; the convictions were 233,759, and may be classified thus:—

Offences.	Total No. of Convictions.
Assaults	44,860
Drunkenness	44,894
Stealing, and attempts to steal	20,577
Vagrancy	18,023
Infractions of police acts	25,913
Infractions of local acts	21,112
Infractions of ways acts	17,382
Infractions of beer acts	11,320
Wilful damage and trespass	13,583
Infractions of the laws of master and servant	9,687
Nuisances	4,328
Other offences	2,080
Total of summary convictions	233,759

and of the punishments for the same.

The punishments in these 233,759 cases may be classified thus:—

1. By various periods of imprisonment (from a week to nine months)	62,293
2. By committal to juvenile reformatories	768
3. By fines	143,463
4. By whipping	525
5. By other punishments	26,710
Total	233,759[1]

Reformatory Schools Act, 17 and 18 Vict., c. 86.

The second item in this table of punishments applies only to a small section of offenders, but it is at once the most novel and the most pregnant consequence of our recent criminal legislation. It dates from the passing, in August 1854, of "An Act for the better Care and Reformation of Youthful Offenders in Great Britain." After reciting that reformatory schools for the better training of juvenile offenders, have been and may be established by voluntary contributions in various parts of Great Britain, and that it is expedient that more extensive use should be made of such institutions, it proceeds to enact that the secretary of state shall, on application, direct the inspection and certification of the inspection of such schools. It is further enacted, that whenever any person under the age of sixteen years shall be convicted of any offence punishable by law, either upon indictment or by summary conviction, it shall be lawful for any court, judge, police magistrate, stipendiary magistrate, or any two or more justices of the peace, or in Scotland for any sheriff, or magistrate of a burgh, or police magistrate, before or by whom such offenders shall be so convicted, in addition to the sentence then passed as a punishment for the offence, to direct such offender to be sent, at the expiration of the sentence, to one of the aforesaid reformatory schools, to be named in such direction, the directors or managers of which shall be willing to receive such offender, and to be there detained for a period of not less than two years, nor more than five years; and such offender shall be liable to be so detained, provided the sentence passed as a punishment shall have been one of imprisonment for fourteen days at least; and it is further provided that the home secretary may at any time direct a discharge. Power is given to the Treasury to defray the costs of maintenance, part of which may be recovered from parents, &c.

Reformatories now under inspection in England.

Within ten days after the passing of this act, the reformatory for boys at Saltley, near Birmingham, was certified in accordance with its provisions. It had been originally established in the town of Birmingham, mainly by the liberality of Mr C. B. Adderley, M.P., with the assistance of Mr Joseph Sturge. At first, great difficulty occurred from the unsuitableness of the indulgent discipline of the voluntary school to the more stringent regulations necessary for inmates received under judicial sentence. But this difficulty has been overcome. At the beginning of 1858 the Saltley school had 39 inmates. The next reformatory certified under the act was that for girls, established and partly maintained by the zealous exertions of Miss Carpenter, at Red Lodge, near Bristol. Here the number of inmates in January 1858 was 57. An adjacent cottage is used as a means of separating the older and more advanced girls, and placing them under the ordinary conditions of free domestic service, previous to their final discharge from the school.

But the most remarkable of these reformatories is that established by Mr Sydney Turner (now the government inspector of reformatory schools), at Red Hill, near Reigate, and of late well known as the "Philanthropic Society's Farm School." Here, in January 1858, 275 boys were maintained, at a nett cost per head of L.25, 4s. The number of boys discharged in the course of 1857 was 149, and the number admitted 129. Of the former, 66 emigrated, at a cost of L.1374, or L.20, 16s. 4d. per head; and 8 were transferred to the Akbar frigate, to be trained for the sea. The institution comprises five schools, each containing on the average 50 boys, and the farm-house containing 20. The total number of English Protestant reformatories in operation at the end of March 1858 was 41, containing 1528 inmates (1287 boys and 241 girls), of whom 180 were free (131 boys and 49 girls), and the remainder were under detention.

Besides these, there are five Catholic reformatories: one in Gloucestershire, one in Leicestershire, two in Middlesex, and one in Yorkshire. The first of these was opened for girls at Arno's Court, near Bristol, under certificate of the 22d April 1856; it contained in 1858, 104 inmates, and formed part of the convent of the "Sisters of the Order of the Good Shepherd." The nuns of that order have another reformatory at Beauchamp Lodge, Hammersmith, which has but very recently been brought into operation. The most extensive and remarkable of these Catholic reformatories is that of the Trappists, designated the "Agricultural Colony of St Bernard's Abbey, near Loughborough." This abbey justifies the old proverb as to the skill of monks in the choice of situations for their monasteries. It is in a beautiful part of Leicestershire, and has a striking aspect. The number of inmates at the close of 1857 was 288, at an average cost of L.23, 10s. per head. "A cheerful, kindly spirit," says Mr Turner, "prevails throughout the establishment, and the whole seems to be in good order." But he is of opinion that, whilst the Fathers themselves justify Napoleon's description of their order ("the Trappists eat little and work much"), they are somewhat disposed to reverse the maxim for the boys, who eat much and work little. Finally, the "Christian Brothers" have two reformatories,—one at Brook Green, Hammersmith; the other at Hulme-on-Spalding in Yorkshire. At the close of the year the former contained 80 inmates, the latter 43. The total number of inmates in the Catholic reformatories in March 1858 was 552 (437 boys and 115 girls), all of whom were under detention.

General results of the reformatory system.

In summing up, generally, the results of the new system, so far as, at this early stage of its operation, "results" can be at all spoken of, the inspector lays great stress on the

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[1] *Judicial Statistics, ut supra*, p. 16.

General results of the reformatory system.

importance of zealous exertion to place the liberated persons in favourable circumstances for their permanent industry and honesty. Often, he argues, and particularly as regards young offenders from large towns, permanent separation from their old haunts and companions is indispensable; and in such cases emigration offers the best method of provision. But it involves heavy charges, and however economically carried on, must considerably increase the expenditure of the reformatory which resorts to it. The reformatory acts make no provision for the costs of any method of ulterior disposal. Yet, as there is no special limit to the amounts that may be contributed from the rates for "care and maintenance," there would seem to be good economy in making those amounts liberal enough to enable the managers of schools to defray from that source some portion of the expense of that final measure, on the wisdom and foresight of which the profit of the previous steps must mainly hinge. Mr Turner also expresses his strong conviction of the value of that clause in the Reformatory Act which makes the parents of delinquent children liable to contribute towards their support in the schools in which they are detained, although some time must elapse before the principle of parental responsibility can be generally and effectually enforced. Already it has in many cases had the effect of inducing drunken and dissolute fathers to be more sober, and has made the family at home more comfortable, by the pressure exercised in exacting payment (rarely exceeding one-twelfth of the average wages) for the child or children in the reformatory.[1] The number of parents and step-parents against whom authority has been taken for proceeding, from 31st March 1857 to 31st March 1858, is 605; that of persons under contribution on the day last named, 292; and the total amount of contributions already received, L.629, 12s. 8d.[2]

Hitherto little has been done to check the juvenile delinquency of Middlesex and Surrey, where the necessity is so great. But the Middlesex industrial schools will soon be in operation under the special act passed for that purpose; and the Surrey magistrates are about to place a considerable number of the juvenile criminals of that county at Redhill and other reformatories. Meanwhile, the commitments of offenders under sixteen years of age in England and Wales has already fallen from 13,981, which was the number in the year ending 29th September 1856, to 12,501, the number in the year ending 29th September 1857; being a decrease of 1480 commitments, and of at least 600 individual children.[3] This is a fact of good augury. If the industrial training be made efficient, if parental responsibility be in proper cases enforced, and if the management of the reformatories be discreet and frugal, no expenditure for purposes of enlightened police was ever better invested by any community. Nor must it be forgotten that the honour of having laid the foundation of reformatories belongs to a small and unostentatious band of voluntary workers, who have sought no reward save that of witnessing effectual and permanent provision for the continuance of their good work, apart from the uncertainties of casual benevolence and temporary excitement.

III. The Police of Scotland.

Early police of Scotland.

The early history of crime and punishment in Scotland has naturally much in common with that of its southern neighbour, but has also its special and characteristic features. In the long series of acts against vagrancy, for example, we find greater prominence given to the pursuit of gipsies, and also greater severity of treatment in respect of all the offending classes. Identification as "Egyptians" seems to have been often sufficient for capital punishment, apart from proof of specific offences. Thus, there is an act of the Privy Council (10th November 1636) which recites, in respect of certain gipsies who had been arrested and lodged in Haddington jail, that "whereas the keeping of them longer within the said Tolbooth is troublesome and burdensome to the town of Haddington, and fosters the said thieves in an opinion of impunity to the encouraging of the rest of that infamous byke of lawless limmers to continue in their thievish trade, therefore the Lords of Secret Council ordain the Sheriff of Haddington or his deputes to pronounce doom and sentence of death against so many of these thieves as are men, and against so many of the women as wants children; ordaining the men to be hangit and the women to be drowned; and that such of the women as has children be scourged through the burgh of Haddington, and be burnt in the cheek." Even of such less dangerous offenders "as make themselves fools *and are bards*, or other such like runners about," it had been enacted half a century earlier, that, being apprehended, they should be put "in the king's ward and irons, sae lang as they have ony goods of their own to live on; and when they have not whereupon to live of their own, that their ears be cuttit off, and be banished the country; and if thereafter they be found again, that they be hangit." These statutes are followed up by their like at brief intervals for a century and a half. Yet, for a much longer period, the criminal law of Scotland stood in honourable contrast to that of England in two particulars at least. On the one hand, it established a public prosecutor,—in the higher courts the lord advocate, acting by the solicitor-general and four advocates-depute; in the lower courts, the procurator-fiscal. On the other hand (and in the germ, as early as 1587), it assigned counsel to prisoners, provided them with a copy of their indictment, and withheld from the lower courts the power of inflicting any punishment greater than imprisonment.

Burgh police of 1834 and subsequent years.

The first distinctive organization of a police force of some sort appears to date from the year 1725, when the act 11 George I., c. 26, authorized the freeholders of every shire or district "to make an assessment for raising a sufficient fund to defray the charges of apprehending, subsisting, and prosecuting criminals." This power subsisted in the freeholders generally, until, by the 2d and 3d Will. IV., c. 65, it was transferred to a more limited body of freeholders designated commissioners of supply. In the following session (by 3d and 4th Will. IV., c. 46), the Scottish burghs were empowered to establish a system of police, the details of which were amended by the act of the 10th and 11th Vict., c. 37, and by that of the 13th and 14th Vict., c. 33, the latter being entitled "An Act to make more effectual Provision for Regulating the Police of Towns and Populous Places, . . . and for Paving, Draining, Cleansing, Lighting, and Improving the same." The general control of the burgh police maintained under these acts, like that of the police of Edinburgh, Glasgow, and some other large cities having local acts, was in the hands of a board of commissioners elected by the rate-payers.

Rural police of Scotland.

In Scotland, as in England, the rural police of counties was very inadequately provided for by enactments which were merely permissive. The acts of 1839 (2d and 3d Vict., c. 65) increased the assessing powers of the commissioners of supply of any county for purposes of police, but those powers were exerted in but few counties. Where the act was adopted, as in Mid-Lothian, Aberdeenshire, Fifeshire, Stirlingshire, and Dumfriesshire, a county meeting was convened for the election of a police committee

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[1] Turner, *First Report of the Inspector of Reformatory Schools in Great Britain* (1858), *passim*; *Returns relating to Reformatory Schools*, 16th April 1858, S. P. 204.

[2] *Return relating to Reformatories*, 1st June 1858, S. P. 306.

[3] Turner, *ut supra*, 16.

Scotch Police.

which committee determined the assessment and the extent of the force, and appointed a superintendent or chief constable, to whom the control of the force was entrusted.[1] But the police assessment, like its predecessor, the "rogue-money fund," was on landed property exclusively.

Police act of 1857.

Finally, the act of 1857 (20th and 21st Vict., c. 72), entitled "An Act to render more effectual the Police in Counties and Burghs in Scotland," dealt with the question in the spirit of the English act of 1856. It made provision for an efficient force in every county of Scotland, and gave facilities for the consolidation of burgh police with county police. By this statute it is enacted: (1.) That the commissioners of supply of each county shall, at meetings duly convened, proceed to establish, from the 15th March 1858, a sufficient police force for such county; (2.) That the commissioners shall, from their own number, appoint certain persons, not more than fifteen nor fewer than three, who with the queen's lieutenant and the sheriff, shall form the police committee of the county. (3.) That the secretary of state shall from time to time make the needful rules for the government and pay of the force determined on by the commissioners of supply. (4.) That the police committee shall appoint a chief constable, who, with the approval of the committee, shall appoint or dismiss the other constables and superintendents to be appointed for such county; and shall choose a deputy from among them, and who shall have power to appoint additional constables at the charge of the persons applying for them, and for such periods, under due notice, as the applicants may desire. Power is also given to the sheriff to appoint additional constables to keep the peace on public works, at the cost of their respective promoters. (5.) Provisions are made respecting the powers and duties of constables, and for the mutual validity of warrants granted in any of the border counties of Scotland and England; constables are empowered in certain cases to accept bail or deposit; are prohibited from receiving fees to their own use; are disqualified to vote at elections, and are exempted from jury and militia services. (6.) The commissioners are empowered to levy a police assessment upon all lands and heritages, according to the valuation rolls in force under the act of the 17th and 18th Vict., c. 91, "for the Valuation of Lands and Heritages in Scotland;" and to levy it either on the proprietor or the tenant,—the latter being authorized to deduct the amount from his rent, and an exemption provided in respect of all houses and tenements which shall have been wholly unoccupied during the whole period to which the assessment refers. (7.) Provisions are made for the appointment and payment of collectors; for the keeping and accessibility (to ratepayers and other persons concerned) of accounts, and for their annual audit; for three commissioners to be a quorum, and for the preses, in case of equality of votes, to have the casting-vote in addition to his own vote. (8.) Powers are given to the commissioners to grant gratuities and superannuations; to provide station-houses and strong rooms; to form police districts, either at their own discretion, and with the approval of the secretary of state, or in obedience to an order in council. (9.) The commissioners of supply of any county, and the magistrates and town council of any burgh situated in or adjacent to such county are empowered to agree together for the consolidation of their respective police forces; or Her Majesty in council may, on representations from burghs, arrange such terms of consolidation; and the chief constable shall have the general control of the consolidated police. (10.) Annual returns of offences and proceedings are to be sent to the secretary of state; Her Majesty is empowered to appoint an inspector of police; and on certificate of the secretary of state that an efficient police has been established in any county or burgh, one-fourth of the charge for pay and clothing shall be paid by the Treasury,—no such payment being made in the case of any unconsolidated burgh having a population at the last census of less than 5000 persons. (11.) Provisions are made with respect to the recovery and application of penalties duly prosecuted for, within six months of the commission of the offence for which such penalties were incurred. (12.) If within six months after the date of this act (25th August 1857) the inspector shall have reported to the secretary of state that any burgh maintains, out of its common good or from any funds other than assessment, an efficient police force, shall be considered as maintaining a separate police force under a local act. (13.) This act shall not affect any police force maintained in respect of any railway, canal, or navigable river under private or local acts of Parliament. The rules and regulations made by the home secretary in pursuance of this act were laid before Parliament on the 22d February 1858.[2]

Scotch Police.

Police of Edinburgh.

In 1852 the amount of police force in the city of Edinburgh was 312, who were under the immediate control of a superintendent (appointed and removeable by the lord provost and sheriff of Mid-Lothian, with appeal to the lord advocate in case of difference), at a salary of L.350 a year, and under the general supervision of the police commission, composed of 32 members, annually elected by the different wards. The amount of police assessment, which includes the cleansing, lighting, and suppression of nuisance departments, as well as that of watching, was L.35,963, 19s. 5d.[3] In addition to the direct management of the city police, the superintendent is public prosecutor in police cases; on him, therefore, devolves the duty of preparing the charges which are to be determined by the judges of police. The subjoined tables show the number of charges brought before those judges, and the result, in each of the years 1854, 1855, and 1856:—

I. *Edinburgh Police,—Cases of Theft, Attempted Theft, and Fraud,* 1854–6.

Year.	Total number of charges.	SUMMARY PROCEDURE.			PUNISHMENT.			
		Number Dismissed.	Number Punished.	Number Admonished.	Imprisoned.	Whipped.	Sent to Ragged School.	To find Securities.
1854.........	1046	253	582	211	400	114	...	68
1855.........	949	229	584	136	405	70	20	89
1856.........	882	154	645	83	501	54	22	68
Total of 3 years.	2877	636	1811	430	1306	238	42	225

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[1] *Minutes of Evidence taken before the Select Committee on Police* (1853), Q. 2128–2227, 3875–4287; First Report, pp. 129–135; Second Report, 100–125; and the several acts of Parliament cited.

[2] Sessional Papers of 1858, No. 92.

[3] *Minutes of Evidence before Select Committee on Police,* 129, 135, 100–108.

II. *Edinburgh Police,—Minor Offences and Contraventions of Police and Local Acts*, 1854–6.

Year.	Total Number of Charges.	Summary Procedure.			Punishment.			
		Number Dismissed.	Number Punished.	Number Admonished.	Imprisoned.	Whipped.	Fined	To find Security.
1854...........	8,769	225	5,786	2758	1118	26	3,769	873
1855...........	8,663	386	6,312	1965	1114	18	4,333	847
1856...........	7,677	270	5,748	1659	998	10	3,817	923
Total of 3 years.	25,109	881	17,846	6382	3230	54	11,919	2643

III. *Edinburgh Police,—Abstract of Charges of all kinds*, 1854–6.

Offences.	Year.			Total of Three Years.
	1854.	1855	1856.	
Theft, attempted theft, and fraud	1046	949	882	2,877
Minor offences and contraventions	8769	8663	7677	25,109
Graver offences remitted to higher courts	588	567	701	1,856
Total number of charges before judges of police	10,403	10,179	9,260	29,842[1]

cottish re- ormatories nder Dun- p's Act, c.

The reformatory system was introduced into Scotland by the 17th and 18th Vict., c. 74 (Dunlop's Act), under the provisions of which fifteen reformatories have been certified; three others have been certified, both under it and under the 17th and 18th Vict., c. 86, and four under the provisions of the last-named statute only. The aggregate number of inmates on the 31st March 1858 was 813, of whom 537 were boys and 276 girls. The Glasgow industrial schools, certified on the 10th March 1855, contained, in March 1858, 129 children under detention (70 boys and 59 girls), and 70 other children attending school (42 boys and 28 girls). These schools are reported by the inspector as "conducted with great earnestness and ability," but exception is taken to the admixture of day scholars with the convicted children. Mr Turner also adds, "It is to be regretted that the provisions for compelling parents to contribute have remained hitherto a dead letter in Scotland; many of the inmates of the houses of refuge are the children of parents in the receipt of considerable wages. The schools certified under Mr Dunlop's act are in fact industrial feeding-schools of a superior description. Scarcely any of the children in them are committed under the act; the clause enabling the parochial boards to withdraw such children on giving security for their better protection having almost neutralized the direct operation of the statute altogether. But the indirect operation of the law appears to be considerable and very advantageous, large numbers of children coming voluntarily, or being sent by their parents,—from the knowledge that if found idling and begging in the streets, they can and will be sentenced to the school, and compelled to attend it. I think the value of these certified industrial schools in Scotland can scarcely be exaggerated."[2]

It would appear that the interval, short as it is, between the date of this report and that of the latest return of inmates in reformatories (31st March 1858) has brought with it considerable change in the relative numbers of detained and free scholars. The number of the former, detained under Dunlop's Act, is stated to be 287 (137 boys and 150 girls), besides 526 (400 boys and 126 girls) detained under 17 and 18 Vict., c. 86, as against 515 voluntary scholars (337 boys and 178 girls). The Glasgow "houses of refuge" alone contain 456 detained inmates, in addition to the 129 in the industrial schools.

Nuisances Removal Act (Scotland), 19 and 20 Vict., c. 103 (July 1856).

The police of public health in Scotland has been largely invigorated by the powers conferred on police commissions, town councils, and parochial boards by the act of the 19th and 20th Vict., c. 103: "An Act to make better provision for the Removal of Nuisances, Regulation of Lodging-Houses, and the Health of Towns in Scotland." This act consists of five distinct parts, the enactments of which are briefly as follows:—(1.) Power of entry, on reasonable belief of the existence of a nuisance, is granted to the local authority (whether commission, council, or board, as above mentioned, a committee thereof, or an inspector appointed thereby); and, on certificate, summary proceedings for abatement of such nuisance may be taken before any resident magistrate, and may be followed up by interdict, penalty, order of remedy at expense of the offending party, or other like procedure, requisite for such abatement. The term *nuisance* extends to the sale of unwholesome meat, and to the corruption of water; and, after due notice, daily and cumulative penalties may be inflicted. (2.) Orders in council may be issued, on fear of epidemic, endemic, or contagious diseases, for providing the boards of supervision of poor relief with proper medical officers (to be paid by Treasury), with power to make all due regulations for the removal or mitigation of such diseases; and, in case of the over-crowding of houses affected, may enforce against such houses the provisions hereafter mentioned for the regulation of common lodging-houses. (3.) The local authority shall cause a register to be kept of all common lodging-houses (such as lodge persons at a charge not exceeding threepence per night, whether paid nightly or weekly), and may refuse to register any such without a satisfactory certificate of character from three inhabitant rate-payers; may, with the approval of the secretary of state, make binding regulations for such houses; may cause additional water supply to be provided therein; may inspect such houses from time to time, and cause them to be properly cleansed and drained; may inflict penalties for infraction of the rules; and may, on a third conviction, refuse further license. (4.) Provision is also made for the enforcement of the act by the sheriff, in the event of neglect on the part of the local authority, or of nuisance occurring in which the local authority has any specific interest; penalties are inflicted for obstruction of the act; provision is made for the partition of costs and penalties in matters in which two or more owners are concerned. The police and constabulary are, within their respective jurisdictions, to assist in the execution of the act; and all rights of action at common law in respect of nuisances are preserved unimpaired. (5.) The 74th section of the "Burgh Police Act" (13 and 14 Vict., c. 33) is repealed, and in lieu thereof power is given to the commissioners to levy special sewer rates; powers are also given to borrow money for construction of sewers, and to repay the same by a sinking fund. The 213th section is also repealed, and power given to the commissioners to enforce the paving and flagging of streets by the owners of the property abutting thereon; and provision is made for the amendment of the "Burial Act" (Scotland), 18 and 19 Vict., c. 68, by defining several parishes, or parts of parishes, when comprehended within the limits of any burgh, as in the purview of such act, one united parish.

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[1] *Miscellaneous Statistics of the United Kingdom, presented to both Houses of Parliament*, 1857, p. 98–100. These Tables have been abridged and re-arranged in simpler form than the original returns.

[2] *First Report of Inspector of Reformatory Schools, ut supra.*

IV. THE POLICE OF IRELAND.

Until the year 1814, the police of Ireland was in a state even more chaotic than that of England or of Scotland. The force that existed was capriciously administered, and not unfrequently grossly abused. Nor can it be matter of surprise that in days when political partizanship of a very emphatic sort was held to be no disqualification even for the judicial bench, the control of police, and the functions of the inferior magistracy, were often turned to factious purposes. The act of 1814 (54 Geo. III., c. 131) did not remedy these evils; but it led to improvements of detail, by the appointment of superintending magistrates, as well as to an increase of the constabulary force. Other acts followed of similar tendency, all of which were consolidated by the 6th Will. IV., c. 13. This act (passed in 1836) empowered the lord-lieutenant to appoint officers and constables in the several towns, baronies, and counties of Ireland, and in the proportions prescribed by the act; with an inspector-general at L.1500 per annum, and two deputy inspectors-general; and also to appoint fifty stipendiary magistrates at salaries ranging from L.400 to L.1000 per annum. The power already vested in the lord-lieutenant to appoint a special police force in any county or district proclaimed to be in a state of disturbance was to continue as before.

Constabulary act of 1836.

The force established under this act consisted of 42 inspectors and sub-inspectors, 465 chief and head constables, 7687 constables and sub-constables, 1 receiver, and 18 paymasters. Its total cost (in 1838) was, including the salaries of the stipendiary magistrates, L.380,268; of which sum, L.152,561 was paid by the counties and towns, and L.227,606 was borne by the Consolidated Fund.

Act of 1848, 11 and 12 Vict., c. 72.

The law of 1836 was amended in 1848 by the act of the 11th and 12th Vict., c. 72 ("An Act to amend the Acts relating to the Constabulary Force in Ireland, and to amend the provisions for the Payment of Special Constables"); and again by the 20th and 21st Vict., c. 17 ("An Act to amend the Act of the 11th and 12th years of Her Majesty, c. 72, so far as relates to the Distribution of the Constabulary Force in Ireland"), passed in July 1857. By this latter act the number of county inspectors was fixed at 35, that of sub-inspectors at 262, that of head constables at 375, and that of constables and sub-constables at 9591, for the whole of Ireland; making a total force, according to the statutory schedule, of 10,263 in 1857, as against 8194 in 1838; and a total cost of L.644,820,[1] as against L.380,268. Both sums include the salaries of stipendiary magistrates, the number of whom is now 72 (1 at L.646, 17 at L.500, 42 at L.400, and 12 at L.300 per annum).

Change in the incidence of Irish police expenditure made in 1846.

In the speech which Sir Robert Peel made on proposing the abolition of the corn laws (27th January 1846), after recommending that the whole expenses of criminal prosecutions, and of maintaining convicts (part of which were then borne by local rates), should be defrayed by the public treasury, he proceeded to say,—"At present you have a great police force in Ireland. The expense of a portion of that force is borne by the land in Ireland; the expense of the remainder is borne by the public treasury; and it certainly is a most anomalous system for one portion to be borne by the treasury and the other portion by the land. I believe that it will be an immense advantage to place the police force directly under the control of the executive; to prevent the possibility of all interference by local bodies; to make it as perfect a system as you can, excluding all power of local nomination or local interference, taking the whole control on the executive government; and in order that you may make that control complete, paying the expense out of the public treasury."

It is curious to notice in this famous speech so direct an attack on the two principles which have so largely and so long prevailed in our police arrangements,—namely, the joint support and the joint control of constabulary, as matters of common interest to the nation and to the locality. Nor will the special circumstances of Ireland suffice to bear out in its full breadth the policy thus enunciated. But no exception seems to have been taken by Irish members to any part of Sir Robert Peel's doctrine. The whole ordinary charge of the Irish constabulary force has been borne by the treasury, in addition to a grant in aid of the Dublin police, and the salaries of the Dublin police justices. The only charge now made to the counties and towns is the cost of the extra force employed in proclaimed counties and districts, that of men employed on railways and in boroughs, and that of revenue men, added to the constabulary force on the abolition of the revenue police in December 1857.

The effective strength and the pay of the constabulary stood thus on the 1st January 1858:—

I. *Constabulary Force of Ireland,—Strength and Pay, January* 1858.

Rank.	Pay.	No. in General Force.	No. in Reserve Force.	Rank.	Pay.	No. in General Force.	No. in Reserve Force.
	L.				L. s.		
Inspector-general	1500	1	...	Special head-constable	70 0	1	1
Deputy inspector-general	800	2	...	Head-constables, (1)	60 0	47	3
Assistant inspector-general	500	2	...	" (2)	50 0	254	4
Receiver	800	1	...	Dismounted constables	36 0	1,607	13
Surgeon	300	...	1	Special constables	40 0	6	9
Veterinary surgeon	100	...	1	Mounted constables	38 0	83	5
Paymaster	200	...	1	Acting constables	30 0	323	17
County inspectors, (1)	298	5	...	Sub-constables, (1)	27 14	8,362	93
" " (2)	250	22	...	Mounted constables	29 4	224	60
" " (3)	220	8	...	Sub-constables, (2)	24 0	644	2
Extra sub-inspectors	180	6	...				
Sub-inspectors, (1)	150	76	...	Total	...	11,847	220
" (2)	120	80	3				
" (3)	100	94	7	Magistrates		72	

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[1] *Estimates of Civil Services—General Abstract of Grants*, &c. (26th March 1858), p. 3. The sum stated to be borne by the public in a subsequent return is L.651,406.

Irish Police.

The total cost of this force is stated, in the receiver's return of 15th July 1858 to be L.668,700 (including L.29,546 for the salaries of magistrates, and other sums for various allowances, for age, &c., and also the cost of clerks); and of this sum L.651,406, 10s. 10d. is stated to be borne by the public, and L.17,293, 11s. 2d. by counties, cities, and towns.[1]

ganiza- on of the ish con- abulary rce.

The Irish constabulary is organized on military principles, and is especially remarkable for the judicious plans by which Major-General Sir Duncan M'Gregor, the inspector-general, has combined competitive examination for cadetships with promotion from the ranks for good service and proved efficiency. Two-thirds of the vacant cadetships are filled up by the lord-lieutenant, and one-third by the inspector-general, who appoints alternately the son of an old constabulary officer and a head constable to his vacancies, thus filling every sixth vacancy from the ranks. The government candidates and the sons of officers are examined on the combined principle of nomination and competition in use in the civil service, four candidates being nominated for each vacancy, of whom the best is chosen. In the examination of head constables, every year's service, and every chevron or other mark of past merit, counts after a prescribed ratio, and unsuccessful head constables of a certain efficiency are permitted to undergo a second competitive examination. "The Irish constabulary force," it is stated, was already "remarkable for admitting no recruit who could not read and write and keep accounts, and for the entire trustworthiness of the men; so that they are sent by ones, twos, or threes to any place, however distant, where there is any duty to be performed, without an officer or non-commissioned officer being in charge of the party; and these competitive examinations have given an increased stimulus to the education of the force. Even the sub-constables in the remote country hamlets are employing schoolmasters in the evenings to instruct them in their barracks.[2]

Irish Police.

Dublin metropolitan police.

The metropolitan police of Dublin was established under the 6th and 7th Will. IV., c. 29, in 1836. It is controlled by two commissioners; is supported partly by police rate, fees, and penalties, and partly by the parliamentary grant already mentioned. Its effective strength and pay in July 1858 were respectively as follows:—

II. *Dublin Metropolitan Police,—Strength and Pay, July* 1858.

Rank.	No:	Pay.			
		L.	s.	L.	s.
Chief superintendent	1	286	10		
Superintendents	4	191	0 to	206	0
Chief inspector	1	160	0		
Inspectors	25	105	0 to	121	0
Acting inspectors	38	67	15		
Sergeants	66	54	0 to	65	0
Acting sergeants	100	50	0 to	62	0
First-class constables	238	48	0		
Second-class "	570	39	0 to	44	0
Third-class "	24	30	0		
Supernumeraries	20	18	5		
Total	1087				

The income and expenditure of the Dublin police establishment for the year 1856–7 were respectively as follows:—

III. *Dublin Metropolitan Police,—Income and Expenditure,* 1856–7.[3]

INCOME.	L.	s.	d.
Parliamentary grant	L.38,000	0	0
Police tax	21,715	0	2
Carriage duties, pawnbrokers' and publicans' licenses, &c.	15,334	2	0
Fines and penalties	2,000	0	0
Total	L.77,049	2	2

EXPENDITURE.	L.	s.	d.
Police courts	L.9,481	9	0
Salaries of commissioners, office establishment, &c.	9,218	2	9
Pay of the force	48,953	0	5
Pensions	3,652	6	1
Rent, taxes, repairs, and other incidental expenses,	5,721	18	7
Total	L.77,026	16	10
Excess of income over expenditure	22	5	4
	L.77,049	2	2

The Dublin police district is nearly 40 square miles in extent, and contains nearly 400,000 inhabitants. The subjoined table shows the number of persons taken into custody, and the results of the hearing of their cases before the magistrates, in each of the years 1854, 1855, and 1856:—

IV. *Dublin Metropolitan Police,—Apprehensions and their Results,* 1854–56.

Year.	Total Number of Apprehensions.	Summary Procedure.		Committed for Trial.	Results of Committal.		
		Discharged.	Convicted.		No Bill, &c.	Convicted.	Acquitted.
1854	43,108	11,810	30,066	1232	184	741	307
1855	35,634	10,667	24,188	779	114	478	187
1856	38,876	14,506	23,692	678	115	413	150
Total of 3 years	117,618	36,983	77,946	2689	413	1632	644

Both committals and convictions, it will be seen, show a decrease in each year as compared with the preceding year. This decrease, too, continued to maintain itself in 1857. But in the last-named year it was characterized by a special feature, sufficiently exceptional to claim a word of notice, although bearing on the sexual proportions of crime —a point of detail which we have excluded from these tables in order to confine them within narrow limits. During the three years 1854–56, the decrease in *male* crime throughout Ireland was relatively greater than that in female crime. In 1857, on the contrary, the decrease in *female* crime was ten times as great as that in male crime. The classification of the offences comprised in the preceding table is as follows:—

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[1] *Statement of the Amount of Constabulary Force in Ireland*, pursuant to 6 Will. IV., c. 13, 24th July 1858, *passim*.

[2] *Papers relating to the Purchase and Sale of Commissions in the Army*, 30th July 1858, 92–95.

[3] *Returns relating to the Dublin Metropolitan Police*, 14th July 1858 (S. P. 430, *passim*).

Concluding Observations.

V. *Dublin Metropolitan Police,—Classification of Offences*, 1854–6.

Offences.	1854.				1855.				1856.			
	Taken into Custody.	Discharged.	Summarily Convicted.	Committed for Trial.	Taken into Custody.	Discharged.	Summarily Convicted.	Committed for Trial.	Taken into Custody.	Discharged.	Summarily Convicted.	Committed for Trial.
Against the person	3,717	1,818	1,810	89	3,362	1,567	1,729	66	3,349	1,635	1,631	83
Against property, with violence	117	56	...	61	76	31	...	45	82	41	...	41
Against property, without violence	7,058	2,918	3,140	1,000	5,131	2,348	2,187	596	5,289	2,616	2,157	516
Against property (malicious)	843	408	426	9	700	332	350	18	715	391	310	14
Forgery and coining	118	63	...	55	105	68	...	37	96	81	...	15
Minor offences and contraventions	9,760	3,732	6,010	18	10,456	4,134	6,306	16	11,785	5,397	6,380	8
Drunkenness	12,139	1,624	10,515	...	9,837	,354	8,483	...	12,817	2,615	10,202	...
Vagrancy	9,356	1,191	8,165	...	5,967	833	5,133	1	4,743	4,730	3,012	1
Totals	43,108	11,810	30,066	1,232	35,634	10,667	24,188	779	38,876	14,506	23,692	678

The subjoined table shows the degree of instruction of the whole number of persons taken into custody during the three years now under review :—

VI. *Dublin Metropolitan Police,—Degree of Instruction of Persons Apprehended*, 1854–6.

Degree of Instruction.	1854.			1855.			1856.		
	Males.	Females.	Total.	Males.	Females.	Total.	Males.	Females.	Total.
Could neither read nor write	9,943	13,975	23,918	7,716	11,309	19,025	7,406	13,344	20,750
Could read only, or read and write imperfectly	12,096	6,278	18,374	10,312	5,582	15,894	11,199	6,097	17,296
Could read and write well	695	42	737	625	19	644	645	31	676
Of superior instruction	78	1	79	71	...	71	153	1	154
Total	22,812	20,296	43,108	18,724	16,910	35,634	19,403	19,473	38,876

Reformatory Schools (Ireland) Act, 21 and 22 Vict., c. 103.

An act of the 21st and 22d Vict., c. 103, entitled "An Act to Promote and Regulate Reformatory Schools for Juvenile Offenders in Ireland," which became law on the 2d August 1858, makes provision for the training of juvenile criminals into habits of honest industry, similar to those which had been for some years in operation in England and Scotland. Grand juries and town councils are empowered to make grants of money in aid of such reformatory schools, duly certified under the act, if they shall think fit; the powers of justices to commit youthful offenders, for periods not more than five years nor less than one year, resemble those accorded by the English law,—"Provided that no such offender shall be liable or directed to be sent to any such reformatory, except to some one reformatory under the exclusive management of persons of the same religious persuasion as that professed by the parents or guardians of such juvenile offenders; and in all cases in which the religion of the parents or guardians is unknown, the said offender shall be considered as belonging to that religious persuasion in which he or she shall appear to have been baptized, or of which he or she shall profess to be a follower." Provisions are also made for the enforcement of due contributions by parents, if of sufficient ability, towards the maintenance of such offenders in the reformatory school.

Concluding observations.

Many years must pass before the full value of reformatory schools can broadly evince itself in their results. But it is already beyond question that no other measures of police have struck so directly at the roots of crime; nor is any recent legislation more pregnant with encouragement to solitary thinkers and obscure workers in the field of social reform. During the century which has elapsed since Fielding aroused public attention to the growing number of criminals who at that time were "once in six weeks carried to slaughter," and to the "dreadful consideration that, with proper care and proper regulations, much the greater part of these wretches might have been made not only happy in themselves, but very useful members of the society which they now so greatly dishonour in the sight of all Christendom," the best portions of many lives have been devoted to the discovery and application of the wisest methods for the abatement of that scandal. Every step in the process has been one of difficulty and struggle, but the good work has been urged onward in the face, not of opposition alone, but sometimes of obloquy. Efforts for the recovery of the criminal have been represented as injuries to the honest. The labours of John Howard have been decried as the expression of morbid sensibilities. And there was something in the doctrine, when clothed in brilliant rhetoric, which looked to some minds like profundity; but the workers worked on.

As respects the ordinary duties of police within the United Kingdom, recent legislation seems to have provided an effective machinery, the further improvement of which is but matter of experience and detail. There are still towns so inadequately provided as to be a source of danger to their neighbours; but the County Constabulary Act will in time provide a remedy. Meanwhile the union of local management with government inspection and publicity insures the general combination of efficiency and economy. But as regards the direct repression of crime there is yet a serious deficiency,—the absence of any adequate register of offences, irrespectively of their detection or pursuit.

Register of crimes.

Registration of this kind presents many difficulties. It ought not to be under the entire control of police functionaries. It cannot be obtained independently of them. It will require at every step the scrutiny of men familiar with the tricks and subterfuges of the "dangerous classes" of society. As it is, police returns include crimes that were never committed; although, of course, their most frequent error is of an opposite kind. Until these difficulties have been overcome, and a registration of offences presenting a reasonable approximation to truth obtained, no just standard will exist by which to measure police efficiency.

reatment released iminals.

The supervision of released criminals is another knotty point to which public attention has been repeatedly aroused, and especially by the recorder of Birmingham, Mr M. D. Hill, in his charges to grand juries, and in other ways. "I propose," said Mr Hill, on one of these occasions, "that every person who has been convicted of a felony, or of a misdemeanour implying fraud (as obtaining goods under false pretences, knowingly passing base coin, and the like), shall be liable to be dealt with as follows:—If after the expiration of his imprisonment under his conviction, he shall be brought before a magistrate *charged with still persevering in crime*, it shall be the duty of the magistrate, if the witnesses, *by evidence of general conduct,* satisfy his mind that the charge is established, to call on the prisoner to show that he enjoys the means of honest subsistence, either from his property, his labour, the kindness of his friends, the bounty of the charitable, or from his parish. Should he succeed in adducing this proof, he is to be discharged. Should no such proof be forthcoming, he is next to be called upon to give bail for his good behaviour. Supposing him to answer this demand, he is to be still entitled to his discharge. But in the event of his failure, he is then to be held to bail on his own recognisances, and his case to be sent to a jury at the assizes or sessions, when, if a verdict pass against him, he is to be imprisoned for a term to be fixed by the law, but capable of diminution by the judge before whom he is tried." Public opinion has not endorsed this proposal; but the question is a pending one. Mr Hill has, we think, refuted some objections that have been urged against his plan. But he has not met the case of the men whom it would discharge for having shown that they *are* gaining a livelihood by labour, the continuance of which the process might make impossible. Nor does it quite appear that conclusive evidence of the charge would usually involve less vigilance and skill than might suffice to prove specific offences. The problem, however, is a weighty one, and every effort to grapple with it is a public service.

Recent inquiries into the conduct of English and Irish police in affrays.

It is almost self-evident that, with every improvement in the mechanism of our police, thorough control over it becomes more and more important. Within a brief period there have been two inquiries into the conduct of constabulary on memorable occasions,—the one, metropolitan, on the affray in Hyde Park, when Sabbath legislation was in question (or in pretext); the other at Belfast, brought about by faction fights. On the whole, both inquiries acquitted the force impugned of the worst charges brought against it, and, full account taken of its difficult duties, tended to its credit. Sir George Grey's circular on the former occasion dealt very fairly with the matter, save, as we think, (after no careless examination of the bulky volume of evidence), that he passed too lightly over that besetting sin of so many police functionaries, the tendency to treat accused persons as guilty persons. On that point the evidence substantiated most reprehensible practices. There is nothing in the administration of police which it behoves the public to watch more jealously.

Another tendency, which is far more visible in continental countries than in our own, may nevertheless deserve a remark; we mean the tendency to carry interference into trivialities. In one of Goethe's conversations with Eckermann there is a passage in which he strikingly depicts the cowed children whom he saw not unfrequently from his window "in our own dear Weimar," flying before the terrible police. "Now," he added, "when the spring sun tempts them from the houses, and they would like to play with their companions before the door, I see them always constrained, as if they were not safe, and feared the approach of some despot of the police. Not a boy may crack a whip, or sing, or shout; the police is immediately at hand to forbid it." Many of us have seen similar things. But that is an evil which in this country (other influences co-operating) will rapidly disappear, as the men themselves become better educated and better trained in their duties. To ensure a police at once efficient and discreet, careful selection, adequate pay, and honourable recognition of meritorious service are the obvious requisites. (E. E.)

POLICY. See Insurance.

POLIDORO. See Caravaggio, *Polidoro Da*.

POLIGNANO, a town of Naples, in the province of Bari, stands on a steep cliff hollowed out by the sea into caverns, and commanding a wide view over a rich and well-cultivated region, 20 miles S.E. of Bari. It contains several churches, an abbey, and a convent. Some coins and other remains have been found in the vicinity. Pop. 5000.

POLIGNY, a town of France, capital of an arrondissement in the department of Jura, on the edge of an extensive plain at the foot of a branch of the Jura Mountains, 18 miles N.E. of Lons-le-Saulnier, and 49 N.W. of Geneva. It was formerly walled, and has still the ruins of an old citadel standing on an eminence. The principal streets, four in number, are regular, well-built, and adorned with several fine fountains. There are no remarkable public buildings, but the town-hall, a college, and manufactories of pottery, saltpetre, leather, &c.; as well as dye-houses, saw-mills, and iron-works. Marble and alabaster are quarried in the neighbourhood. Pop. (1856) 5208.

POLILLO, a small island of the Philippine group, lying to the E. of Luzon, N. Lat. 15. 5., E. Long. 122. 6. It is 30 miles in length, and about 20 in breadth. The soil is very fertile; and a lofty hill, called Malolo, rises in the centre. It has several good harbours, and especially one of the same name as the island on the S.W. coast.

POLISTINA, or Polistena, a town of Naples, in the province of Calabria Ultra I, on an elevated and fertile plain, 13 miles E.N.E. of Palmi. The old village of this name, which stood on the sides of two hills, was totally destroyed by an earthquake in 1783, being entirely thrown into a ravine then formed. Since that catastrophe the present town has been built. Pop. 6000.

POLITIANO, Angelo, was born at Monte Pulciano in Tuscany in the year 1454. He studied the Greek language, of which he became a complete master, under Andronicus of Thessalonica. He was greatly favoured by Lorenzo de' Medici in his education, and he is said to have written verses both in Greek and in Latin when he was not more than twelve years of age. He also studied the Platonic philosophy under Marsilius Ficinus, and that of Aristotle under Argyropylus. Politiano was one of the most learned and polite writers of his time. The first work which gained him a reputation was a poem on the tournament of Julian de' Medici. The account he wrote, some time afterwards, of the conspiracy of the Pazzi, was also very much esteemed. Erasmus and the two Scaligers mention him in terms of the highest praise. He composed many other pieces which merit approbation; and had he lived longer, he would have enriched the republic of letters with many excellent works. He died at the age of forty. The first edition of his works was that of Aldus, Venice, 1498; and many others followed till 1820, when they were inserted in the *Bibliotheca Poetica Italiana*.

POLITICAL ARITHMETIC. See Insurance, and Mortality.

POLITICAL ECONOMY.

Political Economy.

The subordinate parts of the science of political economy have been treated in separate articles of this work, with the fulness which their importance seemed to require. The present article, therefore, will be principally confined to an attempt to define the objects and limits of the science—to trace its progress—to exhibit and establish the fundamental principles on which it is founded—and to point out the relation and dependence of its different parts. In doing this, we shall have occasion to examine some of the more prominent theories advanced in this field of inquiry; our object being, not merely to lay before the reader what we conceive to be a true theory of the science, but also to present him with as full an exposition as our limits will allow of the doctrines advocated by the more celebrated of its professors.

PART I.

DEFINITION AND HISTORY.

Definition of the Science.—Causes of its being neglected in Greece and Rome, and in the Middle Ages.—Species of Evidence on which its Conclusions are founded.—Rise of the Science in Modern Europe.—Mercantile System.—Progress of Commercial Philosophy in England in the Seventeenth and Eighteenth Centuries.—System of Quesnay and the French Economists.—Publication of the "Wealth of Nations."—Distinction between Politics and Statistics, and Political Economy.

Definition of the science.

Political economy[1] is *the science of the laws which regulate the production, distribution, and consumption of the products and services necessary, useful, or agreeable to man, which it requires some portion of voluntary labour to produce, procure, or preserve.*

This definition has been framed so as to exclude all reference to whatever exists independently of man, and may be obtained in unlimited quantities without any laborious exertion. Had such been the case with the various articles required to satisfy our wants and desires, political economy would not have existed. It is the most practical of sciences, for it is exclusively conversant with the application, the objects, and the results of art and industry. It may indeed be said to be the science of values, inasmuch as those things only which may be exchanged or bartered for other things that are either wholly or in part produced by means of voluntary exertion or labour come within the scope of its inquiries. An article may be possessed of the highest degree of *utility*, or, as it is sometimes termed, of intrinsic worth, and yet be wholly destitute of value in exchange. Without utility of some sort or other, nothing can ever become an object of desire or demand. But however necessary an article may be to our comfort, or even existence, and however much it may be in demand, still, if it be a spontaneous production of nature, if it exist independently of human agency, and if every individual have an indefinite command over it, it cannot become the subject of an exchange, or afford any basis for the reasonings of the economist. Though food and clothes are not more useful than atmospheric air, they possess that value of which it is destitute. The reason is obvious. They are not, like air, gratuitous products, which may be had at all times without any exertion; they are obtainable only by labour. And as none will voluntarily sacrifice the fruits of their industry without an equivalent, they are truly said to possess exchangeable worth.

Definition.

Distinction between value in exchange and utility.

The word *value* is, we are aware, very often employed to express the utility as well as the exchangeable worth of articles; but as these qualities have nothing in common, this double employment had better be avoided. It is obvious, for example, that the utility of bread and water, or their capacity to appease hunger and quench thirst, is something fundamentally different from their value or capacity to exchange for or buy other things. Adam Smith perceived this difference, and was alive to the importance of carefully distinguishing between the utility, or, as he expressed it, the "value in use," of commodities, and their value in exchange. But he did not always keep this distinction in view, and it has been frequently lost sight of by later writers. There can, indeed, be no doubt that the confounding of these opposite qualities has been a principal cause of the confusion and obscurity in which many branches of the science, not in themselves difficult, are still involved. When it is said that water is highly valuable, it is meant that, being indispensable to existence, it has a high degree of utility, or of value in use; for, being usually obtainable in large quantities with little labour or exertion, it has in most places a very low value in exchange. But when it is said that gold is highly valuable, a totally different meaning is attached to the phrase. Gold is of comparatively small utility; but as it requires a great deal of labour and expense to bring limited quantities of it to market, it has a high value in exchange, and is readily accepted as an equivalent for large quantities of most other articles. To confound qualities which are so very different must evidently lead to erroneous conclusions. And therefore, to avoid all chance of error from mistaking the sense of so important a word as *value*, we shall not use it except to signify exchangeable worth, or value in exchange; and shall employ the word *utility* to express the power or fitness of an article to satisfy our wants and desires.

Were utility and value identical, or were they regulated by the same laws, it would follow, that whatever increased the utility of an article would also increase its value, and *vice versa*. But the fact is completely the reverse. A deficient harvest adds nothing to the utility—that is, to the nutritive power—of bread; while, by increasing its value and price, it adds to the privations of the great bulk of the consumers, and especially to those of the lower and poorer and most numerous classes. And so in every case. A rise of value or price is always publicly injurious; and conversely. Were the manufacture of hats improved so that they might be sold for half their present price, everybody would gain by the change. Those by whom they have been worn would save half their outlay upon them, while they would be brought within the reach of others who may hitherto have been too poor to become their purchasers. The discovery of the rules or principles by the application of which the value of commodities may be reduced to the lowest limits, is a principal object of this science. For, the more their value is reduced, the more obtainable they become, and the greater, consequently, is the amount of necessaries and conveniences at the disposal of individuals.

Definition of the term *wealth.*

Political economy has frequently been defined to be "the science which treats of the production, distribution, and con-

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[1] *Economy,* from οικος, *a house* or *family,* and νομος, *a law—the government of a family.* Hence political economy may be said to be to the state what domestic economy is to a family.

Definition.

sumption of *wealth;*" and if by wealth were meant those products which possess exchangeable value, and are necessary, useful, or agreeable, the definition would be one of the least exceptionable. But those by whom it has been adopted have given to wealth a different and in general much too extensive a meaning. They have sometimes, for example, considered it as synonymous with "*all that man desires as useful and agreeable.*" But if political economy were to embrace a discussion of the production and distribution of whatever is useful and agreeable, it would include within itself every other science; and the best Encyclopædia would be the best treatise on political economy. Good health is the greatest of boons, and therefore, on this hypothesis, the science of wealth should comprise the science of medicine; civil and religious liberty are highly desirable, and therefore the science of wealth should comprise the science of politics, and so on. Such definitions are obviously worse than useless. They generate confused and erroneous notions respecting the objects and limits of the science, and prevent the student acquiring a distinct idea of the nature of the inquiries in which he is engaged.

Malthus defined wealth to consist of "those material objects which are necessary, useful, and agreeable to man." (*Principles of Political Economy*, p. 28.) But waiving the objections that may perhaps be made to the introduction of the word "material," it is too comprehensive to be of use. Atmospheric air and the heat of the sun are both material products, and are highly useful and agreeable. But their independent existence and incapacity of appropriation exclude them, as already seen, from the investigations of this science.

Adam Smith has not explicitly stated what was the meaning which he attached to the term wealth. Probably, indeed, his ideas on the subject were not very precise; but he most commonly describes it as "the annual produce of land and labour." It has, however, been objected to this definition, that it refers to the sources of wealth before it is known what wealth is, and that it includes the useless products of the earth, as well as those which are appropriated and enjoyed by man.

The definition we have given is not open to any of these objections. By confining the science to a discussion of the laws which regulate "the production, distribution, and consumption of those products and services which have exchangeable value, and are necessary, useful, or agreeable," we give it a distinct and definite object. When thus properly restricted, the researches of the economist occupy a field which is exclusively his own. He runs no risk of wasting his time in inquiries which belong to other sciences, or in unprofitable investigations respecting the production and consumption of articles which cannot be appropriated, and exist independently of human agency.

Capacity of appropriation is indispensable to constitute wealth. And we shall invariably employ this term to distinguish those products which are obtainable only by the intervention of human labour, and which may in consequence be appropriated and consumed exclusively by their owners. A man is not said to be wealthy because he has an indefinite command over atmospheric air; for that being a privilege which he enjoys in common with every one else, it forms no ground of distinction. But he is said to be wealthy according to the degree in which he can afford to command those necessaries, conveniences, and luxuries which are not the gifts of nature, but the produce of industry. It must, however, be carefully observed, that though value and wealth be constantly conjoined, they are not identical, but are as widely different as utility and value. Our command of the necessaries and gratifications of which wealth consists will evidently be greater when their value declines than when it increases. It is a law of this science that *wealth and value vary inversely*—the one increasing as the other diminishes, and diminishing as the other increases. Wealth is greatest where the facility of production is greatest, and value is greatest under the opposite circumstances, or where the difficulty of production is greatest.

Definition.

Importance of the science.

Besides being exclusively conversant with that class of phenomena which the exertion of industry exhibits, the object of this science is to ascertain the means by which the latter may be rendered most productive of the necessaries, luxuries, and enjoyments which form wealth; the laws which determine the distribution of wealth among the different classes into which society is divided; and how it may be most profitably consumed. To enter into lengthened arguments to prove the importance of a science having such objects in view would be worse than useless. The consumption of wealth is indispensable to existence; but the eternal law of Providence has decreed that it can only be procured through the intervention of industry—that man must earn his bread "in the sweat of his face." This twofold necessity renders the production of wealth a constant and principal object of the exertions of the vast majority of the human race. It has subdued the aversion of man from labour, given activity to indolence, and armed the patient hand of industry with zeal to undertake, and perseverance to overcome, the most difficult and disagreeable tasks.

When pursued with proper diligence, these efforts seldom fail to attain the end in view. And while they furnish the bulk of society with ample supplies of the articles required for their comfortable subsistence, they afford time for the cultivation of those speculative inquiries and elegant tastes which elevate and adorn civilized man. To use the words of Dr Barrow,—"Wealth is that which generally men of all things are wont to affect, and covet with most ardent desire, as the great storehouse of their needs and conveniences, the sure bulwark of their state and dignity, the universal instrument of compassing their designs and pleasures; and most evident it is, that in the natural course of things industry is the way to acquire it, to secure it, to improve and enlarge it; the which course, pursued innocently and modestly God will be so far from obstructing, that He will further and bless it; for that indeed it would be a flaw in Providence if honest industry, using the means it affordeth, should fail of procuring a competency."[1]

But when the acquisition of wealth makes a part of the order of Providence, and is indispensable not merely to the supply of our necessary wants, but to our progress in intelligence and refinement, can we doubt the importance of the science which teaches the modes by which its acquisition may be facilitated, and the greatest amount of wealth obtained with the least difficulty? There are none to whom a knowledge of political economy can be considered as extrinsic or superfluous. There are some, doubtless, to whom it may be of more advantage than to others; but it is of paramount consequence to all. The prosperity of individuals and nations does not depend nearly so much on salubrity of climate or fertility of soil, as on their ability to apply labour with perseverance, skill, and judgment. Industry can balance almost every other deficiency. It can render regions, naturally inhospitable and unproductive, the comfortable abodes of an intelligent and refined, a crowded and wealthy population. But where it is wanting, the choicest gifts of nature are of no value; and countries possessed of the greatest capabilities of improvement with difficulty furnish a miserable subsistence to the scanty population of hordes distinguished only by their barbarism and wretchedness.

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[1] See the first of Dr Barrow's eloquent and admirable Sermons on Industry.

Such being the case, it may well excite astonishment that the study of political economy was not early considered as forming a principal part in a comprehensive system of education. Two circumstances, to which we shall now briefly advert, seem to have been principally instrumental in occasioning its neglect,—the institution of domestic slavery in the ancient world, and the darkness of the period when the plan of education in the universities of modern Europe was first organized.

Causes of the neglect of this science in antiquity and the middle ages.

The citizens of Greece and Rome considered it degrading to employ themselves in those occupations which form the principal business of the inhabitants of modern Europe. In some of the Grecian states they were prohibited from engaging in manufacturing or commercial industry; and in Athens and Rome, where this prohibition did not exist, these employments were regarded as mean, mercenary, and unworthy of freemen, and were carried on either by slaves, or the very dregs of the people.[1] Agriculture was treated with more respect. Some of the most distinguished characters in the earlier ages of Roman history had been actively engaged in rural affairs. But notwithstanding their example, in the later ages of the republic, and under the emperors, the cultivation of the soil was usually carried on by slaves belonging to the landlords, and employed on their account. The mass of Roman citizens were mostly engaged in the military service,[2] or derived a precarious and dependent subsistence from the supplies of corn furnished by the conquered provinces. The relations subsisting in modern Europe between landlords and tenants, and masters and servants, being thus in great measure unknown, the ancients were comparative strangers to those interesting questions growing out of the rise and fall of rents and wages which form so important a branch of this science. The philosophy of the ancient world was also extremely unfavourable to its cultivation. The luxurious or more refined mode of living of the rich was regarded by the ancient moralists as an evil of the first magnitude. They considered it as subversive of those warlike virtues which were the principal objects of their admiration; and they denounced the passion for accumulation as being fraught with the most injurious consequences. Political economy could not become an object of attention to men imbued with such prejudices; nor could it be studied by those who held the objects about which it is conversant in contempt, and spurned the labour by which they are produced.

At the establishment of our universities, the clergy being almost the exclusive possessors of the little knowledge then in existence, their peculiar feelings and pursuits naturally exercised a marked influence over the plans of education they were employed to frame. Grammar, rhetoric, logic, school divinity, and civil law comprised the whole course of study. To have appointed professors to explain the principles of commerce, and the means by which labour might be rendered most efficient, would have been considered as alike superfluous and degrading to the dignity of science. The prejudices against commerce, manufactures, and luxury, generated in antiquity, had a powerful influence in the middle ages. None had then any clear ideas of the true sources of wealth, happiness, and prosperity. The intercourse between different countries was extremely limited, and was confined rather to marauding excursions, and a piratical scramble for the precious metals, than to a commerce founded on the gratification of real or reciprocal wants.

These circumstances sufficiently account for the slow progress of this science, and the little attention paid to it, down to a very recent date. And since it became an object of more general attention and liberal inquiry, the opposition between the theories and opinions of the most eminent of its professors—an inevitable result of its recent cultivation—has proved unfavourable to its progress, and generated a disposition to distrust its best established conclusions. This, however, is an extremely ill-founded prejudice; and notwithstanding the diversity of the theories that have been formed to explain its various phenomena, it admits of as much certainty in its conclusions as any science not dependent on mere relation. A brief exposition of the principles on which it is founded, and of the mode in which its investigations should be conducted, will evince the correctness of this statement.

Principles of the science. Nature of the evidence on which its conclusions are founded.

Political economy is not a science of speculation, but of fact and experiment. The principles on which the production and accumulation of wealth, and the progress of civilization depend, are not the offspring of legislative enactments. Man's existence depends on his exerting himself to produce wealth; and the desire by which he is actuated to rise in the world and improve his condition impels him to save and accumulate. The principles which form the basis of this science make, therefore, a part of the constitution of man and of the physical world; and their operations, like those of the mechanical principles, may be traced by the aid of observation and analysis. There is, however, a material distinction between the physical and the moral and political sciences. The conclusions of the former apply in *every* case, while those of the latter apply only in the *majority* of cases; and the theorist must satisfy himself with framing his rules so as to explain their operation in the greater number of instances, leaving it to the sagacity of the observer to modify them so as to suit particular cases. Thus it is a principle admitted alike in morals and political economy, that by far the greater number of individuals have a much clearer view of what is conducive to their own interests than it is possible for any other man, or select number of men, to have; and that, therefore, it is sound policy to allow them to follow the bent of their inclination, and to engage in such branches of industry as they think proper. This is the general theorem; and it is one which is established on the most comprehensive experience. It is not, however, universally applicable, like the laws which regulate the motions of the planetary system. It will hold good in nine out of ten instances, but the tenth may be an exception. But it is not required of the economist that his theories should square with the peculiar bias of a particular person. His conclusions are drawn from contemplating the principles which are found to determine the condition of mankind, as presented on the large scale of nations and empires. His business is with man in the aggregate, with states, and not with families, with the passions and propensities which actuate the great bulk of the human race, and not with those which are occasionally found to influence a solitary individual.

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[1] The force of the prejudices on this head may be learned from the following quotations:—"Illiberales autem et sordidi," Cicero says, "questus mercenariorum, omniumque quorum operæ, non quorum artes emuntur. Est enim illis ipsa merces auctoramentum servitutis. Sordidi etiam putandi, qui mercantur a mercatoribus quod statim vendant, *nihil enim proficiunt, nisi admodum mentiantur!* Opificesque omnes in sordida arte versantur, *nec enim quidquam ingenuum potest habere officina*. . . Mercatura autem, si tenuis est, sordida putanda est; sin autem magna et copiosa, multa undique apportans, multisque sine vanitate impertiens, non est admodum vituperanda." (*De Officiis*, lib. i., sect. 42.) "Vulgaris opificum, quæ manu constant, et ad instruendam vitam occupatæ sunt; in quibus nulla decoris, nulla honesti simulatio est." (Senecæ *Epistolæ*, ep. 89.) A hundred similar quotations might be produced, but the one from Cicero is sufficient to establish the accuracy of what has been advanced. The strength of the prejudice against commerce and the arts is proved by its exerting so powerful an influence over so cultivated a mind. For a further discussion of the opinions of the Romans on this subject see the *Dissertazione del Commercio de Romani* of Mengotti, which received a prize from the Academy of Paris in 1787, and the *Memoria Apolegetica del Commercio de Romani* of Torres, published at Venice in 1788.

[2] "Rei militaris virtus præstat cæteris omnibus; hæc populo Romano, hæc huic urbi æternam gloriam peperit." (Cicero *pro Murena*.)

This distinction should be kept constantly in view. Nothing is more common than to hear it objected to some of the best established truths in politics and political economy, that they are at variance with certain facts, and that, therefore, they should be rejected. But these objections very often originate in an entire misapprehension of the subject. It would be easy to produce a thousand instances of individuals who have been enriched by monopolies and restrictions, and even by robbery and plunder; though it would be rather rash thence to conclude that society may be enriched by such means! This, however, is the single consideration to which the economist has to attend. And until it can be shown that monopolies and restrictions are not destructive of national wealth, and that what is gained by the monopolist is not lost by the public, he is bound to regard them as injurious. To arrive at a well-founded conclusion in this science, it is not enough to observe results in particular cases, or as they affect a few individuals; we must further inquire whether these results be constant and universally applicable; whether the same circumstances which have given rise to them in one instance, would in every instance, and in every state of society, be productive of the same or similar results. A theory which is inconsistent with an uniform and constant fact must be erroneous. But the observance of a particular result at variance with customary experience, and when we may not have the means of discriminating the circumstances attending it, should not make us hastily modify or reject a principle which accounts satisfactorily for the greater number of appearances.

The example of the few arbitrary princes, distinguished by their equity, humanity, and generosity, is not enough to overthrow the principle which teaches that it is of the essence of irresponsible power to debauch and vitiate its possessors, to render them haughty, cruel, and suspicious: nor is the example of those who, attentive only to present enjoyment, and careless of the future, lavish their fortunes in boisterous dissipation or vain expense, sufficient to invalidate the conclusion, that the passion for accumulation is stronger and more powerful than the passion for expense. Had this not been the case, mankind could hardly have emerged from the condition of savages. The stupendous improvements which have been made in different ages and nations, the forests that have been cut down, the marshes and lakes that have been drained and cultivated, the harbours, roads, and bridges that have been constructed, the cities and edifices that have been raised, are *all* the fruit of a saving of income, and establish, in despite of thousands of instances of prodigality, the ascendancy and superior force of the accumulating principle.

The want of attention to these considerations has occasioned much of the error and misapprehension with which this science has been infected. The false theories and opinions which have successively appeared, though destitute of any real foundation, have mostly been supported by an appeal to facts. But a knowledge of facts, without a knowledge of their mutual relation, without being able to show why the one is a cause and the other an effect, is, as Say has observed, no better than the indigested erudition of an Almanac-maker, and affords no means of judging of the truth or falsehood of a general principle.

But though we are not to reject a received principle because of the apparent opposition of a few results with the circumstances of which we are unacquainted, we should have no confidence in its solidity, unless it be deduced from a comprehensive and careful induction. He who would arrive at a true knowledge of the laws regulating the production, distribution, and consumption of wealth, must draw his materials from a very wide surface, and study man under very different aspects. He should have recourse to the history of society, arts, commerce, and civilization; to the works of philosophers and travellers; to everything, in short, that may throw light on the causes which accelerate or retard the progress of civilization. He should observe the changes which have taken place in the fortunes and condition of the human race in different regions and ages; he should trace the rise, progress, and decline of industry; and, above all, he should carefully discriminate the effects of political measures, and the various circumstances wherein advancing and declining societies differ from each other. Such investigations, by disclosing the real causes of national opulence and refinement, and of poverty and degradation, furnish the means of satisfactorily solving almost all the important problems in the science of wealth, and of devising a scheme of administration calculated to insure the continued improvement of nations.

It should be kept in mind, that it is no part of the business of the economist to inquire into the means by which individual fortunes may be increased or diminished, except to ascertain their general operation and effect. The *public interests* should always form the exclusive objects of his attention. He is not to frame systems, and devise schemes, for increasing the wealth and enjoyments of particular classes; but to apply himself to discover the sources of national wealth and universal prosperity, and the means by which they may be best secured and rendered most productive.

Those who reflect on the variety and extent of knowledge required for the construction of a sound theory of political economy will cease to feel any surprise at the errors into which economists have been betrayed, or at the discrepancy of the opinions still entertained on some important points. This science is of very recent origin. Though various treatises of considerable merit had previously appeared on some of its separate parts, it was not treated as a whole, or in a systematic manner, until about the middle of last century. This circumstance is of itself enough to account for the number of erroneous theories that have since appeared. Instead of deducing their general conclusions from a comparison of particular facts, and a careful examination of the phenomena attending the operation of different principles, and of the same principles under different circumstances, the first cultivators of almost every branch of science begin by framing their hypotheses on a very narrow and insecure basis. Nor is it really in their power to go to work differently. Observations are scarcely ever made or particulars noted for their own sakes. It is not till they begin to be in request as furnishing the only test by which to ascertain the truth of some popular theory, that they are made in sufficient numbers and with sufficient accuracy. The *effectual demand* of the theorist occasions, in the peculiar phraseology of this science, the production of the facts or raw materials he is afterwards to work into a system. The history of political economy exemplifies the truth of this remark. Being, as already observed, entirely unknown to the ancients, and but little attended to by our ancestors down to a comparatively late period, those circumstances which would have enabled us to judge with the greatest precision of the wealth and civilization of the more celebrated states of antiquity, and of Europe during the middle ages, have either been thought unworthy of notice by the historian, or have been very imperfectly and carelessly detailed. Those, therefore, who first began to trace the principles of the science had but a comparatively scanty experience on which to build their conclusions. Nor did they even avail themselves of the few historical facts with which they might easily have become acquainted, but confined their attention almost exclusively to those which happened to fall within the sphere of their own observation.

Mercantile system.

Agreeably to what has now been stated, we find that the theories advanced by the early economical writers were formed on the most contracted basis, and were only fitted to explain a few obvious and striking phenomena. The *mercantile theory*, for example, was entirely bottomed on the popular and prevalent opinions respecting money. The precious metals having been long used, both as standards by which to ascertain the values of different commodities, and as the equivalents for which they were most frequently exchanged, acquired a fictitious importance in the estimation of persons of the greatest discernment, as well as of the vulgar. The obvious fact, that all buying and selling is really nothing more than the bartering of one commodity for another—of a certain quantity of corn or wool, for example, for a certain quantity of gold or silver, and *vice versa*, was entirely overlooked. The attention was gradually transferred from the money's worth to the money itself; and the wealth of individuals and of states came to be measured by the quantities of the precious metals actually in their possession, and not by the abundance and value of the disposable products with which they could afford to purchase these metals. On this flimsy and fallacious hypothesis are founded the theories of almost every writer on economical subjects antecedent to the appearance of the works of Child, North, and Locke in England, and of Gournay and Quesnay in France. And, which is of infinitely greater moment, it is on this same hypothesis that the great powers of Europe proceeded to regulate their intercourse with each other. Their grand object was to monopolize the largest possible supplies of gold and silver, not to facilitate the production of necessaries, comforts, and luxuries. And as gold and silver could not be obtained in countries destitute of mines, except in exchange for exported commodities, various schemes were set on foot for encouraging exportation, and for preventing the importation of most products other than the precious metals. In consequence, an excess of exports over imports was long considered as the best possible proof that a country was advancing in the accumulation of wealth: For it was believed that this excess could not be balanced otherwise than by an equivalent importation of gold or silver, or of the only real wealth which it was supposed a country could possess.

These principles and conclusions, though entirely false and erroneous, afford a tolerable explanation of a few very obvious phenomena, and are in perfect unison with the popular prejudices on the subject. It was natural, therefore, that they should be espoused by the merchants or practical men, who were the earliest writers on commerce. They did not consider it necessary to subject the principles they assumed to any refined analysis or examination. But, reckoning them as sufficiently established by the common consent of mankind, they applied themselves to the discussion of the practical measures calculated to give them the greatest efficacy.

Balance of trade.

"Although a kingdom," says one of the earliest and ablest writers in defence of the mercantile system, "may be enriched by gifts received, or by purchase taken, from some other nations, yet these are things uncertain, and of small consideration when they happen. The ordinary means, therefore, to increase our wealth and treasure is by foreign trade, wherein we must ever observe this rule,—to sell more to strangers yearly than we consume of theirs in value. For suppose that when this kingdom is plentifully served with cloth, lead, tin, iron, fish, and other native commodities, we do yearly export the overplus to foreign countries to the value of L.2,200,000, by which means we are enabled, beyond the seas, to buy and bring in foreign wares for our use and consumption to the value of L.2,000,000. By this order duly kept in our trading, we may rest assured that the kingdom shall be enriched yearly L.200,000, which must be brought to us as so much treasure; because that part of our stock which is not returned to us in wares must necessarily be brought home in treasure." (Mun's *Treasure by Foreign Trade*, orig. ed., p. 11.)

The gain on our foreign commerce is here supposed to consist exclusively of the gold and silver which, it is taken for granted, must be brought home in payment of the excess of exported commodities. Mun lays no stress on the circumstance of foreign commerce enabling countries to obtain an infinite variety of useful and agreeable products, of which, but for it, they would be wholly deprived, while it supplies them with a great many more at comparatively low prices. We are desired to consider the innumerable additions which are thus made by commerce to the motives which stimulate, and the comforts and enjoyments which reward, the labour of the industrious—as *nothing*, and to fix our attention exclusively on the favourable balance of gold and silver! This is like desiring a person to estimate the utility of a suit of clothes by the number and glare of the metal buttons with which they are fastened! And yet this rule for judging of the advantageousness of foreign commerce was long regarded as infallible by the generality of merchants and practical statesmen; and, until very recently, we were annually congratulated on the excess of our exports over our imports!

Manufacturing system.

But in addition to the erroneous notions respecting the precious metals, there were other circumstances which led to the establishment of the mercantile system, and the enacting of regulations subversive of the freedom of industry. The feudal governments established in the countries which formed the western division of the Roman empire, early degenerated into a system of anarchy and lawless oppression. The princes, unable to restrain the usurpations of the greater barons, or to control their violence, endeavoured to strengthen their influence and consolidate their power by attaching the cities and towns to their interests. For this purpose they granted them charters, which enfranchised the inhabitants, abolished every existing mark of servitude, and formed them into corporations, or bodies politic, to be governed by councils and magistrates of their own selection. The order and good government that were thus established in them, and the security enjoyed by the citizens, when the rest of the country was a prey to rapine and disorder, stimulated their industry, and gave them a vast ascendancy over the cultivators of the soil. It was from the towns that the princes derived the greater part of their supplies of money, and with their assistance they were enabled to control and subdue the pride and independence of the barons. But the townsfolk were not disinterested enough to take part with their sovereigns merely from gratitude for the original gift of their charters. They were continually soliciting new privileges. And it was not to be expected that princes whom they had laid under the greatest obligations, and by whom they were justly regarded as the most industrious and deserving portion of their subjects, should be at all disinclined to gratify their wishes. To enhance the value of their corporate rights, they were authorized to hinder all individuals, whether native or foreign, who had not obtained leave from them, from carrying on any trade or craft within their limits; to enable them to obtain cheaper food and materials, the exportation of corn and of the raw products used in their manufactures was prevented; and to secure a market for whatever articles they had to sell, heavy duties and prohibitions were imposed on such foreign articles as might come into competition with those made at home, at the same time that bounties were employed to force the exportation of the latter! Such were the principal features of the system of public economy adopted, in the view of encouraging domestic industry, in every country of Europe, in the fourteenth, fifteenth, sixteenth, and seventeenth centuries. The freedom of trade recognised by their ancient laws was almost totally destroyed. It would be easy to mention a thousand instances of the excess to which this artificial system was carried in England and elsewhere; but we shall only observe, as illustrative of its spirit, that by an act passed in 1678, for the encouragement of the woollen manufacture, it was ordered that all *dead bodies* should be wrapped in woollen shrouds!

But the exclusion of foreign competition, and the monopoly of the home market, did not satisfy the manufacturers and merchants. Having obtained all the advantage they could from the public, they next attempted to prey on each other. Those possessed of most influence were authorized to carry on particular branches of industry, to the exclusion of every one else. This abuse having been carried to an extreme in the reign of Elizabeth, who granted an infinite number of new patents, became at last so intolerable as to make all classes join in petitioning for its abolition. And this, after much opposition on the part of government, by whom the power of erecting monopolies was regarded as a very valuable branch of the prerogative, was effected by an act passed in the 21st of James I. But this act did not touch any of the fundamental principles of the mercantile or manufacturing system; and the privileges of bodies corporate were exempted from its operation.

In France the interests of the manufacturers were warmly espoused by Colbert, the celebrated minister of finance during the most splendid period of the reign of Louis XIV.; and the year 1664, when the tariff, compiled under Colbert's direction, was promulgated, has been sometimes considered, though improperly, as the æra of the manufacturing system.

These restrictions were zealously supported by the writers in defence of the mercantile system and the balance of trade. The facilities given to the exportation of manufactured goods, and the obstacles thrown in the way of their importation, seemed to them to be particularly well fitted for making the exports exceed the imports, and procuring a favourable balance. Instead, therefore, of regarding these regulations as the offspring of a selfish monopolizing spirit, they looked on them as having been dictated by the soundest policy. The manufacturing and mercantile systems were thus naturally blended together. The acquisition of a favourable balance of payments was the grand object to be accomplished; and heavy duties and restrictions on importation from abroad, and bounties and premiums on exportation from home, were the means by which it was to be attained! It cannot excite surprise that a system having so many popular prejudices in its favour, and which afforded a plausible and convenient apology for the exclusive privileges enjoyed by the manufacturing and commercial classes, should have early attained, or that it should still preserve, notwithstanding the overthrow of its principles, a powerful practical influence. Melon and Forbonnais in France; Genovesi in Italy; Mun, Sir Josiah Child, Davenant, the authors of the *British Merchant*, and Sir James Steuart in England, are the ablest writers who have espoused, some with more and some with fewer exceptions, the leading principles of the mercantile system.

"It is no exaggeration to affirm that there are but few political errors which have produced more mischief than the mercantile system. Armed with power, it commanded and forbid where it should only have *protected*. The regulating mania which it inspired tormented industry in a thousand ways to force it from its natural channels. It made each nation regard the welfare of its neighbours as incompatible with his own; hence the reciprocal desire of injuring and impoverishing each other; and hence that spirit of commercial rivalry which has been made the immediate or remote cause of the greater number of modern wars. This system stimulated nations to employ force or cunning to extort commercial treaties, productive of no real advantage to themselves, from the weakness or ignorance of others. It formed colonies that the mother country might enjoy the monopoly of their trade, and force them to resort exclusively to her markets. In short, where it has been productive of the least injury, it has retarded the progress of national prosperity; everywhere else it has deluged the earth with blood, and has depopulated and ruined some of those countries whose power and opulence it was supposed it would carry to the highest pitch." (Storch, *Traité d'Economie Politique*, tom. i., p. 122.)

Progress of commercial science in England.

The greater attention which began to be paid, in the seventeenth and in the earlier part of the last century, to subjects connected with finance, commerce, and agriculture, gradually prepared the way for the downfall of the mercantile system. The English writers preceded those of every other country in pointing out its defects, and in discovering the real nature and functions of money, and the true principles of commerce. The establishment of a direct intercourse with India did much to accelerate the progress of sound opinions. The precious metals have always been one of the most advantageous articles of export to the East.[1] And when the East India Company was established in 1600, leave was given them to export *foreign* gold coins or bullion of the value of L.30,000 a year, on condition of their importing, within six months after the termination of every voyage, except the first, as much gold and silver as should together be equal to the value of the silver they exported. But the Company's enemies contended that these conditions were not complied with, and that it was contrary to all principle, and highly injurious to the public interests, to permit the exportation of any quantity of bullion. The merchants and others interested in the India trade,—among whom we have to reckon Sir Dudley Digges, whose defence of the Company was published in 1615; Mun, who published a very able pamphlet in defence of the Company in 1621;[2] Misselden; and, more recently, Sir Josiah Child,—could not controvert the reasoning of their opponents without openly impugning some of the commonly received opinions regarding money. In such circumstances it might easily have been foreseen that prejudice would give way to interest. At first, however, the advocates of the Company did not contend, nor is there, indeed, any good reason for thinking that they were of opinion, that the exportation of gold and silver to the East Indies was beneficial, on the ground that the commodities brought back were of greater value. They contended that the Company did not export a greater quantity of bullion than their charter authorized; and they further contended that its exportation was advantageous, because the commodities imported from India were chiefly re-exported to other countries, where they obtained a greater quantity of bullion in exchange for them than they had originally sent to India.[1] But even this was an immense advance in the progress to a sounder theory. *C'est toujours le premier pas qui coute.* The advocates of the Company began gradually to assume a higher tone; and at length boldly contended that bullion was nothing but a commodity, and that its exportation should be as free as that of anything else. Nor were these opinions confined to the partners of the East India Company. They were gradually communicated to others; and many eminent merchants were taught to look with suspicion on several received maxims, and were in consequence led to acquire more correct and comprehensive views regarding commercial intercourse. The new ideas ultimately made their way into the House of Commons; and in 1663 the statutes prohibiting the exportation of foreign coin and bullion were repealed, and full liberty given to the East India Company and to private traders to export them in unlimited quantities.

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[1] Pliny, when enumerating the spices, silks, and other eastern products imported into Italy, says, "Minimaque computatione millies centena millia sestertium annis omnibus, India et Seres, peninsulaque illa (Arabia) imperia nostro demunt." (*Hist. Nat.*, lib. xii., cap. 18.) Charles V. used to say that the Portuguese, who in his time engrossed almost the whole commerce of the East, were the common enemies of Christendom, inasmuch as they drained it of its treasure to export it to infidels! (Misselden on *Free Trade*, p. 24.)

[2] This pamphlet, which had become extremely rare, is included in the volume of early tracts on commerce reprinted for the Political Economy Club in 1856.

In addition to the controversies respecting the East India trade, the foundation of the colonies in America and the West Indies, the establishment of a compulsory provision for the support of the poor, the acts prohibiting the exportation of wool and the non-importation of Irish cattle, &c., drew an extraordinary portion of the public attention to questions of domestic policy. In the course of the seventeenth century a more than usual number of tracts were published on commercial and economical subjects. And although it must be admitted that the authors of the greater number are deeply imbued with the prevailing spirit of the age, there were some among them who rose far above the prejudices of their contemporaries, and have an unquestionable right to be regarded as the founders of the modern theory of commerce. They were the earliest teachers of those sound and liberal doctrines which show that the prosperity of states cannot be promoted by restrictive regulations, or by the depression of their neighbours; that the genuine spirit of commerce is inconsistent with the selfish and shallow policy of monopoly; and that the *self-interest* of mankind, not less than their duty, requires them to live in peace, and to cultivate a fair and friendly intercourse with each other.

Mr Mun.

We have already referred to Mun's treatise, entitled *England's Treasure by Foreign Trade.* It was first published in 1664; but there is good reason to suppose that it had been written many years previously. Mun's son, in the dedication to Lord Southampton, which he has prefixed to the work, says that his father "was, *in his time*, famous among merchants," a mode of expression which he would hardly have used had not a considerable period elapsed since his father's death; and Misselden, in his *Circle of Commerce*, published in 1623 (p. 36), refers to Mun's tract on the East India trade, and speaks of its author as being an accomplished and experienced merchant. Perhaps, therefore, we shall not be far wrong if we assume that the treatise on Foreign Trade was written so early as 1635 or 1640. At all events, the doctrines which it contains do not differ much from those which he had previously maintained in his pamphlet in defence of the East India Company, and some of the expressions are literally the same with those in the petition presented by that body to Parliament in 1628, which is known to have been written by Mun.[2] The extract we have previously given shows that his opinions, in so far as regards the balance of trade, were identical with those of his contemporaries. But we incline to think that, if not the first, he was one of the first, who endeavoured to show, and who in fact successfully showed, that a favourable balance could not be procured by restrictive regulations; that the exportation and importation of bullion, coin, and everything else, should be freely permitted; and that "violent measures will never bring gold or silver into a kingdom, or retain them in it." (Pp. 27, 92, &c., original edition.) Mun also distinctly lays it down, "that those who have wares cannot want money," and that "it is not the keeping of our money in the kingdom, but the necessity and use of our wares in foreign countries, and our want of other commodities, that causeth the vent and consumption on all sides, which causeth a quick and ample trade." (P. 43.[3]) Nor are these detached and incidental passages thrown out at random. The spirit which they breathe pervades the book, and forms part of the system of the author. His observations in answer to Malyne's, on some rather difficult questions connected with exchange, are both acute and ingenious.

Sir Josia Child.

The first edition of Sir Josiah Child's celebrated work on trade (*A New Discourse of Trade*, &c.) was published in 1668; but it was very greatly enlarged in the next edition, published in 1690. There are many sound and liberal doctrines advanced in this book. The argument to show that colonies do not depopulate the mother country is as conclusive as if it had proceeded from the pen of Malthus; and the just and forcible reasoning in defence of the naturalization of the Jews is highly creditable to the liberality and good sense of the writer, and discovers a mind greatly superior to existing prejudices. Sir Josiah has also some judicious observations on the laws against *forestalling* and *regrating*, on those limiting the number of apprentices, on corporation privileges, &c.

When treating of the laws relating to the exportation of wool, Sir Josiah lays it down, "that they that can give the best price for a commodity shall never fail to have it by one means or other, notwithstanding the opposition of any laws, or interposition of any power by sea or land; of such force, subtilty, and violence, is the general course of trade."

The radical defect of Sir Josiah Child's treatise consists in its being chiefly written to illustrate the advantages which he labours to show would result from reducing the legal rate of interest to four per cent.; an error into which he was led by mistaking the low interest of Holland for the principal cause of her wealth, when in truth it was mainly the result of her comparatively heavy taxation.

It is, however, worthy of remark, that this error was very soon detected. In the same year (1668) that Sir Josiah's treatise first appeared, a tract was published, entitled *Interest of Money Mistaken, or a Treatise proving that the Abatement of Interest is the Effect and not the Cause of the Riches of a Nation.* The author of this tract maintains the opinion afterwards held by Locke and Montesquieu, that the interest of money does not depend on statutory regulations, but that it varies according to the comparative opulence of a country; or rather according to the scarcity and abundance of money, increasing when the supply of money diminishes, and diminishing when it increases.[1] Having endeavoured to establish this plausible but erroneous doctrine, the author contends that Sir Josiah Child had totally mistaken the cause of the wealth of the Dutch, of which he says the lowness of interest was merely a consequence.

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[1] Those who have not the original pamphlets may consult Macpherson's *History of Commerce*, vol. ii., pp. 297, 315, 511; Macpherson's *Account of the European Commerce with India*, pp. 94, 104; and Mr Robert Grant's *Sketch of the History of the Company*, p. 44, where they will find ample confirmation of what is stated above.

[2] This petition, and the reasons on which it is founded, were so well esteemed as to occasion its being reprinted in 1641.

[3] These expressions are in the petition of the Company, presented to Parliament in 1628.

Sir Wm. Petty's *Political Anatomy.*

In 1672 Sir William Petty published his celebrated tract, entitled the *Political Anatomy of Ireland.* In this work the mischievous influence of the act passed in 1664, prohibiting the importation of cattle, beef, &c., from Ireland, is ably exposed, and the advantage of an unconstrained internal commerce clearly set forth. "If it be good for England," says Sir William, "to keep Ireland a distinct kingdom, why do not the predominant party in Parliament, suppose the western members, make England beyond Trent another kingdom, and take tolls and customs upon the borders? Or why was there ever any union between England and Wales? And why may not the entire kingdom of England be further cantonized for the advantage of all parties?"

The great defect of the writings of Mun, Misselden, Child, and others, does not consist so much in their notions about the superior importance of the precious metals, or the balance of trade, as in those respecting the advantages which they supposed were derivable from importing durable rather than rapidly perishable commodities and luxuries. This, however, was an extremely natural opinion; and we need not be surprised that the early writers on commerce fell into an error, from which neither the profound sagacity of Locke, nor the strong sense of Harris, has been able to preserve them. But even so early as 1677, the fallacy of this opinion was perceived. In that year there appeared a small tract, entitled *England's Great Happiness, or a Dialogue between Content and Complaint;* in which the author contends, that if there be a demand for wine, fruit, and such like articles, their importation in exchange for money is advantageous; and, on this ground, he defends the French trade, which was loudly declaimed against by the practical men of that day. We shall make a short extract from this remarkable tract:—

"*Complaint.*—You speak plain; but what think you of the French trade, which draws away our money by wholesale? Mr Fortrey,[2] whom I have heard you speak well of, gives an account that they get L.1,600,000 a year from us.

"*Content.*—'Tis a great sum; but perhaps were it put to a vote in a *wise council,* whether for that reason the trade should be left off, 'twould go *in the negative.* For paper, wine, linen, Castile soap, brandy, olives, capers, prunes, kid-skins, taffaties, and such like, we cannot be without; and for the rest, which you are pleased to style *apes* and *peacocks* (although wise Solomon ranked them with gold and ivory), they set us all agog, and have increased among us many considerable trades. . . . . I must confess, I had rather they'd use our goods than money; but if not, I would not lose the getting of ten pound because I can't get an hundred; and I don't question but when the French get more foreign trade, they'll give more liberty to the bringing in foreign goods. I'll suppose John-a-Nokes to be a butcher, Dick-a-Styles to be an exchange man, yourself a lawyer; will you buy no meat or ribbands, or your wife a fine Indian gown or fan, because they will not truck with you for indentures which they have need of? I suppose no; but if you get money enough of others, you care not though you give it away in specie for these things. I think 'tis the same case."

The spirit of this tract may perhaps be better inferred from the titles of some of the dialogues. Among others, we have "To export money our great advantage;"—"The French trade a profitable trade;"—"Variety of wares for all markets, a great advantage;"—"High living, a great improvement to the arts;"—"Invitation of foreign arts, a great advantage;"—"Multitudes of traders, a great advantage," &c., &c. But its influence was far too feeble to arrest the current of popular prejudice. In the year after its publication (1678) the importation of French commodities was prohibited for three years. This prohibition was made perpetual in the reign of William III., when the French trade was declared to be a nuisance!—a principle, if we may so call it, which has been acted upon down to our own times.

In 1681 a pamphlet was published in defence of the East India Company, under the signature of "Philopatris," but evidently the production of Sir Josiah Child. In the Introduction to this pamphlet the following principles are laid down:—

"That all close monopolies (Sir Josiah contends that the East India Company does not come under this description), of what nature or kind soever, are destructive to trade, and consequently obstructive to the increase of the value of our lands."

"That silver or gold, coined or uncoined, though they are used for a measure of all other things, are no less a commodity than wine, oil, tobacco, cloth, or stuffs; and may, in many cases, be exported as much to the national advantage as any other commodity."

"That no nation ever was, or will be, considerable in trade, that prohibits the exportation of bullion." (P. 3.)

Sir Wm. Petty's *Quantulumcunque.*

In Sir William Petty's *Quantulumcunque,* published in 1682, the subject of money is ably treated, and the idea of draining England of her cash by an unfavourable balance successfully combated. "If some English merchants," it is said, "should be so improvident as to carry out money only, then the foreign merchants would buy up such English commodities as they wanted with money brought into England from their respective countries, or with such commodities as England likes better than money; for the vending of English commodities doth not depend on anything else but the use and need which foreigners have of them." Sir W. denies that "a country is the poorer for having less money;" and concludes by strongly condemning the laws regulating the rate of interest; observing, that there may as well be laws to regulate the rate of exchange and of insurance. (See pp. 3, 6, 8, original edition.)

Sir Dudley North.

But a tract, entitled *Discourses on Trade, principally directed to the Cases of Interest, Coinage, Clipping, and Increase of Money,* written by Sir Dudley North, and published in 1691, contains a far more able statement of the true principles of commerce than any that had then appeared.

We regret that our limits will not permit our giving so full an account as we could have wished of this extraordinary tract. The author is a most intelligent and consistent advocate of the great principles of commercial freedom. He is not, like the most eminent of his predecessors, well informed on one subject, and erroneous on another. He is throughout sound and liberal. His system is consentaneous in its parts, and complete. He shows that in commercial matters nations have the same interests as individuals; and exposes the absurdity of supposing that any trade advantageous to the merchant can be injurious to the public. His opinions respecting the imposition of a seignorage on the coinage of money, and the expediency of sumptuary laws, then in great favour, are equally enlightened.

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[1] It has been generally supposed that Hume was the first who showed (in his *Essay on Interest*) the fallacy of this opinion, and who proved that the rate of interest does not depend on the abundance or scarcity of money, but on the abundance or scarcity of disposable capital compared with the demands of the borrowers and the rate of profit. This, however, is a mistake, the doctrine in question having been fully demonstrated in a pamphlet written by Mr Massie, entitled *Essay on the Governing Cause of the Natural Rate of Interest,* published two years before Mr Hume's Essay appeared.

[2] Mr Fortrey's pamphlet has been much referred to. It was published in 1663, and reprinted in 1673. It contains a very good argument in favour of inclosures. The reference in the text sufficiently explains the opinions of the writer in regard to commerce.

We subjoin from the Preface to this tract an abstract of the general propositions maintained in it:—

"That the whole world as to trade is but as one nation or people, and therein nations are as persons.

"That the loss of a trade with one nation is not that only, separately considered, but so much of the trade of the world rescinded and lost; for all is combined together.

"That there can be no trade unprofitable to the public; for if any prove so, men leave it off; and wherever the traders thrive, the public, of which they are a part, thrive also.

"That to force men to deal in any prescribed manner may profit such as happen to serve them; but the public gains not, because it is taking from one subject to give to another.

"That no laws can set prices in trade, the rates of which must and will make themselves. But when such laws do happen to lay any hold, it is so much impediment to trade, and therefore prejudicial.

"That money is a merchandise, whereof there may be a glut, as well as a scarcity, and that even to an inconvenience.

"That a people cannot want money to serve the ordinary dealing, and more than enough they will not have.

"That no man will be the richer for the making much money, nor have any part in it, but as he buys it for an equivalent price.

"That the free coynage is a perpetual motion found out, whereby to melt and coyn without ceasing, and so to feed goldsmiths and coyners at the public charge.

"That debasing the coin is defrauding one another, and to the public there is no sort of advantage from it; for that admits no character or value but intrinsick.

"That the sinking by alloy or weight is all one.

"That exchange and ready money are the same, nothing but carriage and re-carriage being saved.

"That money exported in trade is an increase to the wealth of the nation; but spent in war, and payments abroad, is so much impoverishment.

"In short, that all favour to one trade or interest is an abuse, and cuts so much of profit from the public."

Unluckily this admirable tract never obtained any considerable circulation. There is good reason, indeed, to suppose that it was designedly suppressed.[1] At all events, it speedily became excessively scarce; and we are not aware that it was ever referred to by any subsequent writer till it was noticed in the first edition of this article.[2]

The disordered state of the coin, and the proceedings relative to the great re-coinage, in the reign of William III., led to a great deal of discussion both in and out of Parliament, and contributed in no ordinary degree to diffuse juster notions respecting money and commerce. It was then that Mr Locke published his well-known tracts on Money,[3] They immediately obtained a very extensive circulation; and though infected with some very grave errors, had a powerful influence in preventing the adoption of Mr Lowndes's proposal for degrading the standard of the coin, and in contributing to establish the true theory of money. The restoration of the currency was not, however, effected without great opposition. A large minority in Parliament supported Lowndes's views; and they were also supported by a number of writers. Of these, Mr Nicholas Barbon seems to have been one of the ablest. In his tract, entitled *A Discourse concerning Coining the New Money Lighter*, published in 1696, he detected several of the errors into which Locke had fallen; and he had the further merit of demonstrating the fallacy of the popular opinions respecting the balance of trade; and of showing that bullion would never be sent abroad in payment of an unfavourable balance, unless it were at the time the cheapest and most profitable article of export.

Mr Barbo

The inferences deduced by Barbon from his investigations into the balance of trade and foreign exchange are:—

"That a trading nation is made rich by traffic and the industry of the inhabitants—and that the native stock of a nation can never be wasted.

"That no sort of commodities ought to be totally prohibited—and that the freer trade is, the better the nation will thrive.

"That the poverty and riches of a nation do not depend on a lesser or greater consumption of foreign trade, nor on the difference of the value of those goods that are consumed.

"That the balance of trade is a notion that serves rather to puzzle all debates of trade, than to discover any particular advantages a nation may get by regulating of trade.

"That the balance of trade (if there be one) is not the cause of sending away the money out of a nation; but that proceeds from the difference of the value of bullion in several countries, and from the profit that the merchant makes by sending it away more than by bills of exchange.

"That there is no occasion to send away money or bullion to pay bills of exchange, or balance accounts.

"That all sorts of goods, of the value of the bill of exchange, or the balance of the account, will answer the bill, and balance the account as well as money." (P. 59.)

It is singular that a writer possessed of such just and enlarged opinions respecting the principles of commercial intercourse, and who had shown that bullion differed in no respect from other commodities, should have maintained that the value of coins depended on the stamp impressed on them by government. This gross and unaccountable error destroyed the effect of Barbon's tract; and was, most probably, the cause of the oblivion into which it very soon fell, and of its never having attracted that attention to which, on other accounts, it was entitled.

Dr Davenant.

The commercial writings of Dr Davenant, inspector-general of imports and exports, were published in the interval between 1695 and 1711. Though a partizan of the mercantile system, Davenant had emancipated himself from many of the prejudices of its more indiscriminate and zealous supporters. He considered a watchful attention to the balance of trade, and its "right government," as of the highest importance; but he did not consider that wealth consisted exclusively of gold or silver; or that prohibitions and restrictions should be rashly imposed, even on the intercourse with those countries with which the balance was supposed to be unfavourable. But we are far from thinking that his commercial writings deserve the eulogies that have been bestowed on them, or that they had any material effect in accelerating the progress of sound commercial science. They do not contain a single principle not to be found in the work of Sir Josiah Child. Some of Davenant's paragraphs are exceedingly good; but the treatises of which they form a part are remarkably inconclusive, and are for the most part pervaded by narrow and contracted views. There is no evidence to show that he was at all aware of the influence of commerce in facilitating the production of wealth by giving rise to the territorial division of labour, and enabling each people to devote itself, in preference, to those employments for the successful prosecution of which they have some peculiar advantage.[1]

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[1] See the Honourable Roger North's Life of his brother, the Honourable Sir Dudley North, p. 179.

[2] This tract, and the greater number of those referred to in this article, with many more of equal value and importance, are included either in the collection of early tracts on trade reprinted by the Political Economy Club of London in 1856, or in the four volumes of economical tracts that have been since reprinted by Lord Overstone. This last is one of the most valuable contributions that have ever been made to the illustration of that science of which the noble lord is so great a master. It has been a means of preserving many valuable publications, some of which were extremely scarce, and ran an imminent risk of being entirely lost, and of making them available to the historians and economists of this and future ages. It is much to be wished that other opulent noblemen and gentlemen would follow so excellent an example, by collecting and reprinting the scarcest and most valuable tracts in other departments of knowledge.

[3] *Considerations on the Lowering of Interest and Raising the Value of Money*, 1691; *Further Considerations concerning Raising the Value of Money*, 1695.

Jacob Vanderlint.

In 1734 Jacob Vanderlint, who describes himself as a tradesman, published his tract, entitled *Money Answers all Things*. Dugald Stewart has referred to it in the Appendix to his Life of Adam Smith, and has quoted some passages illustrative of the advantages of commercial freedom, which, he says, "will bear a comparison, both in point of good sense and liberality, with what was so ably urged by Mr Hume twenty years afterwards, in his *Essay on the Jealousy of Trade*." Vanderlint closes his pamphlet with an argument in favour of the substitution of a territorial tax in place of every other,—an idea borrowed from Locke, and subsequently adopted by the French economists.

Mr Richardson.

In 1744,[2] Mr Richardson, an extensive merchant, published an *Essay on the Causes of the Decline of Foreign Trade*. This essay has been frequently referred to by Adam Smith, and it deserved his notice. Richardson is an intelligent and decided enemy of restrictions, monopolies, and prohibitions. To give full freedom to industry, he proposed that corporation privileges should be abolished, and that the existing taxes should be repealed, and replaced by a *single tax* laid on the consumers of luxuries, proportionally to their incomes. The following extracts will give an idea of the spirit and ability which pervades this essay:—

"In the *Memoirs of De Witt* it is said, 'that restraint is always hurtful to trade;' the reason whereof is plain, for nature has given various products to various countries, and thereby knit mankind in an intercourse to supply each other's wants. To attempt to sell our products, but to buy little or none from foreigners, is attempting an impossibility, acting contrary to the intent of nature, cynically, and absurdly, and, as ours is a populous manufacturing country, might be prejudicial to our interests; for, could we raise all necessaries and vanities within ourselves, this intercourse designed by nature would be destroyed; and then, how is our navy, our only bulwark, to be maintained?" (P. 147.)

"Trade cannot, will not, be forced; let other nations prohibit, by what severity they please, interest will prevail; they may embarrass their own trade, but *cannot hurt a nation whose trade is free so much as themselves*. Spain has prohibited our woollens; but had a reduction of our taxes brought them to their natural value only, they would be the cheapest in Europe of their goodness, consequently must be more demanded by the Spaniards, be smuggled into their country in spite of their government, and sold at better prices; their people would be dearer clothed, with duties and prohibitions, than without, consequently must sell their oil, wine, and other commodities dearer; whereby other nations, raising the like growths, would gain ground upon them, and their balance of trade grow less and less. But should we, for that reason, prohibit their commodities? By no means; for the dearer they grow, no more than what are just necessary will be used; their prohibition does their own business; some may be necessary for us; what are so, we should not make dearer to our own people; some may be proper to assort cargoes for other countries, and why should we prohibit our people that advantage? *Why hurt ourselves to hurt the Spaniards?* If we would retaliate effectually upon them for their ill intent, handsome premiums given to our plantations to raise the same growths as Spain might enable them to supply us cheaper than the Spaniards could do, and establish a trade they could never recover. Premiums may gain trade, but prohibitions will destroy it." (P. 163.)

Mr Richardson applies the same argument to expose the injurious influence of the restraints on the trade with France. "I allow," he says, "that Britain should be always vigilant over the designs of France, but need not be afraid of her power. Her wise regulations in trade should be the objects we should keep our eyes upon, and outdo her if possible; or else, as she rises we must sink. But it is our comfort that our remedy is always in our own hands; nor can there be any solid reason for the nation's paying dearer to other countries for goods we could buy cheaper in France. Would any wise dealer in London buy goods of a Dutch shopkeeper for 15d. or 18d. when he could have the same from a French shopkeeper for 1s.? Would he not consider that, by so doing, he would empty his own pockets the sooner, and that, in the end, he would greatly injure his own family by such whims? And shall this nation commit an absurdity that stares every private man in the face? .... The certain way to be secure is to be more powerful,—that is, to extend our trade as far as it is capable of; and as restraints have proved its ruin, to reject them and depend on freedom for our security, bidding defiance to the French, or any nation in Europe, that took umbrage at our exerting our natural advantages." (P. 184.)

We do not know that the impolicy of restrictions on the importation of foreign corn has ever been more triumphantly exposed than in the following passage:—"Every home commodity, in a free trade, will find its natural value; for though that fluctuates, as of necessity it must, according to the plentifulness or scarcity of seasons, yet, for the home consumption, every home commodity must have great advantage over the foreign, as being upon the spot, and free from freight, insurance, commission, and charges, which on the produce of lands, being all bulky commodities, must in general be about 15 per cent., and a greater advantage cannot be given without prejudice; for 15 per cent. makes a great difference in the price of necessaries between the nation selling and the nation buying, and is a great difficulty on the latter, but, arising from the natural course of things, cannot be helped, though it is a sufficient security to the landholder that foreigners can never import more necessaries than are absolutely required; and I presume in such cases they have more charity than to starve the people merely for an imaginary profit, which yet would prove their ruin in the end; for it is a fallacy and an absurdity to think to raise the value of lands by oppressions on the people that cramp their trade; for if trade declines, the common people must either come upon the parish, or fly for business to our neighbours. In the first case, they become a heavy tax on the rich, and, instead of buying the produce of their lands, must have it given them; and, in the second case, when the consumers are gone, what price will the produce of land bear?" (P. 56.)

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[1] The progress of enlarged and liberal opinions with regard to commerce seems to have been in no small degree counteracted by the publication of the *British Merchant*. This work was written by some of the first merchants of their time to expose the alleged defects in the commercial treaty with France negotiated by Queen Anne's Tory administration in 1713. It consists of a series of papers published weekly, and afterwards collected in three volumes. Public opinion being very much against the treaty, the *British Merchant* enjoyed a large share of popularity. Its authors appeared to have been thoroughly imbued with all the prejudices of the mercantile sect; and the work is now only deserving of notice as containing the fullest exposition of their peculiar doctrines.

[2] We quote from the edition of the Essay published at Edinburgh in 1756. The first edition, in 4to, was published in 1744.

Mr Hume.

Mr Harris.

Of a work so well known as Mr Hume's *Political Essays* (published in 1752) it is superfluous to speak. The ability with which he has combated the prejudice against the French trade, and ridiculed the fear of being deprived of a sufficiency of bullion; the liberality and expansion of his views respecting commerce; the beauty of his style, and the aptness of his illustrations, cannot be too highly praised. It did not, however, enter into his plan to give a systematic view of the influence of commerce, nor did he institute any analysis of the sources of wealth. Mr Harris endeavoured to supply the latter deficiency; and his *Essay on Money and Coins*, published in 1757, is perhaps on the whole the best economical treatise that had appeared previously to the *Wealth of Nations*. We have already noticed Harris's mistake in supposing that it was more profitable to import durable rather than rapidly consumable commodities; and, as a writer on commerce, he is undoubtedly inferior to Sir Dudley North and Mr Richardson. But the comprehensive and able manner in which he has treated the subject of money, the skill with which he has illustrated the influence of the division of labour, and the near approach he has made to some of the fundamental doctrines of Smith, if they do not give him a pre-eminence, certainly place him in the first rank among his precursors.

Early Italian writers on commerce.

We have been induced to treat of the progress of commercial science in England at considerable length, partly on account of the interest and importance of the subject, and partly because it has been but little investigated. Say and other continental writers contend that the Italians and French were the first who discovered and established the just principles of commercial intercourse. But the details now given prove the indisputable priority of the English. The economical works of Davanzati, Serra, Turbolo, and Scaruffi are almost wholly occupied with a discussion of the effects of a forced reduction of the standard of money. They deserve credit for having opposed all tampering with the currency; but the arguments they employ to show its injustice and impolicy are stated with much greater brevity and force in Sir Robert Cotton's speech before the Privy Council in 1626. The *Discurso Economico* of Bandini, the earliest writer on commerce whose works have been thought worthy of a place in the voluminous collection of Italian works on political economy[1] was published so late as 1737. Belloni and Algarotti's *Essays on Commerce*, both very inferior to the works of Child and North, were published, the former in 1750, and the latter in 1763.

Early French writers on commerce.

The French have still less claim than the Italians to be considered the discoverers of the true principles of commerce. There are many just and striking observations on the injury France sustained from the want of a free internal traffic, and the oppressiveness of taxation, in the *Dixme Royale* of Marshal Vauban, written in 1698. But Vincent de Gournay, whom the French state to be one of the earliest of their authors who entertained comprehensive and liberal notions in regard to commerce, was born so late as 1712.[2] Gournay published translations of the treatise of Sir Josiah Child, and of a tract by Sir Thomas Culpepper, at Paris in 1752. So slow was the progress of economical science in France, that even Montesquieu has a chapter entitled, "A quelles nations il est désavantageux de faire le commerce."[3]

System of the French Economists.

M. Quesnay.

But neither the efforts of the English nor French writers in favour of the freedom of commerce and industry had any considerable influence on the mercantile system. Their opinions respecting the nature of wealth and the causes of national opulence being confused and contradictory, their arguments in favour of a liberal system of commerce had somewhat of an empirical appearance, and failed to make that impression which is always made by arguments founded on well-established principles, and shown to be consistent with experience. Locke, as will be afterwards seen, entertained correct opinions respecting the paramount influence of labour in the production of wealth; but he does not appear to have been aware of their value, and did not again refer to them. And though Harris adopted Locke's views, and deduced from them some important practical inferences, his general reasonings are merely introductory to his *Treatise on Money*, and are not thrown into a scientific form. On the whole it would seem that the celebrated M. Quesnay, a physician attached to the court of Louis XV., was the first who investigated the sources of wealth, in the view of ascertaining the fundamental principles or natural laws on which national prosperity is mainly dependent; and by so doing he gave to political economy a systematic form, and raised it to the rank of a science. Having been brought up in the country, Quesnay was naturally inclined to regard agriculture with more than ordinary partiality. Its depressed state in France made him set about discovering the causes which had prevented its making that progress which the industry of the inhabitants, the fertility of the soil, and the excellence of the climate seemed to ensure. In the course of this inquiry he became convinced that the prohibition of exporting corn to foreign countries, and the preference given in the system of Colbert (which continued in the ascendant) to manufactures and commerce over agriculture, formed the most powerful obstacle to the improvement of the latter. But Quesnay did not satisfy himself with exposing the injustice of this preference and its pernicious consequences. His zeal for the interests of his favourite pursuit led him not merely to place it on the same level with the other great departments of industry, but to raise it above them, by endeavouring to show that agriculture is the only species of industry by which the riches of a nation can be increased. Founding on the fact, that everything which either ministers to our wants or gratifies our desires, must be originally derived from the earth, Quesnay assumed as a self-evident truth, that the earth is the only source of wealth, and held that industry is altogether incapable of producing any new value, except when employed in its culture, including therein the working of fisheries and mines.[1] His observance of the effects produced by the vegetative powers of nature, and his inability to explain the true origin and causes of rent, confirmed him in his opinion. The circumstance, that of all who engage in industrial undertakings, none but the cultivators of the soil pay rent for the use of natural agents, appeared to him to prove beyond all question that agriculture is the only variety of industry which yields a nett surplus (*produit net*) over and above the expenses of production. He admitted that manufacturers and merchants are highly useful; but as they realize no nett surplus in the shape of rent, he contended that they added no greater value to the commodities they manufactured or carried from place to place than was barely equivalent to the capital or stock consumed in these operations. These principles once established, it followed that landlords, farmers, and the labourers employed in agriculture are the only *productive* classes; and that the industry of manufacturers and traders being *unproductive*, their means of subsistence and wealth must be wholly derived from the agriculturists. It further followed that the expenses of government, and the various public burdens, however imposed, are really defrayed out of the *produit net*, or rent of the landlords: and consistently with this principle, Quesnay proposed that the existing taxes should be repealed, and that a single tax (*l'impôt unique*), laid directly on the produce of the land, should be imposed in their stead.

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[1] *Scrittori Classici Italiani di Economia Politica*. The publication of this collection of the works of her economical writers does honour to Italy, or rather to Napoleon, by whom it was liberally patronized. It was begun in 1803, and finished in 1805, in 50 volumes 8vo.

[2] See Dupont's edition *Des Œuvres de M. Turgot*, tom. iii., p. 311.

[3] Maupertuis, in his *Eloge de Montesquieu*, candidly admits that France is indebted for the science of commerce, finance, and population, to England. The passage is curious:—"Comme le plan de Montesquieu," he observes, "renfermoit tout ce qui peut être utile au genre humain, il n'a pas oublié cette partie essentielle qui regarde le commerce, les finances, la population; science *si nouvelle parmi nous*, qu'elle n'y a encore point de nom. Ce'st *chez nos voisins qu'elle est née*; *et elle y demeura jusque à ce que M. Melon lui fit passer le mer.*" Melon's work, *Essai Politique sur le Commerce*, was published in 1734. It is entirely founded on the principles of the mercantile system. Mr Bindon translated it into English, and published it, along with some rather valuable annotations and remarks, at Dublin in 1739. Melon had advocated the ruinous policy of raising the denomination of the coin. This gave occasion to the publication of an acute work by Dutot, entitled *Réflexions Politiques sur les Finances et le Commerce*, 2 tomes 12mo, 1738. Dutot's work was in its turn very ably criticised by Duverney in his *Examen des Réflexions Politiques sur les Finances*, &c., 2 tomes 12mo, 1740. These works contain a great deal of curious and interesting information respecting French finance. Duverncy's account of the Mississippi scheme is particularly good.

The *economical table* of M. Quesnay—"Cette formule étonnante," says Dupont, "qui peint la naissance, la distribution, et la reproduction des richesses, et qui sert à calculer avec tant de sureté, de promptitude, et de précision, l'effet de toutes les opérations relatives aux richesses"—was published at Versailles in 1758.

But Quesnay, though deeply impressed with the superior importance of agriculture, did not solicit for it any exclusive favour or protection. He successfully contended that the advantage of the agriculturists, and of all classes, would be best promoted by establishing a perfectly free system. It could never, he said, be for the interest of the proprietors and cultivators of the soil to discourage the pursuits, or fetter the industry, of merchants, artificers, and manufacturers; for the greater their liberty, the greater would be their competition, and the cheaper their products. Neither, on the other hand, could it ever be for the interest of the unproductive classes to injure the agriculturists by preventing them from exporting their produce, or subjecting them to restrictive regulations. Cultivators who enjoy the greatest degree of freedom prosecute their business under the most favourable circumstances; and their nett surplus (*produit net*)—the only fund whence any accession to the public wealth can be derived—attains in consequence to the largest dimensions. According to this "liberal and generous system" (*Wealth of Nations*, p. 303[2]), the establishment of perfect liberty, perfect security, and perfect justice, is the only, as it is the infallible, means of securing the highest degree of prosperity to all classes.

"On a vu" says the commentator of this system, M. Mercier de la Rivière, "qu'il est de l'essence de l'ordre que l'intérêt particulier d'un seul ne puisse jamais être séparée de l'intérêt commun de tous; nous en trouvons une preuve bien convaincante dans les effets que produit naturellement et nécessairement la plénitude de la liberté qui doit regner dans le commerce, pour ne point blesser la propriété. L'intérêt personnel, encouragée par cette grande liberté, presse vivement et perpétuellement chaque homme en particulier, de perfectionner, de multiplier les choses dont il estvendeur, de grossir ainsi la masse des jouissances qu'il peut procurer aux autres hommes, afin de grossir, par ce moyen, la masse des jouissances que les autres hommes peuvent lui procurer en échange. *Le monde* alors *va de lui-même;* le désir de jouir, et la liberté de jouir, ne cessant de provoquer la multiplication des productions et l'accroissement de l'industrie, ils impriment à toute la société un mouvement qui devient une tendance perpétuelle vers son meilleur état possible." (Tome ii., p. 444.[3])

We shall have other opportunities of fully examining the principles of this theory. At present it is sufficient to remark that, in assuming agriculture to be the only source of wealth, because the matter of commodities is derived from the earth, Quesnay and his followers mistook altogether the nature of production, and really supposed wealth to consist of matter. But, in its natural state, matter is rarely possessed of utility, and is always destitute of value. The labour bestowed on its appropriation, and in fitting it for and applying it to our use, is the only means by which it acquires exchangeable value, and becomes wealth. The latter is not produced by adding to the contents of our globe, these being susceptible neither of augmentation nor diminution, but by giving utility to matter already in existence. And it will be immediately seen, that the labour employed in manufactures and commerce is as productive of utility, and consequently of wealth, as that employed in agriculture. Neither is the cultivation of the soil, as Quesnay supposed, the only variety of industry which yields a surplus over the expenses of production. When none but the best soils are cultivated, and when, consequently, agriculture is most productive, no rent, or *produit net*, is obtained from the land; and it is only after recourse has been had to poorer soils, and when the productive powers of the labour and capital employed in cultivation begin to diminish, that rent begins to appear; so that, instead of its being any proof of the superior productiveness of agricultural industry, rent is a consequence of its becoming comparatively less productive! The opinion of Quesnay, that man derives no assistance from the productive powers of nature, if he be not employed in agriculture, is totally destitute of foundation. It will be shown in a subsequent part of this article, that the manufacturer and merchant derive fully as much assistance from these powers as the agriculturist, fisher, or miner.

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[1] "Cherchant d'où vient les richesses des nations, Quesnay trouva qu'elles ne naissent que des travaux dans lequels la *Nature et la Puissance Divine* concourent avec les efforts pour produire ou faire recueillir des productions nouvelles: de sorte qu'on ne peut attendre l'augmentation des ces richesses que de la cultivation, de la pêche, et de l'éxploitation des mines, et des carriers." (See the "Notice sur les Economistes," by one of the most zealous of the sect, Dupont de Némours, in the *Œuvres de Turgot*, tom. iii., p. 312.)

[2] M'Culloch's edition, 1 vol. 8vo.

[3] That Quesnay is entitled to the merit of originality cannot, we think, be disputed. He had certainly, however, been anticipated in several of his peculiar doctrines by some English writers of the previous century. The fundamental principles of the economical system are distinctly and clearly stated in a tract entitled *Reasons for a Limited Exportation of Wool*, published in 1677. "That it is of the greatest concern and interest to the nation," says the author of the tract, "to preserve the nobility, gentry, and those to whom the land of the country belongs, at least, much greater than a few artificers employed in working the superfluity of our wool, or the merchants who gain by the exportation of our manufactures, is manifest—1. Because they are the masters and proprietaries of the foundation of all the wealth in this nation, all profit arising out of the ground, which is theirs; 2. Because they bear all taxes and public burdens, which, in truth, are only borne by those who buy, and sell not; all sellers raising the price of their commodities, or abating of their goodness, according to their taxes." (Not being able to procure the pamphlet itself, we quote from the extract given in Mr Smith's *Memoirs of Wool*, vol. i., p. 254.) In 1696 Mr Asgill published a treatise entitled *Several Assertions Proved, in order to Create Another Species of Money than Gold*, in support of Dr Chamberlayne's proposition for a land bank. We extract from this treatise the following passage, breathing, as Dugald Stewart has justly observed, the very spirit of Quesnay's philosophy. "What we call commodities is nothing but land severed from the soil. Man deals in nothing but earth. The merchants are the factors of the world, to exchange one part of the earth for another. The king himself is fed by the labour of the ox; and the clothing of the army and the victualling of the navy must all be paid for to the owner of the soil as the ultimate receiver. All things in the world are originally the produce of the ground, and there must all things be raised." (This passage has been quoted in Lord Lauderdale's *Inquiry into the Nature and Origin of Public Wealth*, 2d ed., p. 109.) These passages are interesting as exhibiting the first germs of the theory of the Economists. But there is no reason to suppose that Quesnay was aware of the existence of either of the tracts referred to. The subjects treated in them were of too local a description to excite the attention of foreigners; and Quesnay was too candid to conceal his obligations, had he really owed them any. It is probable he may have seen Locke's treatise on *Raising the Value of Money*, where the idea is thrown out that all taxes fall ultimately on the land. But there is an immeasurable difference between the suggestion of Locke and the well-digested system of Quesnay.

But though the theory of the Economists, considered in reference to the fundamental principles of the science, be as erroneous as that to which it was opposed, its novelty and ingenuity, its systematical and consentaneous form, the liberal system of commercial intercourse which it recommended, and the benevolent and excellent character of its founder, speedily obtained for it a very high degree of reputation. The opinions of Quesnay were early communicated to, and zealously espoused by, the Marquis de Mirabeau, Mercier de la Rivière, Dupont de Némours, St Peravy, and others; and were afterwards advocated by Turgot, one of the most distinguished statesmen of whom France has to boast;[1] and by Letrosne, Condorcet, Raynal, and most of the succeeding French writers on commerce and finance. Their practical influence on the legislation of France has also been considerable. In 1763 the free transportation of corn from one province to another was permitted; and in 1764 liberty was given to export it to foreign countries whenever the home price did not exceed thirty livres the septier (48s. the quarter). This last edict, after being suspended in 1770, was again revived in 1778 during the administration of Turgot. But the facility given to the imposition of the *contribution foncière* may be considered as the greatest practical achievement of the Economists; and there is reason to fear that it will long continue to afford a palpable proof of the fallacy of their doctrines.[2]

Notwithstanding the defects of their theory, the labours of the Economists contributed powerfully to accelerate the progress of this science. In reasoning on subjects connected with national wealth, it was henceforth found to be necessary to subject its sources, and the laws which regulate its production and distribution, to a more accurate and searching analysis. In the course of this examination, it was speedily ascertained that the mercantile and economical theories were alike erroneous and defective; and that to establish the science on a firm foundation, it was necessary to take a much more extensive survey, and to seek for its principles, not in a few partial and distorted facts, or in metaphysical abstractions, but in the connection subsisting among the various phenomena manifested in the progress of civilization. The Count di Verri, whose *Meditations on Political Economy* were published in 1771, pointed out the fallacy of the opinions entertained by the Economists respecting the superior productiveness of agriculture; and showed that all the operations of industry really consist of modifications of matter already in existence.[3] But Verri did not trace the consequences of this important principle; and, possessing no clear or definite notions of what constituted wealth, he did not attempt to discover the means by which its production might be promoted. He made several valuable additions to particular branches of the science, and had sufficient acuteness to detect the errors in the systems of others; but the task of constructing a better system in their stead required talents of a far higher order.

Wealth of Nations.

At length, in 1776, our illustrious countryman, Adam Smith, published the *Wealth of Nations*—a work which has done for political economy what the *Principia* of Newton did for physics, and the treatise *De Jure Belli ac Pacis* of Grotius for international law. In this work the science was, for the first time, treated in its fullest extent, and many of its fundamental principles placed beyond the reach of cavil and dispute. In opposition to the Economists, Smith showed that *labour* is the only source of wealth, and that the desire of individuals to improve their fortunes and rise in the world occasions its accumulation. He next traced the means by which the powers of labour may be rendered most effective; and showed that it is productive of wealth when employed in manufactures and commerce, as well as in the cultivation of the land. Having established these principles, Smith showed, in opposition to the commonly received opinions of the merchants and statesmen of his time, that wealth did not consist in the abundance of gold and silver, but in that of the various necessaries, conveniences, and enjoyments of human life; and he further showed that individuals are always the best judges of what is for their own interest, and that, in prosecuting branches of industry advantageous to themselves, they necessarily prosecute such as are advantageous to the public.[1] Thence he drew his grand inference, that every regulation intended to force industry into particular channels, or to determine the commercial intercourse to be carried on between different parts of the same country, or between distant and independent countries, is impolitic and pernicious—injurious to the rights of individuals, and adverse to the progress of real opulence and lasting prosperity.

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[1] Turgot's *Réflexions sur la Formation et la Distribution des Richesses*, published in 1771, is certainly the best of all the works founded on the principles of the Economists, and is, in some respects, the best work on political economy published previously to the *Wealth of Nations*.

[2] Exclusive of the *Réflexions* of Turgot, the following are the principal works published by the French Economists:—*Tableau Economique, et Maximes Générales du Gouvernement Economique*, par François Quesnay, 4to, Versailles, 1758; *Théorie de l'Impôt*, par M. de Mirabeau, 4to, 1760; *L'Ami des Hommes*, par M. de Mirabeau, 7 tomes, 1760, &c.; *Eléments de la Philosophie Rurale*, par M. de Mirabeau, 3 tomes 12mo, 1763; *L'Ordre Naturel et Essentiel des Sociétés Politiques*, par Mercier de la Rivière, 4to, et 2 tomes 12mo, 1767; *Sur l'Origine et Progrès d'une Nouvelle Science*, par Dupont de Némours, 1767; *La Physiocratie, ou Constitution Naturelle du Gouvernement le plus avantageux aux genre humain*, par Quesnay, 2 tomes, 1767; *Lettres d'un Citoyen à un Magistrat, sur les Vingtièmes et les âutres Impôts*, par l'Abbé Baudeau, 1768; *Mémoire sur les Effets de l'Impôt Indirect*, par St Peravy, 12mo, 1768.

[3] "Alcuni benemeriti scrittori, rattristati dai gravi disordini, che soffrono i popoli per le gabelle, sono passati all'estremo de considerare ingiusto e mal collocato il tributo se non ripartito sui fondi di terra, e colla creazione di un linguaggio ascetico, hanno eretta la setta degli economisti, presso la quale ogni uoma che non adoperi l'aratro, e un essere sterile, e i manifattore si chiamano una *classe sterile*. Rispettando il molto di vero e di utile che da essi è stato scritto, io non saprei associarmi alla loro opinione ne sul tributo, ne su di questa pretesa classe sterile. La riproduzione e attribuibile alla manifattura ugualmente, quanto al laroro de Campi. Tutti i fenomini dell' universo, sieno essi prodotti dalla mano dell'uomo o vero dalle universali leggi della fisica, non ci danno idea di attuale *creazione*, ma unicamente di una *modificazione* della materia. *Accostare seperare* sono gli unici elementi che l'ingegno umano ritrova analizando l'idea della *riproduzione;* e tanto e riproduzione *di valore e di richezza* se la terra, l'aria, e l'aqua ne'campi si trasmutino in grano, come se colla mano dello uomo il glutine di un insetto si trasmuti in velluto, o vero alcuni pezzetti di metallo si organizzino a formare una ripetizione. Degli intieri citta, e degli stati intieri campano non d'altro che sul prodotto di questa fecondissima *classe sterile*, la di cui riproduzione comprende il valore della materia prima, la consumazione proporzionata delle mani impiegatevi, e di piu quella porzione che fa arrichire chi ha intrapresa la fabbrica e chi vi s'impiega con felice talento." (*Meditazioni sulla Economia Politica*, § 3.)

It may here, perhaps, be necessary to observe that, in laying it down that individuals are the "best judges" of what is best for themselves, the phrase is not to be taken absolutely, but conditionally, or as meaning the best in their circumstances, with their knowledge, views, and means of compassing their ends. People in a different situation, with more extensive information, able to make a more correct estimate of the ends proper to be sought after, and possessing more efficient means for their attainment, would probably act differently. But in legislating, men should be taken for what they really are, and not for what it may be supposed they should be. And though it were otherwise, legislators are rarely more advanced than those for whom they legislate, and are extremely apt to be biassed by party and selfish considerations. Hence the true line of policy—allow all individuals at all times to prosecute what they believe to be their interest in their own way, provided only they do not encroach on the rights of others. When they are left to their own guidance, their constant endeavour is to find out better methods of effecting their objects; and they seldom fail to profit by such new lights, inventions, and discoveries, as may come to their knowledge. And while they have every facility, they have every motive to get into the right path, or that by following which they may best advance themselves. But when they are kept in a state of pupilage and dictated to by others, their talents are but little exerted, and they become less enterprising, and care less about the progress of discovery. At the same time, too, that their energies are paralysed, and that they are injuriously affected by the ignorance, the crotchets, and the prejudices of their self-sufficient guides, they cannot abandon the path chalked out for them, though they may have ascertained that it would be greatly for their advantage to leave it, and to enter upon a different one. The pretension to direct others what they should and should not do, and with whom or in what they should deal or not deal, is, in truth, so excessively overweening, and so certain to be abused, that it could be safely entrusted only to omniscience. And it could nowhere be worse placed than in the hands of individuals or legislatures, who, to use the words of Smith, had folly and presumption enough to fancy themselves fit to exercise it.

The fact, that traces of most part of the principles referred to above, and that the distinct statement of some of the more important amongst them, may be found in the works of previous writers, detracts but little, if anything, from the merits of Smith. In adopting the discoveries of others, he made them his own; he demonstrated the truth of principles on which his predecessors had in most instances stumbled by chance; separated them from the errors by which they were encumbered; traced their remote consequences; pointed out their limitations; showed their practical importance and real value; and reduced them into a consistent and well-compacted system. We do not, however, mean to say that Smith produced a perfect theory. Undoubtedly there are errors, and those, too, of no slight importance, in the *Wealth of Nations*. The principles already noticed, and which form its basis, are unimpeachable. Smith, however, has not always reasoned correctly from them, and he has occasionally introduced others, which a more careful observation and analysis has shown to be ill-founded. But after every allowance has been made for the defects in his great work, enough remains to justify us in considering him as the real founder of the science. Though he has not left a perfect treatise, he has left one which contains a greater mass of useful and universally interesting truths than have ever been given to the world by any other individual; and he has pointed out and smoothed the route by following which subsequent philosophers have been enabled to perfect much that he had left incomplete, to rectify the mistakes into which he fell, and to make many new and important discoveries. Whether, indeed, we refer to the soundness of its leading doctrines, to the liberality and universal applicability of its practical conclusions, or to the powerful and beneficial influence it has had on the improvement of economical science, and on the policy and destiny of nations, the *Wealth of Nations* must be placed in the foremost rank of those works that have done most to liberalize, enlighten, and enrich mankind.[2]

Distinction between politics and political economy.

The practical part of this science was long confounded with that of politics; and it is undoubtedly true that they are very intimately connected, and that it is frequently impossible to treat those questions which strictly belong to the one without referring more or less to the principles and conclusions of the other. But in their leading features they are sufficiently distinct. The laws which regulate the production and distribution of wealth are the same in every country and stage of society. Those circumstances which are favourable or unfavourable to the increase of riches and population in a republic may equally exist, and will have the same effects, in a monarchy. That security of property, without which there can be no steady and continued exertion,—that freedom of engaging in every different branch of industry, so necessary to call the various powers and resources of human talent and ingenuity into action,—and that economy in the public expenditure, so conducive to the accumulation of national wealth,—are not the exclusive attributes of any particular species of government. If free states have generally made the most rapid advances in wealth and population, it is an indirect rather than a direct consequence of their political constitution. It results more from the greater security which a popular government presents, that the right of property will be held sacred,—that the freedom of industry will be less fettered and restricted,—and that the public income will be more judiciously levied and expended,—than from the circumstance of a greater proportion of the people being permitted to exercise political rights and privileges. Give the same securities to the subjects of an absolute monarch, and they will make the same advances.

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[1] It is of importance to observe, that Dr Smith does not say that, in prosecuting such branches of industry as are most advantageous to themselves, individuals necessarily prosecute such as are at the same time *most* advantageous to the public. His leaning to the system of the Economists—a leaning perceptible in every part of his work—made him so far swerve from the principles of his own system as to admit, that individual advantage is not always a true test of the public advantageousness of different employments. He considered that agriculture, though not the only productive employment, is the most productive of any; that the home trade is more productive than a direct foreign trade; and the latter than the carrying trade. It will be hereafter seen that there is no foundation for these distinctions.

[2] Mr Buckle carries his admiration of Smith and his great work to what will perhaps appear to some an extravagant extent. "Well may it be said of Adam Smith, and said, too, without fear of contradiction, that this solitary Scotchman has, by the publication of one single work, contributed more towards the happiness of man than has been effected by the united abilities of all the statesmen and legislators of whom history has preserved an authentic account." (*History of Civilization*, i., p. 196, 2d ed.)

Industry does not require to be stimulated by extrinsic advantages. The additional comforts and enjoyments which it procures have always been found sufficient to insure the most persevering and successful exertions. And whatever may be the form of government, those countries always advance in the career of improvement in which the public burdens are moderate, industry free, and every individual permitted peaceably to enjoy the fruits of his labour. It is not, therefore, so much on its political organization, as on the talents and spirit of its rulers, that the wealth of a country is principally dependent. Economy, intelligence, and liberality on the part of those in power, have frequently elevated absolute monarchies to a very high degree of opulence and prosperity; while all the advantages derived from a more liberal system of government have not been able to preserve free states from being impoverished and exhausted by the extravagance, intolerance, and short-sighted policy of their rulers.

Politics and political economy are therefore sufficiently distinct. The politician examines the principles on which government is founded, he endeavours to determine in whose hands the supreme authority may be most advantageously placed, and unfolds the reciprocal duties and obligations of the governing and governed portions of society. The political economist does not take so high a flight. It is not of the constitution of the government, but of its ACTS only, that he presumes to judge. Whatever measures affect the production or distribution of wealth come within the scope of his observation, and are canvassed by him. He examines whether they are in unison with the principles of the science. If they are, he pronounces them to be advantageous, and shows the nature and extent of the benefits of which they will be productive; if they are not, he shows in what respect they are defective, and to what extent their operation will be injurious. But he does this without inquiring into the constitution of the government by which these measures have been adopted. The circumstance of their having emanated from the privy council of an arbitrary monarch, or the representative assembly of a free state, though in other respects of supreme importance, cannot affect the immutable principles by which he is to form his opinion upon them.

Distinction between statistics and political economy.

Besides being confounded with politics, the practical part of political economy has also been frequently confounded with statistics; but they are still more easily separated and distinguished. The object of the statistician is to describe the condition of a country at a particular period; while the object of the political economist is to discover the causes which have brought it into that condition, and the means by which its wealth and riches may be indefinitely increased. He is to the statistician what the physical astronomer is to the observer. He takes the facts furnished by the statistician, and after comparing them with those furnished by historians and travellers, he applies himself to discover their relation. By a patient induction,—by carefully observing the circumstances attending the operation of particular principles,—he discovers the effects of which they are really productive, and how far they are liable to be modified by the operation of other principles. It is thus that the relation between rent and profit, between profit and wages, and the various general laws which regulate and connect the apparently conflicting, but really harmonious interests of the different classes, have been discovered and established with all the certainty of demonstrative evidence.

PART II.

PRODUCTION OF WEALTH.

SECT. I.—*Definition of Production.—Labour the only Source of Wealth.*

Definition of production.

All the operations of nature and art are reducible to, and really consist of, transmutations,—changes of form and of place. By production in this science is not meant the production of matter, that being an attribute of Omnipotence, but the production of utility, and consequently of exchangeable value, by appropriating and modifying matter, so as to make it satisfy our wants, and contribute to our well-being. The labour which is thus employed is the only source of wealth.[1] Nature spontaneously furnishes the matter of which commodities are made; but, independently of labour, matter is seldom of much use, and is never of any value. Place us on the banks of a river, or in an orchard, and we shall infallibly perish of thirst or hunger, unless, by an effort of industry, we raise the water to our lips, or pluck the fruit from its parent tree. It is seldom, however, that the mere appropriation of matter is sufficient. In the infinite majority of cases, additional labour is required to convey it from place to place, and to give it that peculiar shape, without which it may be totally useless, and incapable of either ministering to our necessities or comforts. The coal used in our fires is buried deep in the bowels of the earth, and is absolutely worthless until the miner has extracted it from the mine, and brought it into a situation where it may be used. The stones and mortar of which our houses are built, and the rugged and shapeless materials from which the various articles of convenience and ornament with which they are furnished have been prepared, were, in their original state, alike destitute of value and utility. And of the innumerable variety of animal, vegetable, and mineral products which form the materials of our food and clothes, few were originally serviceable, while many were extremely noxious to man. His labour has given them utility, has subdued their bad qualities, and made them satisfy his wants, and minister to his comforts and enjoyments. "Labour was the first price, the original purchase money, that was paid for all things. It was not by gold or by silver, but by labour, that all the wealth of the world was originally purchased." (*Wealth of Nations*, p. 14.)

Those who observe the progress and trace the history of the human race in different countries and periods, will find that their well-being has always been pretty nearly proportioned to their expertness in appropriating the raw products of nature, and in adapting them to their use. The savage, who gathers wild fruits, or picks up shellfish on the sea-coast, is placed at the very bottom of the scale of civilization, and is, in point of comfort, decidedly inferior to many of the lower animals. The *first* step in the progress of society is made when man learns to hunt wild animals, to feed himself with their flesh, and clothe himself with their skins. But labour, when confined to the chase, is extremely barren and unproductive. Tribes of hunters, like beasts of prey, whom they closely resemble in their habits and modes of subsistence, are but thinly scattered over the surface of the countries which they occupy; and, notwithstanding the fewness of their numbers, any unusual deficiency in the supply of game never fails to reduce them to the extremity of want. The *second* step in the progress upwards is made when the tribes of hunters and fishers addict themselves, like the ancient Scythians and modern Tartars, to the domestication of wild animals and the rearing of flocks. Their subsistence is much less precarious than that of hunters; but they are almost entirely destitute of the comforts and elegances which give to civilized life its chief value. The *third* and most decisive step in the progress of civilization—in the great art of producing necessaries and conveniences—is made when the wandering tribes of hunters and shepherds renounce their migratory habits, and become agriculturists and manufacturers. It is then, properly speaking, that man begins fully to avail himself of his productive powers. He becomes laborious, and, by a necessary consequence, his wants are for the first time fully supplied, and he acquires an extensive command over the articles required for his comfort as well as subsistence.

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[1] This point has been well stated by M. Destutt Tracy:—" Non seulement," says he, " nous ne créons jamais rien, mais il nous est même impossible de concevoir ce que c'est que créer ou anéantir, si nous entendons rigoureusement par ces mots, faire quelque chose de rien, ou reduire quelque chose à rien; car nous n'avons jamais vu un être quelconque sortir du néant ni y rentrer. De là cet axiome admis par toute l'antiquité, 'Rien ne vient de rien, et ne peut rédévenir rien.' Que faisons-nous donc par notre travail, par notre action sur tous les êtres qui nous entourent? Jamais rien qu'opérer dans ces êtres des changements de forme ou de lieu qui les approprient à notre usage, qui les rendent utiles à la satisfaction de nos besoins. Voilà ce que nous devons entendre par produire; c'est donner aux choses une utilité qu'elles n'avoient pas. Quel que soit notre travail, s'il n'en resulte point d'utilité, il est infructeux; s'il en resulte, il est productif." (*Traité d'Economie Politique*, p. 162.)

The earth not a source of wealth.

However paradoxical the assertion may at first sight appear, it is notwithstanding true that the earth does not gratuitously supply us with a single atom of wealth. It is a powerful machine given by Providence to man; but without his labour it would be altogether useless, and would stand idle and unemployed. It is through the intervention of labour that the products of the earth become valuable and useful. Its surface is, in its natural state, covered with fruits and game; its bowels contain an infinite variety of mineral products; its seas and rivers are stored with fish; and it is endowed with inexhaustible vegetative and productive powers. But these powers and products are of no use, and have no value, until man renders the former subservient to his purpose, and appropriates the latter, and gives them the peculiar form required to fit them for his service.

Opinion of Hobbes.

The importance of labour in the production of wealth was very clearly perceived both by Hobbes and Locke. At the commencement of the 24th chapter (entitled, "Of the Nutrition and Procreation of a Commonwealth") of the *Leviathan*, published in 1651, Hobbes says, "The nutrition of a commonwealth consisteth in the plenty and distribution of materials conducing to life.

"As for the plenty of matter, it is a thing limited by nature to those commodities which, from (the two breasts of our common mother) land and sea, God usually either freely giveth, or for labour selleth to mankind.

"For the matter of this nutriment, consisting in animals, vegetables, minerals, God hath freely laid them before us, in or near to the face of the earth, so as there needeth no more but the labour and industry of receiving them: insomuch that plenty dependeth (next to God's favour) on the labour and industry of man."

Opinion of Locke.

But Locke had a much clearer apprehension of this doctrine. In his *Essay on Civil Government*, published in 1689, he has entered into a lengthened and able analysis to show that the products of the earth owe almost all their value to labour. "Let any one consider," says he, "what the difference is between an acre of land planted with tobacco or sugar, sown with wheat or barley, and an acre of the same land lying in common, without any husbandry upon it, and he will find that the improvement of labour makes the far greater part of the value. I think it will be but a very modest computation to say that, of the products of the earth useful to the life of man, *nine-tenths* are the effects of labour; nay, if we will rightly consider things as they come to our use, and cast up the several expenses about them, what in them is purely owing to nature and what to labour, we shall find that in most of them *ninety-nine hundredths* are wholly to be put on the account of labour.

"There cannot be a clearer demonstration of anything than several nations of the Americans are of this, who are rich in land and poor in all the comforts of life; whom nature, having furnished as liberally as any other people with the materials of plenty,—*i. e.*, a fruitful soil apt to produce in abundance what might serve for food, raiment, and delight,—yet, for want of improving it by labour, have not one-hundredth part of the conveniences we enjoy; and the king of a large and fruitful territory there feeds, lodges and is worse clad, than a day-labourer in England.

"To make this a little clear, let us but trace some of the ordinary provisions of life through their several progresses before they come to our use, and see how much of their value they receive from human industry. Bread, wine, and cloth are things of daily use and great plenty; yet notwithstanding, acorns, water, and leaves or skins must be our bread, drink, and clothing, did not labour furnish us with these more useful commodities; for whatever bread is more worth than acorns, wine than water, and cloth or silk than leaves, skins, or moss, that is solely owing to labour and industry; the one of these being the food and raiment which unassisted nature furnishes us with, the other provisions which our industry and pains prepare for us, which how much they exceed the other in value, when any one hath computed, he will then see how much labour makes the far greatest part of the value of things we enjoy in this world; and the ground which produces the materials is scarce to be reckoned on as any, or at most but a very small part of it.

"An acre of land that bears here twenty bushels of wheat, and another in America which, with the same husbandry, would do the like, are without doubt of the same natural intrinsic value. But yet the benefit mankind receives from the one in a year is worth L.5, and from the other possibly not worth *one penny*; if all the profit an Indian received from it were to be valued and sold here, at least, I may truly say, not $\frac{1}{1000}$th. 'Tis labour, then, which puts the greatest part of value upon land, *without which it would scarcely be worth anything*; 'tis to that we owe the greatest part of its useful products; for all that the straw, bran, bread, of that acre of wheat is more worth than the product of an acre of good land which lies waste, is all the effect of labour. For 'tis not merely the ploughman's pains, the reaper's and thrasher's toil, and the baker's sweat, is to be counted into the bread we eat; the labour of those who broke the oxen, who digged and wrought the iron and stones, who felled and framed the timber employed about the plough, mill, oven, or any other utensils, which are a vast number, requisite to this corn, from its being seed to be sown to its being made bread, must all be charged on the account of *labour*, and received as an effect of that; Nature and the earth furnishing only the almost worthless materials as in themselves. 'Twould be a strange catalogue of things that industry provided and made use of about every loaf of bread, before it came to our use, if we could trace them. Iron, wood, leather, barks, timber, stone, brick, coals, lime, cloth, dyeing drugs, pitch, tar, masts, ropes, and all the materials made use of in the ship that brought away the commodities made use of by any of the workmen, to any part of the work; all which it would be almost impossible, at least too long, to reckon up." (*Of Civil Government*, book ii., §§ 40, 41, 42, and 43.)[1]

Had Locke carried his analysis a little further, he could not have failed to perceive that water, leaves, skins, and the other spontaneous productions of nature, have no value except what they owe to the labour required for their appropriation. The value of water to a man placed on the bank of a river depends on the labour required to raise it to his lips; and its value, when carried ten or twenty miles off, is equally dependent on the labour required to convey it there. All the rude products and capacities of nature are gratuitously offered to man. She is not niggardly or parsimonious. She neither demands nor receives an equivalent for her favours. An object or a power which may be freely appropriated or applied to our use, may, like the water which floats a ship, or the wind which fills her sails, be of the very highest utility; but being the free gift of nature, it has no value.[1]

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[1] This is a very remarkable passage. It contains a far more distinct and comprehensive statement of the fundamental doctrine, that labour is the constituent principle of value, than is to be found in any other writer previous to Smith, or than is to be found even in the

"Si je retranche," to use a striking illustration of this doctrine given by M. Canard, "de ma montre, par la pensée, tous les travaux qui lui ont été successivement appliquées, il ne resterai que quelques grains de minéral placées dans l'intérieur de la terre, d'où on les a tirés, et où ils n'ont aucune valeur. De même, si je décompose le pain que je mange, et que j'en retranche successivement tous les travaux successifs qu'il a reçus, il ne restera que quelques tiges d'herbes, graminées, éparses dans des désertes inculcates, et sans aucune valeur." (*Principes d'Economie Politique*, p. 6.)

It has been said that demand is the source or cause of value. Such, however, is not the case. The real or supposed suitableness of certain articles to satisfy our wants, or to add to our enjoyments, makes them, as already seen, objects of desire or demand. But their value depends entirely on the greater or less difficulty of obtaining them, that is, on the greater or less quantity of labour required to produce or acquire them. This labour, therefore, is at once the source and the measure of their value.

But suppose that we stumble upon a nugget of gold or a diamond, are we to be told, it is asked, that its value is proportioned only to the labour, if so it may be called, expended in finding it? No! you are to be told nothing of the sort. In these and all similar inquiries, the question does not turn upon accidental or exceptional occurrences, like that now referred to, but upon the nature of the processes necessary to obtain sufficient supplies of the required article. If gold and diamonds could be had in any quantity in the easy way that has been specified, their value would sink accordingly, and they would become cheaper than iron or bits of glass. But not one millionth—no, nor one ten-millionth—part of the supplies of gold and diamonds brought to market has ever been, or ever will be, furnished by chance finders. And the quantities offered by them being so extremely small as to have no influence of any kind upon the market, they are sold at the price necessary to indemnify the ordinary producers of the metal and the gem. And hence, though it may not be strictly true of every sovereign in existence, or of every diamond, hat, or other article in the shops, that its price is proportioned to the cost of its production, this (apart from general fluctuations) is true in more than 999 out of every 1000 instances. Those that are exceptions are so very few as to be wholly inappreciable and undeserving of any notice.

It is to labour, therefore, that we owe everything possessed of exchangeable value. *Dii laboribus omnia vendunt.* Labour is the talisman that has raised man from the condition of the savage—that has changed the desert and the forest into cultivated fields—that has covered the earth with cities and the ocean with ships—that has given him plenty, comfort, and elegance, instead of want, misery, and barbarism.

"Why," asks Dr Barrow, "is any man a beggar, why contemptible, why ignorant, why vicious, why miserable? Why, but for this one reason, because he is slothful; because he will not labour to rid himself of these evils?" (Second Sermon on Industry.)

Having established this fundamental principle—having shown that labour alone gives value to commodities and procures for us whatever we most covet and desire—it is plain that the great practical problem of this science must resolve itself into a discussion of the means by which labour may be rendered most efficient, that is, by which the greatest amount of necessary and desirable products may be obtained with the least outlay of labour. Every measure and invention that has any tendency to save labour, or to reduce the cost of commodities, adds proportionally to our command over wealth and riches; while every measure or regulation that has any tendency to waste or misapply labour, or to raise the cost of commodities, equally lessens this command. This is the simple and decisive test by which we are to judge of every measure affecting the wealth of the country, and of every invention. If they render labour more productive—if they tend to reduce the value of commodities—to render them more easily obtainable, and consequently to bring them within the command of a greater portion of society—they are advantageous; but if their tendency be different, they are as certainly disadvantageous. Considered in this point of view, that great branch of the science which treats of the production of wealth will be found to be abundantly simple, and easily understood.

Labour, according as it is applied to the raising of raw produce—to the fashioning of that raw produce, when raised, into articles of utility, convenience, or ornament—and to the conveyance of raw and wrought products from one country and place to another—is said to be agricultural, manufacturing, and commercial. An acquaintance with the particular processes and most advantageous methods of applying labour in each of these great departments of industry, forms the appropriate study of the agriculturist, manufacturer, and merchant. It is not consistent with his objects for the political economist to enter into the details of particular businesses and professions. He confines himself to an investigation of the means by which labour gene-

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Wealth of Nations. But Locke does not seem to have been sufficiently aware of the value of the principle he had elucidated, and has not deduced from it any important practical conclusion. On the contrary, in his tract on the *Raising of the Value of Money*, published in 1691, he lays it down broadly, that all taxes, however imposed, ultimately *fall on the land;* whereas it is plain he should, consistently with the above principle, have shown that they would fall, not exclusively on the produce of land, but generally on the produce of industry, or on all species of commodities.

[1] Bishop Berkeley entertained very just opinions respecting the source of wealth. In his *Querist*, published in 1735, he asks,—"Whether it were not wrong to suppose *land* itself to be wealth? And whether the *industry of the people* is not first to be considered as that which constitutes wealth, which makes even land and silver to be wealth, neither of which would have any value but as means and motives to industry?" "Whether, in the wastes of America, a man might not possess twenty miles square of land, and yet want his dinner or a coat to his back." (*Querist*, Nos. 38 and 39.) We shall afterwards notice Sir William Petty's opinion on this subject. Say appears to think (*Discours Préliminaire*, p. 37) that Galiani was the first to show, in his treatise *Della Moneta*, published in 1750, that labour is the only source of wealth. But the passages we have now laid before the reader prove the erroneousness of this opinion. Galiani has entered into no analysis or argument to prove the correctness of his statement; and as it appears from other parts of his work that he was well acquainted with Locke's *Tracts on Money*, a suspicion naturally arises that he had seen the *Essay on Civil Government*, and that he was really indebted to it for a knowledge of this principle. This suspicion derives strength from the circumstance of Galiani being still less aware than Mr Locke of the value of the discovery. (See *Trattato della Moneta*, p. 39, ediz. 1780.)

rally may be rendered most productive, and how its powers may be increased in *all* departments of industry.

SECT. II.—*Means by which the Productive Powers of Labour are Increased.—Security of Property.—Division of Labour.—Accumulation and Employment of Capital.*

Means by which the productive powers of labour may be increased.

The most careless and inattentive observer of the progress of mankind from poverty to affluence must have early perceived that there are *three* circumstances whose conjoint operation is necessary to stimulate and improve the productive powers of industry. The *first* and most indispensable is that *security of property*, which produces a strong conviction in the mind of individuals that they will be allowed to dispose at pleasure of the fruits of their industry. The *second* is the introduction of exchange or barter, and the consequent appropriation of particular individuals to particular employments. And the *third* is the accumulation and employment of the produce of previous labour, or, as it is more commonly termed, of capital or stock. Every improvement that either has been or that may yet be made in the production of necessaries and conveniences, will be found to be resolvable into the more judicious application of one or more of those means of stimulating labour, and adding to its power. To give a full exposition of the nature and influence of each would far exceed the limits of this article; and we must content ourselves with such observations as may suffice to give a general idea of their operation.

Security of property.

Security of property is the first and most indispensable requisite to the production of wealth. Its utility in this respect is so obvious, as to make it be more or less respected in every country, and in the earliest and rudest periods. All have been impressed with the reasonableness of the maxim which teaches that those who sow should be permitted to reap; that the labour of a man's body and the work of his hands should be considered as exclusively his own. No horde, how barbarous soever, has been discovered in which the principle of *meum* and *tuum* was not recognised. Nothing, it is evident, could ever tempt any one to engage in laborious employments—he would neither domesticate wild animals, nor clear and cultivate the ground,—if, after months and years of toil, when his flocks had become numerous, and his harvests were ripening for the sickle, a stranger were allowed to rob him of the produce of his industry. No wonder, therefore, that the utility of regulations fitted to secure to individuals the peaceable enjoyment of the produce they had raised, and of the ground they had cultivated and improved, suggested itself to the first legislators. The author of the book of Job places those who removed their neighbours' landmarks at the head of his list of wicked men; and some of the earliest profane legislators subjected those guilty of this offence to a capital punishment. (Goguet, *De l'Origine des Loix*, &c., tom. i., p. 30, 4to ed.)

Paley has said that the law of the land is the real foundation of the right of property. But the obvious utility of securing to individuals the property acquired by their industry has undoubtedly formed the irresistible reason which has induced every people emerging from barbarism to establish this right. It is, in truth, the foundation on which all the institutions of society rest. Until property has been publicly guaranteed, men look on each other as enemies rather than as friends. The idle and improvident are always desirous of seizing on the earnings of the laborious and frugal; and were their efforts to enrich themselves by the plunder of their neighbours not restrained by the strong arm of the law, they would, by generating a feeling of insecurity, effectually check both industry and accumulation, and sink all classes to the same level of hopeless misery as themselves. Nor is the security of property less necessary to accumulation than to production. No man ever denies himself an immediate gratification when it is within his power, unless he think that by doing so he has a fair prospect of obtaining at some future period a greater accession of comforts and enjoyments, or of avoiding some considerable evil. Where the right of property is vigilantly protected, an industrious man, who produces as much by one day's labour as is sufficient to maintain him two days, instead of idling away the second day, accumulates the surplus which exceeds his wants as a capital; the increased consequence and enjoyments which the possession of capital brings along with it being, in the great majority of cases, more than sufficient to countervail the desire of immediate gratification. But wherever property is insecure, we look in vain for the operation of this principle. "It is plainly better for us," is then the invariable language of the people, "to enjoy while it is in our power, than to accumulate property which we shall not be permitted to use, and which will either expose us to the extortion of a rapacious government, or to the depredations of those who exist only by the plunder of their more industrious neighbours."

The right of property is not violated merely when a man is deprived of the power of peaceably enjoying the fruits of his industry; it is also violated, and perhaps in a still more unjustifiable manner, when he is prevented from exerting himself in any way not injurious to others that he considers most likely to conduce to his interests. Of all the species of property which a man can possess, the faculties of his mind and the powers of his body are most particularly his own. He should therefore be permitted to enjoy, that is, to use or exert these powers at discretion. And hence the right of property is as much or more infringed upon when a man is interdicted from engaging in such and such branches of business, as it is when the property he has produced and accumulated is forcibly taken from him. Every monopoly which gives to a few individuals the power to carry on certain branches of industry to the exclusion of others, is thus, in fact, established in direct violation of the rights of every one else. It prevents them from using their natural capacities or powers in the way they might consider best; and as every man who is not a slave is justly held to be the best judge of what is advantageous for himself, the principles of natural law and the right of property are both subverted when he is excluded from any lawful business. In like manner, the right of property is violated whenever individuals are obliged to employ themselves or their property in any specified manner, to accept certain rates of interest for loans, or certain rates of wages, and so forth.

Effects of insecurity.

The finest soil, the finest climate, and the finest intellectual powers can prevent no people from becoming barbarous, poor, and miserable, if they have the misfortune to be subjected to a government which does not respect and support the right of property. This is the greatest of all calamities. The ravages of civil war, of pestilence, and of famine may be repaired, but nothing can enable a nation to contend against the deadly influence of an established system of violence and rapine. The want of security, of a lively and well-founded expectation of being permitted freely to dispose of the fruits of industry, is the principal cause of the wretched state of the Ottoman dominions in the present day, as it was of the decline of industry and arts in Europe during the middle ages. When the Turkish conquerors overran those fertile and beautiful countries in which, to the disgrace of the other European powers, they are still permitted to encamp, they parcelled them among their followers, on condition of their performing certain military services, on a plan corresponding in many important particulars to the feudal system of our ancestors. But these possessions are not hereditary. And unless their present possessors leave them in trust to some religious incorporation for behoof of their children and legatees, they would, on their death, revert to the sultan. Hence, among the greater number of the occupiers of land in Turkey there is little thought of futurity. No one feels any interest about the prosperity of an unknown successor, and, except in the peculiar cases now mentioned, no one ever executes any improvement unless he expects to reap all the advantage during his own life. This is the cause why the Turks are so extremely careless about their houses. They seldom construct them of solid or durable materials. And it would be a gratification were they assured that they would fall to pieces the moment they have breathed their last. Under this miserable system the palaces have been changed into cottages, and the cities into villages. The long-continued want of security has extinguished the very spirit of industry, and destroyed not only the power, but even the desire to emerge from barbarism.

Had it been possible for arbitrary power to profit by the lessons of experience, it would long since have perceived that its own wealth, as well as that of its subjects, would be best promoted by maintaining the inviolability of property. Were the Turkish government to establish a vigilant system of police, to give to individuals full power to dispose of the fruits of their labour, and to substitute a regular plan of taxation for the present odious system of extortion and tyranny, industry would revive, capital and population would be augmented, and moderate duties, imposed on a few articles in general demand, would bring a much larger sum into the coffers of the treasury than all that is now obtained by force and violence. The stated public burdens to which the Turks are subject are light compared with those imposed on the English, the Hollanders, and the French. But when the latter have paid the taxes due to government, they know they will be permitted peaceably to enjoy or accumulate the remainder of their earnings; whereas the Turk, notwithstanding the reforms of which so much has been said, has no security but that, the moment after he has paid his stated contribution, the pasha, or one of his satellites, may strip him of every additional farthing he possesses. Security is the foundation, the principal element, in every well-digested system of finance. When maintained inviolate, it enables countries to support with little difficulty a very heavy load of taxes; but where there is no security, where property is a prey to rapine and spoliation, to the attacks of the needy, the powerful, or the profligate, the smallest burdens are justly regarded as oppressive, and uniformly exceed the means of the impoverished and spiritless inhabitants.

Let us not, therefore, deceive ourselves by supposing that it is possible for any people to emerge from barbarism, or to become wealthy, populous, and civilized, without the security of property. From whatever point of the political compass we may set out, this is the principle to which we must come at last. Security is indispensable to the successful exertion of the powers of industry. Where it is wanting, it is idle to expect either riches or civilization.[1] "The exclusive right to the produce is the only excitement to industry which acts constantly and universally—the only spring which keeps human labour in motion."[2]

Objection of Rousseau and Beccaria ill-found

Rousseau and some other writers of his caste have made an objection to the right of property, which has been in some measure sanctioned by Beccaria.[3] They allow that this right is advantageous for those who possess property; but they contend that it is disadvantageous for those who are poor and destitute. It condemns, say they, the greater portion of mankind to a state of misery, and provides for the exaltation of the few by the depression of the many! The sophistry of this reasoning is so apparent as hardly to require being pointed out. The right of property has not made poverty, but it has made wealth. Previously to its institution, those nations which are now most civilized were sunk to the same level of wretchedness and misery as the savages of New Holland and Kamtschatka. All classes have been benefited by the change, and it is mere error and delusion to suppose that the rich have been benefited at the expense of the poor. The right of property gives no advantage to any one man over any other man. It deals out justice impartially to all. It does not say, "Labour, and I shall reward you," but it says, "Labour, and I shall take care that none be permitted to rob you of the produce of your exertions." This right has not made all men rich, because it could not make all men frugal, fortunate, and industrious. But it has done more than all the other institutions of society put together to produce that result. It is not, as it has been sometimes ignorantly or knavishly represented, a bulwark thrown up to protect the property of a few favourites of fortune. It is a rampart raised by society against its common enemies,—against rapine and violence, plunder and oppression. Without its protection, the rich man would become poor, and the poor man would never be able to become rich,—all would sink to the same bottomless abyss of barbarism and poverty. "The security of property has overcome the natural aversion of man from labour, given him the empire of the earth, a fixed and permanent residence, and has implanted in his breast the love of country and of posterity. To enjoy immediately,—to enjoy without labour,—is the natural inclination of every man. This inclination must be restrained; for its obvious tendency is to arm all who have nothing against those who have something. The law which restrains this inclination, and which secures to the humblest individual the quiet enjoyment of the fruits of his industry, is the most splendid achievement of legislative wisdom,—the noblest triumph of which humanity has to boast." (Bentham, *Traité de Législation*, tom. ii., p. 37.)[4]

Division of labour

Division of Labour.—The division of labour may be best treated of in two branches,—viz., 1*st*, The division of labour among individuals; and, 2*d*, Its division among nations.

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[1] "Ce n'est que là où les proprietés sont assurés, où l'emploi des capitaux est abandonné au choix de ceux qui les possédent; ce n'est que là, dis-je, que les particuliers seront encouragés à se soumettre aux privations le plus dures pour compenser par leurs épargnes les retards que la profusion du gouvernement peut apporter aux progrès de la richesse national. Si l'Angleterre, malgré ses guerres ruineuses, est parvenue à un haut degré d'opulence; si, malgré les contributions énormes dont le peuple y est chargé, son capital est pourtant accrue dans le silence par l'économie des particuliers, il ne faut attribuer ces effets qu'à la liberté des personnes, et à la sureté des proprietés qui y règnent, plus que dans aucun autre pays de l'Europe, la Suisse excepté." (Storch, *Traité d'Economie Politique*, tom. i., p. 317.)

[2] Paley's *Moral Philosophy*, b. vi., cap. 11.

[3] Speaking of theft, Beccaria calls it "Il delitto di quella infelice parte di uomini a cui *il diritto di proprietà* (*terribile, e forse non necessario diritto*), *non ha lasciato che una nuda essistenza.*" (*Dei Delitti e delle Pene*, § 22.)

[4] The treatise of M. Thiers, *De la Propriété*, is deserving of the highest commendation. It was published in 1848, when Communism was struggling for the ascendant, and the maxim *la propriété c'est le vol* was current in France. Thiers has set in the clearest light the folly, and indeed, atrocity of the projects involved in the schemes of the Communists, and in the principles, if so we may call the miserable fallacies, on which they were said to be bottomed; and has forcibly depicted the universal poverty and barbarism that would inevitably follow from their being adopted. It says little for the progress of science, or for the influence of common-sense, that such pernicious theories should have received any popular support. It is satisfactory, however, to find that, when put forth, their real character and tendency was so promptly and ably exposed.

1. *Individual Division of Labour.*—The division of labour can only be imperfectly introduced in rude societies and thinly-peopled countries. But in every state of society, in the rudest as well as in the most improved, we may trace its operation and effects. Men are endowed with such various physical powers, talents, and propensities, that those who are best fitted for some pursuits, are not unfrequently wholly unfit for others. These differences being palpable and obvious, a regard to their mutual interest and convenience would lead them, at a very early period, to introduce the practice of barter and a subdivision of employments. And a brief experience would suffice to show, not only that their tasks were in consequence better suited to their capacities, but that their aggregate production was largely increased; and that to obtain the greatest supply of useful and desirable articles, they should apply themselves to particular businesses, and exchange the articles each had to spare for such of the products of his neighbours as he had occasion for, and they were willing to part with. As society advances, this system becomes more and more extended. In process of time different men become tanners or dressers of skins, shoemakers, weavers, house-carpenters, smiths, and so on; and each endeavours to cultivate and bring to perfection whatever talent or genius he may possess for the peculiar branch of industry in which he is employed. The mass of necessary and desirable articles and services is in consequence prodigiously augmented. Wherever the division of labour is carried to any considerable extent, agriculturists do not spend their time in clumsy attempts to manufacture their own produce; and manufacturers cease to interest themselves about the raising of corn and the fattening of cattle. The facility of exchanging is the vivifying principle of industry. It stimulates agriculturists to adopt the best system of cultivation, and to raise the largest crops, that they may barter such portions of their produce as exceed their wants for the various articles furnished by manufacturers and merchants; and it stimulates the latter to put forth their energies in the view of obtaining greater quantities of agricultural and other raw products. Hence it is that the business of an advanced society resolves itself almost entirely into the negotiation of exchanges; and that society itself may be said to be an association founded on a principle of reciprocity, in which, speaking generally, nothing is to be had except for an equivalent of one sort or other.[1]

The advantages that result from individuals being able to embrace the pursuits which are most agreeable to their tastes, and for which they are best suited, are too apparent to require further notice. But the influence of the division of employments in adding to the efficiency of labour, though less obvious than the other, is no less important, and requires to be set in its true light. This has been done in a very masterly manner by Smith, who has classed the circumstances which make the division of labour increase its productive powers under the following heads:—*First,* The increase of the skill and dexterity of the workman; *Second,* The saving of time, which would otherwise be lost in passing from one employment to another; and, *Third,* The tendency of the division of employments to facilitate the invention of machines and processes for abridging and saving labour. We shall make a few observations on each of these heads.

D ision of la ur in cr ses the sk and de erity of w kmen.

1*st, As respects the increased skill and dexterity of the labourer*, it is plain that when a person's whole attention is devoted to some one calling, when all the energies of his mind and powers of his body are made to bear, as it were, on it only, he can hardly fail to attain to a degree of proficiency in that calling to which no individual engaged in a variety of occupations can be expected to reach. A peculiar play of the muscles, or sleight-of-hand, is necessary to perform the simplest operation in the best and most expeditious manner; and this can only be acquired by constant practice. Smith has given an example, in the case of the nail manufacturer, of the extreme difference between training a workman to the precise occupation in which he is to be employed, and training him to a similar and closely allied occupation. "A common smith," says he, "who, though accustomed to handle the hammer, has never been used to make nails, if, upon some particular occasion, he is obliged to attempt it, will scarce, I am assured, be able to make above two or three hundred nails in a day, and those very bad ones. A smith who has been accustomed to make nails, but whose sole or principal business has not been that of a nailer, can seldom, with his utmost diligence, make more than eight hundred or a thousand nails in a day. But I have seen several boys under twenty years of age, who had never exercised any other trade but that of making nails, who, when they exerted themselves, could make each of them upwards of *two thousand three hundred nails in a day;*" or nearly three times the number of the smith who had been accustomed to make them, but who was not entirely devoted to that particular business!

Saves time.

2*d,* The division of labour prevents that *waste of time in moving from one employment to another* which necessarily takes place when the same individuals have successively to engage in different occupations. If these be carried on at considerable distances from each other, and require, as they generally do, different sets of tools, the serious loss of time that is occasioned by leaving one and going to another is obvious. And though the employments were contiguous, or concentrated in the same workshop, the loss would be very considerable. For, as Smith has observed, "a man commonly saunters a little in changing from one business to another. When he first begins his work, he is seldom keen or hearty; his mind is said not to go along with it, and for some time he rather trifles than applies himself to good purpose. The habit of sauntering, and of indolent, careless application, which is naturally, or rather necessarily, acquired by every country workman, who is obliged to change his work and his tools every half hour, and to apply his hand in twenty different ways almost every day of his life, renders him almost always slothful and lazy, and incapable of any vigorous application, even on the most pressing occasions. Independent, therefore, of his deficiency in point of dexterity, this cause alone must always reduce considerably the quantity of work which he is capable of performing." (*Wealth of Nations*, p. 5.)

Facilitates the invention of machines.

3*d,* As respects the tendency of the division of employments to *facilitate the invention of machines and processes for saving labour*, it is obvious that those engaged in an industrial pursuit will be more likely to discover easier and readier methods of carrying it on when their attention is devoted exclusively to it, than if they had occasionally to attend to a number of other pursuits. But it is a mistake to suppose, as is sometimes done, that the influence of the division of labour is confined to work-people and artificers. It extends to all classes,—to those who work with the head as well as those who work with the hand. As society advances, the study of particular branches of science and philosophy becomes the principal or sole occupation of the most ingenious men. Chemistry becomes a distinct science from natural philosophy; the physical astronomer separates himself from the astronomical observer; the political economist from the politician; and each meditating exclusively or principally on his peculiar department, attains to a degree of proficiency and expertness in it which the general scholar seldom or never reaches. And hence, in labouring to promote our own ends, we adopt those courses which are most advantageous for all. Like the different parts of a well-constructed engine, the inhabitants of countries like England are all mutually dependent on and connected with each other. Without any previous concert, and obeying only the powerful and steady impulse of self-interest, they universally conspire to the same great end, and contribute, each in his respective sphere, to furnish the greatest supply of necessaries, conveniences, and enjoyments.

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[1] "Je ne crains point le dire: la société *est purement et uniquement une série continuelle d'échanges;* elle n'est jamais autre chose dans aucune époque de sa durée, depuis son commencement le plus informe jusqu'à sa plus grande perfection; et c'est là le plus grand éloge qu'on en puisse faire, car l'échange est une transaction admirable, dans laquelle les deux contracteurs gagnent toujours tous deux; par consequent la société est une suite non interrompue d'avantages sans cesse renaissans pour tous ses membres." (Destutt Tracy, *Economie Politique*, p. 144.)

Division of labour limited by the extent of the market.

But it should be observed that the advantages derived from the division of labour, though they are partially enjoyed in every country and state of society, are only reaped in their full extent where there is a great power of exchanging, or an extensive market. Many employments cannot be separately carried on beyond the precincts of a large city; and in all cases the division becomes more perfect according as the demand for the produce of the work is extended. It is stated by Smith that in his time ten labourers employed in different departments in a pin factory could produce 48,000 pins a day; and such has been the progress of improvement, that they are now (1858) able to produce twice that number, or upwards. But, unless the demand had been sufficiently extensive to take off this increased quantity, it is evident that the greater division of employments and other improvements introduced into the factory, could not have been carried to their present extent. And this principle holds in every case. A cotton-mill could not be constructed in a small country having no intercourse with its neighbours. The demand and competition of the commercial world have been necessary to carry the manufactures of Glasgow, Manchester, and Birmingham to their present state of improvement.

The influence of the division of labour in multiplying and perfecting the products of industry was noticed by several writers previous to Smith, especially Harris and Turgot. But none of them did what Smith has done. None of them fully analysed and exhibited its various effects, or showed that the power of engaging in different employments depends on the power of exchanging; and that consequently the advantages derived from the division of labour are dependent on, and regulated by, the extent of the market. This is a principle of great importance, by establishing which Smith shed a new light on the theory of production, and laid the foundation of many important practical conclusions. "Présentée de cette manière," says M. Storch, "l'idée de la division du travail étoit absolument neuve; et l'effet qu'elle a fait sur les contemporains de Smith, prouve bien qu'elle l'étoit réellement pour eux. Telle qu'elle se trouve indiquée dans les passages que je viens de citer, elle n'a fait aucune impression. Développée par Smith, cette idée a d'abord saisi tous ses lecteurs; tous en ont senti la vérité et l'importance; et cela suffit pour lui en assurer tout l'honneur, lors même que son génie ait été guidé par les indications de ses devanciers." (Tome vi., p. 10.)

Territorial division of labour.

2. *Territorial Division of Labour, or Commerce.*—The division of labour is not confined to its effect on the occupations of men in limited societies. It extends much further than this; and influences the population of entire provinces, and even great nations, in the same way that it influences individuals and families, by teaching them that it is for their interest to addict themselves in preference to those industrial pursuits for succeeding in which they have some natural or acquired advantage. And hence the *territorial division of employments*, and the commerce of which it is at once the cause and the effect. The various soils, climates, and capacities of the different districts of an extensive country render some particularly well suited for the prosecution of certain branches of industry, and others for the prosecution of other branches. A district where coal is abundant, which has an easy access to the ocean, and a considerable command of internal navigation, is the natural seat of manufactures. Wheat and other species of grain are the proper products of rich arable soils; and cattle, after being reared in mountainous districts, are most advantageously fattened in meadows and low grounds. Nothing is more obvious than that the inhabitants of these districts, by confining themselves to the businesses for the carrying on of which they have some especial capability, will produce a much greater aggregate quantity of useful and desirable articles than they could do were they to engage indiscriminately in every possible employment. It cannot be doubted that a vastly greater supply of manufactured goods, corn, and cattle, is produced by the inhabitants of Glasgow, the Carse of Gowrie, and Argyleshire respectively, confining themselves to manufactures, agriculture, and the rearing of cattle, than if each had endeavoured, in addition to their own, to raise the products peculiar to the others.

But it is easy to see that foreign trade, or the territorial division of labour between different and independent countries, contributes to increase the wealth of each in the same manner that the trade between different provinces of the same kingdom contributes to increase their wealth. There is a still greater difference between the productive powers with which nature has endowed different and distant countries than there is between those of the provinces of the same country. The establishment of a free intercourse between them must therefore be proportionally more advantageous. It would evidently cost a great deal more to raise the wines of France or Spain in England, than to make Yorkshire yield the same products as Devonshire. Indeed there are a multitude of products, some of which are of the very greatest utility, that cannot be raised except in particular situations. Were it not for our commercial intercourse with foreigners, we should be wholly destitute of tea, raw cotton, raw silk, gold bullion, and a thousand other equally useful and valuable commodities. Providence, by giving different soils, climates, and natural productions to different countries, has evidently provided for their mutual intercourse and civilization. There can, indeed, be no reasonable doubt, had their trade been free and unfettered, that each people would have engaged in preference in those departments of industry in which their genius, the capacities of their soil, their products, climate, and situation fitted them to excel. And though, owing to the prevalence of that selfish and short-sighted policy, of which we have traced the outline, the benefits that would have resulted from foreign trade have been greatly diminished, still it would be no easy matter to exaggerate the amount and importance of those of which, even in its restricted state, it has been productive. Products of all sorts have been multiplied and cheapened; and their distribution binds together the universal society of nations by the common and powerful ties of mutual interest and reciprocal obligation. Commerce has also, by showing how greatly they are indebted to others, moderated the extravagantly high opinion which nations, when they have little intercourse with their neighbours, are too apt to entertain of themselves; and has thus either wholly removed or greatly weakened a host of unworthy prejudices. It has shown that nothing can be more illiberal and absurd than the once prevalent dread of the progress of others in wealth and civilization; and that the true glory and real interest of every nation will be more certainly advanced by endeavouring to emulate and outstrip its neighbours in the career of science and civilization, than by labouring to attain a barren pre-eminence in the bloody and destructive, though necessary, art of war.

Effect of the territorial division of labour in augmenting national wealth.

The way in which commerce gives increased efficacy to labour, and augments national wealth, may be easily illustrated. Thus, in the case of the intercourse, or territorial division of labour, carried on between England and Portugal, our superior wool, added to our command of coal, skilful workmen, and improved machinery, enable us to produce cloth at a much cheaper rate than the Portuguese; while, on the other hand, the soil and climate of Portugal being peculiarly favourable for the growth of the grape, she produces wine at an infinitely less cost than it could be produced for here. And hence it is obvious that, by exchanging cloth for wine, and wine for cloth, both parties, the English and Portuguese, are greatly benefited. Each of them is incomparably better supplied than they otherwise would be with useful and desirable articles. Portions of their capital and industry are diverted into those channels in which they are naturally most productive and most secure; and in which, consequently, it is not more for their own than for the general advantage of mankind that they should be employed.

Sophism of the French Economists on the subject of commerce.

These statements are sufficient to expose the sophism of the Economists, who contended that, as equivalents must always be given for commodities brought from abroad, foreign commerce could not be a means of increasing wealth. How, they asked, can wealth be increased by giving equal values for equal values? They admitted that commerce might make a *better distribution* of the wealth of the world; but as it merely exchanged one sort of wealth for another, they denied that it could make any addition to its amount. At first sight, this sophistical and delusive statement appears sufficiently conclusive; but a very few words will be enough to demonstrate its fallacy. In commercial transactions none of the parties obtain articles of greater value than those they gave in exchange for them. The cloth with which the English merchant purchases Portuguese wine may have cost as much as the latter, or it may have cost more. But then it must be observed that, in making the exchange, the value of the wine is estimated by what it takes to produce it in Portugal, which has peculiar capabilities for that species of industry, and not by what it would take to produce it in England were the trade put an end to; and, in like manner, the value of the cloth is estimated by what it takes to produce it in England, and not by what it would take to produce it in Portugal. Hence, by trading together, countries obtain commodities which it might not be possible for them to produce at home, or, if possible, only at a comparatively heavy cost, for what it takes to produce them in other countries under the most favourable circumstances, and at the least expense. The gain of one is not the loss of another. They are universally benefited by the intercourse; for their labour being better distributed and rendered more efficient, they all obtain larger supplies of useful and desirable articles.

To set this important principle in a clearer point of view, let it be supposed that in England a given number of men can, in a given time, manufacture 10,000 yards of cloth and raise 1000 quarters of wheat, and that the same number of men can, in a given time, manufacture in Poland 5000 yards of cloth and raise 2000 quarters of wheat. It is plain that the establishment of a free intercourse between the two countries would in these circumstances enable England, by manufacturing cloth and exporting it to Poland, to obtain *twice* the quantity of corn in exchange for a given outlay of capital and labour that she would obtain in return for the same outlay on cultivation at home; and Poland would, on her part, be enabled to obtain *twice* as much cloth in exchange for her corn as she would have done had she attempted directly to manufacture it. How ridiculous, then, to contend that commerce is not a means of adding to the efficacy of labour, and consequently of increasing wealth! Were the intercourse between England and Portugal and the West Indies put an end to, it would require at least fifty or a hundred times the expense to produce port-wine, sugar, and coffee, directly in this country, that is required to produce the equivalents sent to Portugal and the West Indies in exchange for them. And no outlay, however great, could directly supply us with teas, spices, and fifty other most important articles.

"The commerce of one country with another is merely an extension of that division of labour by which so many benefits are conferred on the human race. As the same country is rendered richer by the trade of one province with another; as its labour becomes thus infinitely more divided and more productive than it could otherwise have been; and as the mutual interchange of all those commodities which one province has and another wants, multiplies the accommodations and comforts of the whole, and the country becomes thus in a wonderful degree more opulent and happy; so the same beautiful train of consequences is observable in the world at large, that vast empire of which the different kingdoms may be regarded as the provinces. In this magnificent empire one province is favourable to the production of one species of produce, and another province of another. By their mutual intercourse mankind are enabled to distribute their labour as best fits the genius of each particular country and people. The industry of the whole is thus rendered incomparably more productive, and every species of necessary, useful, and agreeable accommodation is obtained in much greater abundance, and with infinitely less expense." (Mill's *Commerce Defended*, p. 38.)

To enter into a more enlarged discussion of this interesting and important subject would be inconsistent alike with the objects and limits of this article. In the articles on COLONIES, and the CORN LAWS AND CORN TRADE, we have examined the policy of the restrictions on the colonial and corn trades; and in the article EXCHANGE we have pointed out the circumstances which regulate the importation and exportation of the precious metals, and have shown that, instead of an excess of exports over imports being any criterion of an advantageous commerce, it is quite the reverse, and that it is by the excess of the imports over the exports that the gain of the merchants, and consequently of the community, is to be estimated. In the fourth book of the *Wealth of Nations*, Adam Smith has examined and refuted the various arguments in favour of restrictions on commerce in the most able and masterly manner, and with an amplitude of illustration which leaves little to be desired. A very complete exposure of the sophisms of the French Economists on the subject of commerce may be found in the pamphlets of Mill (*Commerce Defended*) and Colonel Torrens (*Economists Refuted*), in answer to Spence's pamphlet entitled *Britain Independent of Commerce*. And ample information on most points relating to the practice, theory, and history of commerce will be found in the *Principles of Political Economy* (4th edition), and in the *Commercial Dictionary*, by the author of this article.

When the division of labour was first introduced, commodities were universally bartered for each other. But as the division of employments was extended, and exchanges became more numerous, it became obvious that it would be highly advantageous to use some one article as a common medium of exchange, as an equivalent for all other articles, and as a standard by which to ascertain their values. It is unnecessary, however, to inquire into this subject. It has been already fully discussed in the article MONEY, in this work, to which the reader is referred for further information with respect to it.

Definition.

Accumulation and Employment of Capital. — Capital may be defined to be "*that portion of the accumulated produce of labour which may be* DIRECTLY *employed to maintain productive labourers, or to facilitate production.*"

The fitness of an article to serve as an instrument of production, or to support those engaged in industrial undertakings, is the only criterion by which to decide whether it is or is not capital. Its employment, on which much stress has been laid, depends entirely on the judgment or caprice of its owner, and affects neither its identity nor its qualities. It is frequently, also, very difficult to distinguish between what are really productive and unproductive employments; so that a definition which depended on such a distinction being made, must be of the class of those that explain *ignotum per ignotius.* But there is never, or but very rarely, any difficulty in learning whether an article may be employed to facilitate labour or maintain labourers; and that is all that is required for its proper classification. A great many articles, including pictures, prints, statues, vases, most sorts of gems, trinkets, and so forth, cannot be employed in either of the ways now referred to, and have therefore no claim to be called capital. But any article that may be so employed is entitled to that designation, however it may be disposed of. Gunpowder, for example, is capital, whether it be expended in fireworks or in the blasting of rocks; and horses have no better claim to be called capital when they are employed in ploughing and harrowing, than when they are racing at Newmarket or Goodwood.

Accumulation and employment of capital.

Having thus seen what capital is and what it is not, we proceed to observe that its accumulation and employment are indispensable to the successful prosecution of almost every branch of industry. Without the capital which chiefly consists of tools and engines, and which has been denominated *fixed*, labour could not be rendered considerably productive; and without the capital which chiefly consists of the food and clothes required for the consumption of the labourer during the time he is employed in production, and which has been denominated *circulating*, he could not engage in any undertaking which did not yield a speedy return. An agricultural labourer, for example, might have an ample supply of carts and ploughs, of oxen and horses, and generally of all the instruments and animals used in his department of industry; but were he destitute of *circulating* capital, or of food and clothes, he would be unable to avail himself of their assistance, and instead of tilling the ground, would have to betake himself to some species of appropriative industry. And, on the other hand, supposing the husbandman to be abundantly supplied with provisions, what could he do without *fixed* capital, or tools? What could the most skilful agriculturist perform without his spade and his plough? a weaver without his loom? or a house-carpenter without his saw, his axe, and his planes? Both sorts of capital are required for the elevation of every nation in the scale of civilization. And it is only by their conjoined and powerful operation that wealth is largely produced.

The division of labour in such societies as are a little advanced is consequent to the accumulation of capital. Before labour can be considerably subdivided, "a stock of goods of different kinds must be stored up somewhere, sufficient to maintain the labourer, and to supply him with the materials and tools of his work. A weaver cannot apply himself entirely to his peculiar business, unless there is beforehand stored up somewhere, either in his own possession or in that of some other person, a stock sufficient to maintain him, and supply him with the materials and tools of his work, till he has not only completed, but sold his web. This accumulation must evidently be previous to his applying his industry for so long a time to such a peculiar business." (*Wealth of Nations*, p. 119.)

As the accumulation of stock must precede all but the earliest division of labour, so its further division is more and more extended as capital is more and more accumulated. Accumulation and division act and re-act on each other. The raw material which the same number of people can work up increases according as labour is more and more subdivided; and when the operations of each workman are reduced to a greater degree of identity and simplicity, he has, as already explained, a greater chance of discovering machines and processes for facilitating and abridging labour. Industry therefore not only increases in every country with the increase of the stock or capital which sets it in motion, but, in consequence of this increase, the division of labour becomes extended, new and more powerful implements and machines are invented, and the same amount of labour produces a much greater quantity of commodities.

Besides enabling labour to be divided, capital contributes to facilitate labour and produce wealth in the three following ways:—

Modes in which t employment of capital f cilitates labour.

First.—It enables work to be executed that could not be executed, or commodities to be produced that could not be produced, without it.

Second.—It saves labour in the production of almost every species of commodities.

Third.—It enables work to be executed better, as well as more expeditiously.

1. It ena bles man produce commodi ties tha could no be prod ed with it.

With regard to the first mode in which we are benefited by the employment of capital, or its *enabling commodities to be produced that could not be produced without it*, we have seen that the production of such commodities as require a considerable period for their completion cannot be attempted until a stock of circulating capital, or of food and clothes, sufficient for the maintenance of the labourers employed on them, has been provided. But the employment of fixed capital in the shape of tools and engines is also in most cases indispensable in production. There are, indeed, very few, if any, arts that may be carried on by the mere agency of the fingers, or rude tools given to us by nature. A pair of stockings could not be produced without the aid of wires; and though the ground may be cultivated without ploughs, it could not be cultivated without spades or hoes. But man is not, like the lower animals, condemned to vegetate for ever in the situation in which he was originally placed. He is always aspiring to something better; and he has a head to contrive, as well as hands to construct the means and instruments required to assist him in his undertakings. And no sooner is one step gained, one difficulty overcome, than he advances to grapple with another. The *curis acuens mortalia corda* never ceases to operate. The spirit which it inspires is neither enervated by success nor dispirited by failure. It is perpetually urging society forward to attempt new discoveries, and to improve and perfect the inventions already made. It is this principle that has made so many natural powers subservient to our will, and armed, if we may so speak, our feeble hands with "the force of all the elements."

2. It sav labour i the production commodi ties.

In the *second* place, while the employment of capital is indispensable to the production of many descriptions of commodities, it enables a large saving of labour to be effected in the production of a still greater number, and by lowering their price, brings them within the reach of a much larger number of consumers. We have been so long accustomed to make use of the most powerful machines, that it requires a considerable effort of abstraction to become fully aware of the extent of the advantages we derive from them. But if we compare the arts practised alike in rude and civilized societies, we cannot fail to be convinced that we owe a very large portion of our superior well-being to the employment of machines of one sort or other. It is by their means that the land is cultivated, clothes manufactured, books and newspapers printed, and the products of industry, with the treasures of art and knowledge, conveyed from one country and hemisphere to another. Those who reflect, how cursorily soever, on the immeasurable distance between slings, or bows and arrows, and muskets and heavy ordnance, between the pen of a copying-clerk and a steam-press, between spindles and distaffs and spinning-mills, between a canoe and a line-of-battle or first-class merchant ship, and on fifty similar contrasts, will be ready to admit that the progress of mankind from their lowest and most abject to their highest and most polished state, has been mainly a consequence of the invention and improvement of tools and engines. Man was defined by Dr Franklin to be a "tool-making animal;" and the definition turns upon one of his distinctive and most valuable faculties, and is really one of the best that has been given.

3. It enables us to xecute ork better, as well s more xpediiously.

In the *third* place, the employment of machinery enables work to be done *better*, as well as more expeditiously, than it could be done without it. Cotton, for example, might be spun by the hand; but the admirable machines invented by Hargreaves, Arkwright, Crompton, and others, have not only enabled a hundred or a thousand times more yarn to be produced than could be spun by means of a common hand-wheel (itself a great invention), but it has also improved its quality, and given it a degree of fineness, and of evenness or equality in its parts, which was never previously attained. It would require a painter months, or it might be years, to paint with a brush the cottons or printed cloths used in the hanging of a single room; and it would be very difficult, if not impossible, for the best artist to give the same perfect identity to his figures that is given to them by the admirable machinery now used for that purpose. Not to mention the other and more important advantages derived from the invention of moveable types and printing, the most perfect manuscript—one on which years of patient and irksome labour have been expended—is unable, in point of delicacy and correctness, to match a well-printed work, executed in the hundredth part of the time, and at a hundredth part of the expense, required to copy the manuscript. The great foreign demand for English manufactured goods results no less from the superiority of their fabric than from their greater cheapness; and for both these advantages we are principally indebted to the excellence of our machinery.

e power employ our dends on amount capital.

There are other considerations which equally illustrate the extreme importance of the accumulation and employment of capital. Setting aside the variations of harvests, the produce of the land and labour of a nation cannot be increased otherwise than by an increase in the number of its labourers or of their productive powers. But without an increase of capital, it is in most cases difficult to employ additional workmen with advantage. If capital be not augmented, and if the food and clothes destined for the support of the labourers, and the tools and machines with which they are to work, be all required for the maintenance and efficient employment of those in existence at this or any other period, there can be no advantageous demand for more. In such circumstances, the rate of wages cannot rise; and if the number of inhabitants be increased, they can hardly fail to be worse provided for. Neither can the productive powers of the labourer be considerably augmented without a previous increase of capital. For it is only by their better education and training, by the greater subdivision of their employments, or by an improvement of machinery, that the productive powers of workmen are ever materially increased. And in almost all these cases additional capital is required. When the work to be done consists of a number of parts, to keep every man constantly employed in a particular part requires a larger stock than where every man is occasionally employed in different parts. "When," says Adam Smith, "we compare the state of a nation at two different periods, and find that the annual produce of its land and labour is evidently greater at the latter than at the former, that its lands are better cultivated, its manufactures more numerous and more flourishing, and its trade more extensive, we may be assured that its capital must have increased during the interval between these two periods, and that more must have been added to it by the good conduct of some, than had been taken from it either by the private misconduct of others or by the public extravagance of government." (*Wealth of Nations*, p. 152.) It is therefore apparent that no country can ever reach the stationary state so long as she continues to add to her capital. While she does this, she will have an increasing demand for labour, and will be constantly augmenting the mass of necessaries, luxuries, and conveniences, and consequently also the numbers of her people. But with every diminution of the rate at which capital may have been accumulating, the demand for labour will decline. When no additions are made to capital, no more labour will be, or at least can be, beneficially employed. And should the national capital be diminished, the condition of the great body of the people would be deteriorated; for the wages of labour would be reduced, and pauperism, with its attendant train of vice, misery, and crime, would begin to spread its ravages throughout the largest portion of society.

Accumulation of capital.

Having thus endeavoured to point out the vast importance of the employment of capital, and the manner in which it co-operates in production, we proceed to explain the circumstances most favourable for its accumulation.

Advantage of high profits.

Now, as capital is nothing but the accumulated produce of bygone industry, it is evident that its increase will, *cæteris paribus*, be greatest where industry is most productive, or, in other words, where *the profits of stock are highest*.[1] A man who produces a bushel of wheat in two days may accumulate twice as fast as a man who, either from a deficiency of skill, or from having to cultivate a bad soil, has to labour four days to produce the same quantity; and capitalists who invest stock so as to yield a profit of ten per cent., have it equally in their power to accumulate twice as fast as those who can only obtain five per cent. on their outlays. Experience, too, shows that while large profits afford greater means of saving, they act as incentives to accumulation. Hence it is found that in the countries which are making the greatest progress, the rate of profit is always comparatively high. In Australia and the United States, for example, it is usually twice as high as in Great Britain or France; and it is to this that the more rapid advancement of the former in wealth and population is mainly to be ascribed. We do not mean to say that high profits are necessarily and in every instance accompanied by a great degree of prosperity. Countries with every other advantage for the profitable employment of industry and stock, may be subjected to revolutionary and arbitrary governments which do not respect the right of property; and the want of security thence resulting may be sufficient to paralyze their exertions, and to hinder them from accumulating capital. But we have no hesitation in laying it down as a principle which holds universally, that if the governments of any two or more countries be about equally liberal, and property in each about equally well secured, their comparative prosperity will depend on the rate of profit. Where profits are high, there is a great demand for labour, and population and riches are rapidly augmented; and where they are low, the demand for labour is proportionally reduced, and the progress of society rendered so much the slower.

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[1] To avoid all chance of misconception, it is necessary to observe, that this refers to *nett* profit, or to the sum which remains to the capitalist after all his outgoings are compensated, including therein a sum sufficient to insure his capital against risk, and to make up for whatever may be peculiarly disagreeable in his business.

Parsimony necessary to accumulation.

But however high the rate of profit, had men always lived up to their incomes,—that is, had they always consumed them in the gratification of their immediate wants and desires,—there would have been no such thing as capital in the world. High profits are advantageous because they afford the means of amassing capital; but something more is necessary to make us use these means, and that is the desire implanted in the breasts of all, or mostly all individuals, of rising in the world, and improving their condition. This strong desire has prompted them, as already seen, to invent machines and instruments; and it also prompts them to save and accumulate a portion of their incomes or earnings as a fund or capital to be employed in their future undertakings, or invested in loans to others, or retained as a reserve stock on which to fall back in sickness or adversity. Hence it is to the principle of accumulation, or rather to its source, parsimony, which, though one of the most useful, is one of the least popular of the virtues, that we owe that capital without whose assistance and co-operation mankind could have made no considerable progress, and would most likely have continued in a state but little removed from barbarism.

Bacon objects to parsimony, that "it withholdeth men from works of liberality and charity." (*Essays*, No. 34.) But unless a man be born to affluence, which is the lot of few, the exercise of parsimony is required to enable him to be really charitable. Those who spend as fast as they acquire are almost always in difficulties; they live, as the phrase is, from hand to mouth; and are without the means, even if they had the inclination, to act liberally. But it is not necessary to the practice of a proper degree of parsimony that people should submit to painful privations, or that they should behave in a mean or niggardly manner. Parsimony is not to be confounded with the base passion of avarice. It does not regard accumulation as an end, but only as a means to an end; and it should correspond to, and be consistent with, a man's situation and prospects. And, in truth, it is everywhere found that the establishments of those parties, whether in the lower, middle, or upper classes, who are said to be saving or parsimonious, are more distinguished by their good order and the avoidance of waste than by anything else. They do not deny themselves gratifications, but they keep the taste for them within due bounds, and do not allow their means to be made away with (as many do), they know not how. They are careful and economical upon principle, and add to their fortunes that they may be able to live better, and be more hospitable and generous. Cicero says of Rabirius Postumus, "*In augenda re non avaritiæ prædam, sed instrumentum bonitati quærere videretur.*" (Pro Rabirio Postumo, cap. 2.)

It has been wisely ordered that this principle should be as powerful as it is advantageous. "With regard to profusion," says Smith, "the principle which prompts to expense is the passion for present enjoyment; which, though sometimes violent, and very difficult to be restrained, is in general only momentary and occasional. But the principle which prompts to save is the desire of bettering our condition; a desire which, though generally calm and dispassionate, comes with us from the womb, and never leaves us till we go into the grave. In the whole interval which separates these two moments there is scarce perhaps a single instance in which any man is so perfectly and completely satisfied with his situation as to be without any wish of alteration or improvement of any kind. An augmentation of fortune is the means by which the greater part of men propose and wish to better their condition. It is the means the most vulgar and the most obvious; and the most likely way of augmenting their fortune is to save and accumulate some part of what they acquire either regularly and annually, or upon some extraordinary occasion. Though the principle of expense, therefore, prevails in almost all men upon some occasions, and in some men upon almost all occasions, yet in the greater part of men, taking the whole course of their life at an average, the principle of frugality seems not only to predominate, but to predominate very greatly." (*Wealth of Nations*, p. 151.)

It is this principle which carries society forward. The spirit of parsimony, and the efforts which the frugal and industrious classes make to improve their condition, in most instances balance not only the profusion of individuals, but also the more wasteful profusion and extravagance of government. This spirit has been happily compared by Smith to the unknown principle of animal life—the *vis medicatrix naturæ*—which frequently restores health and vigour to the constitution, in spite both of disease and of the mischievous prescriptions of the physician.

But though the principle of accumulation be powerful enough, when its vigorous action is not paralysed by any fear of insecurity, to make good the waste or loss of large amounts of capital, we must not fall into the error of supposing, as very many have done, that its operations are in all cases promoted by a large public expenditure. To a certain extent, indeed, this is true. A moderate increase of taxation has the same effect on the habits and industry of a nation that an increase of his family or of his unavoidable expenses has upon a private individual. Man is not influenced solely by hope; he is also powerfully operated upon by fear. Taxation brings the latter principle into the field. To the desire of rising in the world, an increase of taxation superadds the fear of being cast down to a lower station, of losing consideration, and of being deprived of conveniences and gratifications which habit may have rendered almost indispensable: and the combined influence of the two principles produces efforts that could not be produced by the unassisted agency of either. They stimulate individuals to endeavour, by increased efforts of industry and economy, to repair the breach taxation has made in their fortunes. And it not unfrequently happens that their efforts do more than this, and that, consequently, the national wealth is increased through the increase of taxation. But we must be on our guard against the abuse of this doctrine. To render increased taxation a cause of greater exertion, economy, and invention, the increase should be slow and gradual; and it should never be carried to such a height as to disable individuals from meeting the sacrifices it imposes, by such additional exertion and economy as it may be in their power to make, without requiring any very sudden or violent change in their habits. Difficulties which, though great, are seen to be surmountable, sharpen the inventive powers, and are readily grappled with. But an apparently insurmountable difficulty, or such an excessive increase of taxation as it was deemed impossible to meet, would not stimulate, but destroy exertion. Instead of producing new efforts of ingenuity and economy, it would produce only despair. Whenever taxation becomes so heavy that the produce it takes from individuals cannot be replaced by fresh efforts of economy and invention, these efforts uniformly cease to be made; the population becomes dispirited, industry is paralysed, and the country rapidly declines.

Ambition to rise is, we repeat it, the animating principle of society. Instead of remaining satisfied with the condition of their fathers, the great object of mankind in every age has been to rise above it, to elevate themselves in the scale of consideration and of wealth. To achieve this grand object, they scruple not

> "Certare ingenio, contendere nobilitate
> Noctes atque dies niti præstante labore
> Ad summas emergere opes, rerumque potiri."[1]

To continue stationary, or to retrograde, is not natural to society. Man from youth grows to manhood, then decays and dies; but such is not the destiny of nations. The arts, the scientific discoveries, and the capital of one generation become the patrimony of that which succeeds them; and as the former are imperishable, and will continue to give birth to new arts and new discoveries in all time to come, while the natural tendency of the latter is to increase, it follows that, if not counteracted by the want of security, or by other adventitious causes, the principle of improvement would always operate, and would secure the constant advancement of nations in wealth and population.

Credit.

It may be said perhaps that, however true, the previous statements are incomplete, from no mention being made of *credit*, which, we are assured, plays an important part in all industrial operations. But this is an entire mistake. Credit is not capital, nor even anything real. It is merely the term employed to designate the lending or transfer of capital by one individual to another. The lender is said to give, and the borrower to get or receive credit. No doubt we often hear of this, that, and the other undertaking being carried on by means of credit; but by this is really meant that they are carried on by the agency of borrowed capital. And speaking generally, the giving of credit or the lending of capital may be said to be advantageous, because in most instances the borrowers employ it to better purpose than the lenders. When, however, it is otherwise, and capital is conveyed, as is sometimes the case, from the industrious and frugal to the idle and improvident, the credit that has been given is plainly injurious. And in all cases its influence, whether for good or for evil, depends on the capital being employed more or less advantageously after its transfer than before.

SECT. III.—*Different Employments of Capital and Industry.—Manufactures and Commerce shown to be equally advantageous as Agriculture.—Rate of Profit a true Test of Individual and Public Advantage.*

ifferent nploy- ents of pital and dustry.

In the previous section we endeavoured to show that the increase and diminution of capital is the pivot on which national prosperity principally hinges; that an increase of capital proportionally increases the means of supporting and employing labour, and that any considerable diminution of its amount seldom fails to lessen the comforts and enjoyments, and perhaps also the necessaries of the productive classes, and to spread poverty throughout the land; and we also endeavoured to show that the increase and diminution of the rate of profit is the great cause of the increase and diminution of capital. But if such be the case, it would seem necessarily to follow that those employments which yield the greatest profit, or in which industry is most productive, are the most advantageous. Adam Smith, however, with Malthus and others, have objected to this inference. They allow that if two capitals yield equal profits, the employments in which they are engaged are equally beneficial to their possessors; but they contend that if one of them be employed in agriculture, it will be productive of greater public advantage. We believe, however, notwithstanding the deference due to the authorities referred to, that this opinion rests on no good foundation, and that the average rate of profit is the test by which we should always judge which employment is most and which is least advantageous.

A capital may be employed in *four* different ways,—viz., *first*, In the acquisition of raw products; or, *secondly*, In manufacturing and preparing these raw products for use and consumption; or, *thirdly*, In transporting the raw and manufactured products from one place to another, according to the demand; or, *fourthly*, In dividing either into such small parcels as may suit the public convenience, and supplying them to those by whom they are wanted. The capital of those who undertake the improvement or cultivation of lands, mines, or fisheries, is employed in the first of these ways; that of master manufacturers in the second; that of wholesale merchants in the third; and that of retailers in the fourth. It is difficult to conceive that a capital should be employed in any way which may not be classed under one or other of these heads.

Employment of capital in agriculture.

It is unnecessary to enlarge on the importance of employing capital in the acquisition of raw produce, and especially in the cultivation of the soil. It is from the latter, including therein mines and fisheries, that the matter of all commodities that minister to our necessities, comforts, and enjoyments is originally derived. The industry which appropriates the raw or spontaneous products of the earth preceded every other. But these are always comparatively limited. And it is by agriculture only,—that is, by the united application of immediate labour and capital to the cultivation of the ground,—that large supplies of those species of produce which form the principal part of the food of man can be obtained. It is not quite certain whether any of the principal bread corns, as wheat, barley, rye, oats, &c., have been discovered growing spontaneously. But although this must originally have been the case, their extreme scarcity, and the labour required to raise them in considerable quantities, prove that we are indebted for them almost exclusively to agriculture. The transition from the pastoral to the agricultural mode of life is the most important step in the progress of society. Whenever, indeed, we compare the supplies of food and other raw products obtained from a given surface of a well-cultivated country, with those obtained from the same extent of an equally fertile country occupied by hunters or shepherds, the powers of agricultural industry in increasing useful productions appear so extraordinary, that we cease to feel surprise at the preference which was so early and generally given to agriculture over manufactures and commerce, and are disposed to subscribe without hesitation to the panegyric of Cicero when he says, "*Omnium autem rerum ex quibus aliquid acquiritur, nihil est agricultura melius, nihil uberius, nihil dulcius, nihil homine libero dignius.*"[2]

But are there any really just grounds for this preference? Are not manufactures and commerce as advantageous as agriculture? Without the latter we should never possess any considerable supply of the materials out of which food

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[1] Lucretius, lib. ii., lin. 14.

[2] Xenophon, in his treatise on the *Science of Good Husbandry*, dwells at considerable length on the superior importance of agricultural industry. He says, "The earth gives us plenty of all things, yet (he judiciously adds) it does not allow us to reap them in sloth and idleness, but excites us to health and strength by the labour it appoints us." And in another place he says, "He was surely a wise man who said that husbandry was the mother and nurse of all other sciences; for if husbandry flourish, all other sciences and faculties fare the better; but whenever the ground lies uncultivated, and brings no crop, all other sciences are at a loss, both by sea and land." (Bradley's trans. of Xenophon's *Œconomics*, London, 1727.)

Employment of capital in manufacturing industry.

and clothes are made; but without a knowledge of the arts by which they are converted into food and clothes the largest supply of these materials would be of little or no service. The industry of the miller and baker is as necessary to the production of bread as that of the husbandman who tills the ground. The agriculturists raise flax and wool; but if the spinners and weavers did not give them additional utility, by fitting them for being made into comfortable dresses, these articles would be nearly, if not entirely, worthless. Without the labour of the miner who extracts the mineral from the bowels of the earth, we should be destitute of the material out of which many of our most useful implements and splendid articles of furniture are made; but those who compare the ore when dug from the mine with the finished articles, will probably be convinced that we do not owe more to the miner than to the purifiers and refiners of the ore, and the artists who afterwards converted it to useful purposes.

Necessity of manufacturing industry to the improvement in agriculture.

Besides being necessary to render most sorts of raw produce of any use, manufacturing industry is further necessary to the acquisition of that produce. The mechanic who fabricates the plough contributes as efficaciously to the production of corn as the husbandman who guides it. But plough-wrights, mill-wrights, smiths, and all those artizans who prepare tools and machines for the husbandman, are really manufacturers, and differ in no respect from those employed to give utility to wool and cotton, except that they work on harder materials. Tools and machines are the products of the tool and engine manufacturer; and without their aid neither agriculture nor any other employment could become considerably productive.

"Distinguer," says the Marquis Garnier, "le travail des ouvriers de l'agriculture d'avec celui des autres ouvriers, est une abstraction presque toujours oiseuse. Toute richesse, dans le sens dans lequel nous la concévons, est nécessairement le résultat de ces deux genres de travail, et la consommation ne peut pas plus se passer de l'un que de l'autre. Sans leur concours simultané il ne peut y avoir de chose consommable, et par conséquent point de richesse. Comment pourrait-on donc comparer leurs produits respectifs, puisque, en séparant des deux espèces de travail, on ne peut plus concévoir de véritable produit, de produit consommable et ayant une valeur réele? La valeur du blé sur pied résulte de l'industrie du moissonneur qui récueillera, du batteur qui le séparera de la paille, du méunier et du boulanger qui le convertiront successivement en farine et en paine, tout comme elle résults du travail du labourer et du sémeur. Sans le travail du tisserand le lin n'aurait pas plus le droit d'être compté au nombre des richesses que l'ortie, ou tout autre végétal inutile. A quoi pourrait-il donc servir de rechercher lequel de ces deux genres de travail contribue le plus à l'avancement de la richesse nationale? N'est-ce pas comme si l'on disputait pour savoir lequel, du pied droit ou du pied gauche, est plus utile dans l'action de marcher?"[1]

No real difference between agricultural and manufacturing industry.

There is not at bottom any real distinction between agricultural and manufacturing industry. It is, as already seen, a vulgar error to suppose that the operations of husbandry add anything to the stock of matter in existence. All that man can do, and all that he ever does, is to give to matter that particular form or shape which fits it for his use. But it was contended by Quesnay and the Economists, and their opinions have in this instance been espoused by Smith, that while the husbandman, in adapting matter to our use, is powerfully assisted by the vegetative powers of nature, the manufacturer has to perform everything himself without any such co-operation. "No equal quantity of productive labour employed in manufactures," says Smith, "can ever occasion so great a reproduction (as if it were employed in agriculture). In them *nature does nothing, man does all;* and the reproduction must always be in proportion to the strength of the agents that occasion it. The capital employed in agriculture, therefore, not only puts into motion a greater quantity of productive labour than any equal capital employed in manufactures, but in proportion, too, to the quantity of productive labour which it employs it adds a much greater value to the annual produce of the land and labour of the country, to the real wealth and revenue of its inhabitants. Of all the ways in which a capital can be employed, it is by far the most advantageous to the society." (*Wealth of Nations*, p. 162.)

Opinion of Smith respecting the superior productiveness of agriculture.

Error of this opinion.

This is perhaps the most objectionable passage in the *Wealth of Nations;* and it is astonishing that so able and sagacious a reasoner as Smith should have maintained a doctrine so manifestly erroneous. It is unquestionably true that nature powerfully assists the husbandman. He prepares the ground for the seed, and deposits it therein; but it is nature that unfolds the germ, that feeds and ripens the growing plant, and brings it to maturity. But does she not do as much for us in every other department of industry? The powers of water and of wind which move our machinery, support our ships, and impel them over the deep,—the pressure of the atmosphere and the elasticity of steam, which enable us to work the most stupendous engines,—are they not spontaneous gifts of nature? Machines are in truth merely contrivances by which we press natural powers into our service, and make them perform the principal part of what would otherwise be wholly the work of man. In navigation, for example, is it possible to doubt that the powers of nature,—the buoyancy of the water, the impulse of the wind, and the polarity of the magnet,—contribute fully as much as the labour of the sailor to waft our ships from one hemisphere to another. In bleaching and fermentation the whole processes are carried on by natural agents. And it is to the influence of heat in softening and melting metals, preparing food, and warming houses, that we owe many of our most powerful and convenient instruments, and that these northern climates have been made to afford a comfortable habitation. So far, indeed, is it from being true that nature does much for man in agriculture and nothing in manufactures, that the fact is more nearly the reverse. There are no limits to her bounty in manufactures, but there are limits, and those not very remote, to her bounty in agriculture. Any amount of capital may be expended in the construction of steam-engines, ships, or other machines, and, however largely they may be multiplied, the last, apart from the improvements which are usually being made, will be as powerful and efficient as the first. But such is not the case with the soil. Lands of the first quality are speedily exhausted; and capital cannot be applied indefinitely, even to the best soils, without obtaining a diminished rate of profit. The rent of the landlord is not, as Smith supposed, the recompense of the work of nature remaining, after all that part of the produce is deducted which may be regarded as a recompense for the work of man. It is, as will hereafter be shown, the excess of produce obtained from the best soils in cultivation over that which is obtained from the worst,—it is a consequence, not of an increase, but of a diminution of the productive power of the labour employed in agriculture.

Nature co-operates with man in manufactures and commerce.

Employment of capital in commercial industry.

Inasmuch as all labour which gives utility to matter is productive, it follows that the labour which is employed in carrying commodities from where they are produced to where they are to be consumed, and in dividing them into minute portions, so as to suit the wants of the consumers, is as much entitled to that designation as if it were employed in agriculture or manufactures. The miner gives utility to matter, to coal, for example, by bringing it from the bowels of the earth to its surface; and the merchant or carrier, who transports this coal from the mine whence it has been dug to the city, or place where it is to be burned, gives it a further and perhaps a more considerable value. We do not owe our fires either to the miner or coal-merchant. They are the result of their conjoined operations, combined with those of the parties who have supplied them with the tools and implements used in their respective employments.

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[1] *Discours Préliminaire*, p. 58, 2d ed. of trans. of the *Wealth of Nations.*

dvantage f retail ealers.

Not only, however, must commodities be brought from where they are produced to where they are to be consumed, but it is further necessary that they should be divided into such small and convenient portions that individuals may be able to purchase the quantities they are desirous to obtain. "If," says Smith, "there was no such trade as a butcher, every man would be obliged to purchase a whole ox or a whole sheep at a time. This would generally be inconvenient to the rich, and much more so the poor. If a poor workman was obliged to purchase a month's or six months' provisions at a time, a great part of the stock which he employs as a capital in the instruments of his trade, or in the furniture of his shop, and which yields him a revenue, he would be forced to place in that part of his stock which is reserved for immediate consumption, and which yields him no revenue. Nothing can be more convenient for such a person than to be able to purchase his subsistence from day to day, or even from hour to hour, as he wants it. He is thereby enabled to employ almost his whole stock as a capital. He is thus enabled to furnish work to a greater value, and the profit which he makes by it in this way much more than compensates the additional price which the labour of the retailer imposed upon the goods. The prejudices of some political writers against shopkeepers and tradesmen are altogether without foundation. So far is it from being necessary either to tax them or to restrict their numbers, that they can never be multiplied so as hurt the public interest, though they may so as to hurt one another. The quantity of grocery goods, for example, which can be sold in a particular town is limited by the demand of that town and its neighbourhood. The capital, therefore, which can be employed in the grocery trade cannot exceed what is sufficient to purchase that quantity. If this capital is divided between two different grocers, their competition will obviously tend to make both of them sell cheaper than if it were in the hands of one only; and if it were divided among twenty, their competition would be just so much the greater, and the chance of their combining together in order to raise the price just so much the less. Their competition might perhaps ruin some of themselves; but to take care of this is the business of the parties concerned, and it may safely be trusted to their discretion. It can never hurt either the consumer or the producer; on the contrary, it must tend to make the retailers both sell cheaper and buy dearer than if the whole trade was monopolized by one or two persons. Some of them perhaps may occasionally decoy a weak customer to buy what he has no occasion for. This evil is, however, of too little importance to deserve the public attention, nor would it necessarily be prevented by restricting their numbers." (*Wealth of Nations*, p. 160.)

gricul-re, manu-ctures, d com-erce ually ad-ntageous.

Thus it appears that the various modes in which industry may be exerted, or that the raising of raw produce, the fashioning of that produce, after it is raised, into useful and agreeable articles, the carrying of the raw and manufactured products from one place to another, and the retailing them in such portions as may suit the public demand, are equally advantageous,—meaning thereby, that the capital and labour employed in any one of these departments contributes, equally with that employed in the others, to increase the mass of articles fitted to satisfy our wants or desires. Without a previous supply of raw produce, we should have no manufactures; and without these and commercial industry, the greater part of that produce would be entirely worthless, and would neither minister to our wants or our comforts. Manufacturers and merchants are to the body politic what the digestive powers are to the human body. Food is indispensable to existence; but the largest supplies of food cannot lengthen our days if the machinery by which nature adapts it to our use, and incorporates it with our body, be vitiated and deranged. Nothing, therefore, can be more silly and childish than the estimates so frequently put forth of the comparative advantageousness of agricultural, manufacturing, and commercial industry. They are alike indispensable, and depend upon, and grow out of, each other. "Land and trade," to borrow the just and forcible expressions of Sir Josiah Child, "are twins, and have always, and ever will, wax and wane together. It cannot be ill with trade but lands will fall, nor ill with lands but trade will feel it." This reasoning cannot be controverted; and on its authority we are entitled to condemn every attempt to exalt one species of industry, by giving it factitious advantages, as being both impolitic and pernicious. It must be done at the expense of the others; and no preference can be given to agriculturists over manufacturers and merchants, or to the latter over the former, without having prejudicial results. Wherever industry is free, the interests of individuals and the public always coincide. And those who, in such circumstances, succeed best in increasing their own wealth necessarily also succeed best in increasing the wealth of the state of which they are subjects.

This dependence of the different branches of industry on each other, and the necessity of their co-operation to enable mankind to make any considerable progress in civilization, have been ably illustrated in an early number of the *Edinburgh Review*:—"It may safely be concluded, that all those occupations which tend to supply the necessary wants or to multiply the comforts and pleasures of human life, are equally productive, in the strict sense of the word, and tend to augment the mass of human riches,—meaning by riches all those things which are necessary, or convenient, or delightful to man. The progress of society has been productive of a complete separation of employments originally united. At first every man provided, as well as he could, for his necessities as well as his pleasures, and for *all* his wants as well as *all* his enjoyments. By degrees a division of these cares was introduced; the subsistence of the community became the province of one class, its comforts of another, and its gratifications of a third. The different operations subservient to the attainment of each of these objects were then entrusted to different hands; and the universal establishment of barter connected the whole of these divisions and subdivisions together,—enabled one man to manufacture for all, without danger of starving by not ploughing or hunting, and another to plough or hunt for all, without the risk of wanting tools or clothes by not manufacturing. It has thus become as impossible to say exactly who feeds, clothes, or entertains the community, as it would be to say which of the many workmen employed in the manufacture of pins is the actual pin-maker, or which of the farm-servants produces the crop. All the branches of useful industry work together to the common end, as all the parts of each branch co-operate to its particular object. If you say that the farmer feeds the community, and produces all the raw materials which the other classes work upon, we answer, that unless those other classes worked up the raw materials, and supplied the farmer's necessities, he would be forced to allot part of his labour to this employment, whilst he forced others to assist in raising raw produce. In such a complicated system it is clear that all labour has the same effect, and equally increases the whole mass of wealth. Nor can any attempt be more vain than theirs who would define the particular parts of the machine that produce the motion, which is necessarily the result of the *whole powers combined*, and depends on each particular one of the mutually-connected members." (Vol. iv., p. 362.)

Division of labour does not degrade the labourer.

The extent to which the division of labour is carried in manufacturing establishments, and the exclusive attention which it requires the workman to bestow on one operation, or on some portion thereof, has been supposed to exert a highly pernicious influence over his mental faculties. But we have seen that this is an exceedingly erroneous supposition, and that, in truth and reality, the work-people engaged in manufactures are, speaking generally, more intelligent than the ordinary run of agricultural labourers. (See MANUFACTURES.)

Manufactures not productive of increased mortality.

Much also has been said respecting the extraordinary mortality of large manufacturing establishments. The ready communication of contagion where people are crowded together,—the want of sufficient ventilation,—the confinement of children,—and the positive unhealthiness of some processes,—are circumstances from which most writers have been led to infer that the mortality in manufacturing cities *must* be unusually great, without giving themselves the trouble to inquire whether it really was so. The returns under the population acts have shown the fallacy of these opinions. Great Britain is at present infinitely more of a manufacturing country than in 1780; but, notwithstanding the vast increase during the intermediate period of what we have been in the habit of considering unhealthy employments, the average mortality in England and Wales in 1856 and 1857 was less than one in every forty-seven[1] of the existing population, whereas in 1780 it was probably more than one in every thirty-five. It may perhaps be said that this increased healthiness is mainly owing to improvements in agriculture,—to the drainage of bogs and marshes, the inclosure and cultivation of commons and wastes,—the influence of which has counteracted the increase of manufactures. But suppose this were admitted, we should have to inquire what had occasioned these extraordinary improvements in agriculture. And a moment's reflection would suffice to convince us that they have principally resulted from the improvement and extension of manufactures, and the consequently increased demand of the manufacturing population for the produce of the soil. A good deal, however, of the diminution of mortality is a direct rather than an indirect consequence of the circumstances referred to. Every one knows the vast importance, in respect of health, of people being supplied with comfortable clothes at a cheap rate. And that is one of the many advantages which grow out of improved manufactures. The reduction in the price of cotton goods, to notice one only of innumerable instances, occasioned by the greater facility with which they are produced, enables the poorer classes to clothe themselves in a comfortable and elegant dress, and is productive of an increase of enjoyment, of which it is difficult to estimate the extent.

Eulogium of Malthus on manufactures.

Malthus, whose leanings were all on the side of agriculture, has justly observed that "Most of the effects of manufactures and commerce on the general state of society are in the highest degree beneficial. They infuse fresh life and activity into all classes of the state, afford opportunity for the inferior orders to rise by personal merit and exertion, and stimulate the higher orders to depend for distinction upon other grounds than mere rank and riches. They excite invention, encourage science and the useful arts, spread intelligence and spirit, inspire a taste for conveniences and comforts among the labouring classes, and, above all, give a new and happier structure to society, by increasing the proportion of the *middle classes*,—that body on which the liberty, public spirit, and good government of every country must mainly depend." (*Observations on the Effects of the Corn Laws*, p. 29.)

Hence it would seem that those engaged in the different channels of employment contribute in nearly equal degrees to the general wellbeing; and though some rank higher in the public estimation than others, they are not on that account more indispensable. "The great author of order hath distributed the ranks and offices of men in order to mutual benefit and comfort, that one man should plough, another thresh, another grind, another labour at the forge, another knit or weave, another sail, another trade, another supervise all these, labouring to keep them all in order and peace; that one should work with his hands and feet, another with his head and tongue; all conspiring to the common end—the welfare of the whole, and the supply of what is useful to each particular member; every man so reciprocally obliging and being obliged; the prince being obliged to the husbandman for his bread, to the weaver for his clothes, to the mason for his palace, to the smith for his sword; those being all obliged to him for his vigilant care in protecting them, for their security in pursuing the work, and enjoying the fruit of their industry." (Barrow's Third Sermon on Industry.)

Rate of profit true test of the advantageousness of different employments.

Thus, from whatever point of view we may regard the division and combination of employments, we come to the same result. The inextinguishable passion for gain—the *auri sacra fames*—will always lead individuals to employ themselves and their stocks in those branches of industry in which, all things considered, wages and profits are highest. And we have seen that these are the employments in which it is most for the public interest that capital should be invested. The profits of a particular branch of industry are rarely raised except by an increased demand for its produce. Should the demand for cottons, owing to their being substituted for other articles now in use, be considerably augmented, their price would rise, so as to yield the manufacturers comparatively high profits. But profits in different employments constantly tend to equality; and they can never, unless monopolies interpose, continue either permanently higher or lower in one than in others. Whenever, therefore, the rise in the price of cottons had taken place, the manufacturers engaged in the trade would put forth all their energies and borrow additional capital, at the same time that a number of capitalists engaged in less lucrative employments would contract their engagements, and transfer a portion of their stock to where it would yield a larger return. The equilibrium of profit would thus be again restored. For the additional impetus given to the production of cottons, by proportioning their supply to the increased demand, would infallibly reduce their price to its proper level. Such is the mode in which the interests of individuals are in every case rendered subservient to those of the public. High profits attract capital; but high profits in particular businesses are the effect of high prices; and these are always reduced, and the commodities brought within the command of a greater number of purchasers, as soon as additional capital and work-people have been employed in their production. It is plain, therefore, that that employment is the best which yields the greatest profit; and if two capitals yield equal profits, it is a proof that the departments of industry in which they are respectively invested, how much soever they may differ in many respects, are equally beneficial. Nothing can be more nugatory than to apprehend that, under a free system, capital or work-people will be attracted to a disadvantageous employment. The one is determined by high profits, and the other by high wages; and their subservience to this irresistible influence is not more for their own than for the public advantage.

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[1] In 1856 the mortality was 1 in 49, and in 1857 it was 1 in 46.

PART III.

DISTRIBUTION OF WEALTH.

Having thus endeavoured to trace the various methods by which that labour which is the only source of wealth may be rendered most productive, and to exhibit the relation and dependence of the different kinds of industry, we proceed to the third division of our subject, or to an investigation of the laws regulating the proportions in which the various products of art and industry are distributed among the different classes of the people.

Sect. I.—*Primary Division of the Produce of Industry.—Value of Commodities measured in the Earliest Stages of Society by the Quantities of Labour expended in their Production.*

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It is evident that only three classes—labourers, capitalists, and owners of land—can be directly concerned in the production of commodities. It is to them, therefore, that all that is derived from the surface of the earth, or from its bowels, by the united application of immediate labour and capital, must primarily belong. The other classes, if such there be, have no revenue except what they derive, either voluntarily or by compulsion, from these three classes.

But although there be no state of society in which any class besides labourers, landlords, and capitalists, participates directly in the produce of industry, there are states of society in which that produce belongs to one only of these classes; and others in which it belongs to two of them, to the exclusion of the third. The reason is, that in the earlier stages of society, little or no capital being accumulated, there is no distinction between labourers and capitalists; and that, in all newly-settled and unappropriated countries, abundance of fertile lands may be obtained without paying any rent.

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In that remote period which preceded the establishment of property in land, and the accumulation of capital or stock,—when men roamed, without any settled habitations, over the surface of the earth, and existed by the appropriation of its spontaneous productions,—the whole produce of labour belonged to the labourer, and the quantity of it required to procure different articles formed the only standard by which their relative worth or exchangeable value could be estimated. "If among a nation of hunters," says Adam Smith, "it usually costs twice the labour to kill a beaver that it does to kill a deer, one beaver would naturally exchange for or be worth two deer. It is natural that what is usually the produce of two days' or two hours' labour should be worth double of what is usually the produce of one day's or one hour's labour.

"If the one species of labour should be more severe than the other, some allowance will naturally be made for this superior hardship; and the produce of one hour's labour in the one way frequently exchanges for that of two hours' labour in the other.

"Or if the one species of labour requires an uncommon degree of dexterity and ingenuity, the esteem which men have for such talents will naturally give a value to their produce superior to what would be due to the time employed about it. Such talents can seldom be acquired but in consequence of long application; and the superior value of their produce may frequently be no more than a reasonable compensation for the time and labour which must be spent in acquiring them. In the advanced state of society, allowances of this kind, for superior hardship and superior skill, are commonly made in the wages of labour; and something of the same kind must probably have taken place in the earliest and rudest period.

"In this state of things, the whole produce of labour belongs to the labourer; and the quantity of labour commonly employed in acquiring or producing any commodity is the only circumstance which can regulate the quantity of labour (of other commodities) which it commonly ought to purchase, command, or exchange for." (*Wealth of Nations*, p. 22.)

Thus far there is no room for doubt or difference of opinion. Where there are none but labourers, they only can share in its produce; and the quantity of labour required to produce articles or procure services forms the only standard by which their value is estimated. It is at this point, therefore, that the investigation of the laws which regulate the division of the produce of industry among the three great classes of labourers, capitalists, and landlords should properly begin: and we shall commence it by endeavouring, in the first place, to acquire a knowledge of the laws which determine the value of commodities in an advanced period of society, when circulating and fixed capital are employed in their production, and when land is appropriated and rent paid. A previous acquaintance with these laws is necessary to ascertain the principles which regulate their distribution.

Sect. II.—*Preliminary Considerations.—Equality of Wages and Profits.—Inquiry into the Effect of Variations of Demand and Supply on Value and Price.—Cost of Production shown to be their regulating Principle.*

Preliminary considerations.

If the popular opinions on this subject were well founded, the inquiry on which we are about to enter might be disposed of in a few words. The value of commodities, when compared with each other, and their value or price when compared with money, is held almost universally to depend on their abundance or scarcity in the market, compared with the demand. But though this statement has some it has but a very small admixture of truth. And it will be found that the prices of commodities are determined, speaking generally, by the cost of their production,—that is, by the quantities of labour required to produce them and bring them to market. Before, however, we proceed further, it may be proper, the better to facilitate our investigations in this and the following sections, to premise, that wherever industry is free, the rate of wages earned by the labourers in specified departments, and the rate of profit derived from the capital vested in them cannot, for any considerable period, taking everything into account, either fall below or rise above the rates of wages and profits accruing to the labourers and capitalists engaged in other departments.

Equality of the wages earned by the labourers engaged in different branches of industry.

With regard to the *first* of these positions, or the equality of the wages earned by those engaged in different employments, it is not meant to infer that all labourers receive precisely the same sum of money, or the same proportion of the produce of their labour. Such an opinion would be equally at variance with fact and with principle. Wages are a compensation made to the labourer for the exertion of his physical powers, or of his skill or ingenuity. They therefore vary according to the greater intensity of the labour to be performed, and to the degree of skill and ingenuity required. Wages would not be equal if a jeweller or engraver, for example, received no more than a common farm-servant or scavenger. A long course of training is required to instruct a man in the businesses of jewellery and engraving; and if this were not compensated by a higher rate of wages, none would choose to learn such difficult arts, and all persons would addict themselves, in preference, to such employments as hardly require any training. The cost of producing artificers or labourers regulates the wages they obtain, in the same way that the cost of producing commodities regulates their value. Artizans who practise a difficult or nice business lose all the time spent in their apprenticeship, as well as the clothes and provisions consumed during its currency. Hence, in addition to the rate paid to farm-servants and those who get little or no training, their wages should include a payment for the extra time and expense required to learn their business. If they be either more or less than are sufficient to compensate for this greater outlay on their education, work-people will, in the former case, be attracted to their peculiar departments, and in the latter they will leave them to go to others; this influx on the one hand, and efflux on the other, being sure to continue till wages have found their just and true level.

Besides this prominent cause of apparent inequality, wages vary in amount proportionally to the ease and hardship, the agreeableness and disagreeableness, the constancy and inconstancy, of employment. In the greater number of manufactures a journeyman may, except in periods of general distress, usually obtain constant employment. But there are several businesses, such as those of masons and bricklayers, that can neither be carried on in hard frost nor foul weather. Their earnings should therefore be sufficient not only to maintain them while they are employed, but also while they are idle, and to make them some compensation for those anxious and desponding moments which the thought of so precarious a situation must sometimes occasion. Hence, says Smith, "where the computed earnings of the greater part of manufacturers are nearly upon a level with the day-wages of common labourers, those of masons and bricklayers are generally from a half more to double those wages. Where common labourers earn four and five shillings a week, masons and bricklayers frequently earn seven and eight; and where the former earn nine or ten, as in London, the latter commonly earn fifteen and eighteen." (*Wealth of Nations*, p. 47.)

But these variations, instead of being inconsistent with the principle we have been endeavouring to establish, plainly result from it. Wages are not equal when each workman earns the same number of shillings or of pence in a given space of time, but when each is paid in proportion to the severity of the labour he has to perform, the degree of previous education and of skill that it requires, and the other causes of variation. So long, indeed, as competition is allowed to operate without let or hindrance of any kind, or as every one may employ himself as he pleases, the higgling of the market will always adjust the rate of wages, on the principle now mentioned; and it will, in reality, be nearly equal in different employments. If it were depressed in one department below the common level, labourers would leave it to go to others; and if it were raised above it, labourers would be attracted from the departments where wages were lower, until the increased supply had sunk them to their just level. A period of greater or less duration, according to the circumstances of the country at the time, is always required to bring about this equalization. But all theoretical inquiries, and such as have the establishment of principles for their object, either are or should be founded on periods of average duration; and when such is the case, we may always, without occasioning any error of consequence, assume that the wages earned in different employments are, all things considered, about equal.

Equality of the profits of the capital employed in different businesses.

In like manner, the profit accruing to the undertakers of different businesses varies proportionally to the greater or less risk, and other circumstances affecting the capital which is employed in them. It is obvious, indeed, that profits have not attained their proper level until they have been adjusted so as to balance these advantages and disadvantages. None would engage in unusually hazardous undertakings did the capital which they employ only yield the same profit that might be obtained by employing it in more secure businesses. None will voluntarily place their fortunes in situations of comparative danger. Extraordinary risk must be compensated. And hence the well-known distinction between *gross* and *nett* profit. Gross profit varies according to the risk, respectability, and agreeableness of different employments; whereas nett profit is the same, or nearly the same, in them all. A gunpowder manufacturer, for example, must obtain as much profit, over and above that which is obtained from the securest businesses, as will suffice to guarantee or *insure* his capital from the extraordinary risk to which it is exposed in a business of such extreme hazard. Were he to obtain *more* than this amount, additional capital would be attracted to the business; and were he to obtain *less*, capital would be withdrawn from it. The ever-acting principle of competition, or, which is the same thing, the self-interest of every individual, will not permit the wages or profits of any particular set of workmen or capitalists, taking all things into account, to continue either long below or long above the common and average rate of wages and profits obtained by those who are employed or have capital vested in other businesses. It is by this common standard that the wages and profits of particular businesses are always regulated; they never diverge considerably from it; they have a constant tendency to equalization; and may, in theoretical inquiries, be supposed, without occasioning any error of consequence, exactly to coincide.

The equality, or rather the constant tendency to equality, of the wages earned by the labourers, and of the profits derived from the capital employed at the same time in the various branches of industry, was pointed out by Harris, and also by Cantillon in his work entitled *The Analysis of Trade*, &c., published in 1759; but it was first fully demonstrated in the eighth, ninth, and tenth chapters of the first book of the *Wealth of Nations*. The establishment of this principle was one of the greatest services rendered by Adam Smith to the science. Nothing can be more convincing and satisfactory than his reasoning on this subject. The equality of wages and of profits has, since the publication of his work, been always assumed as admitted and incontestible.

Variations of demand and supply exert no permanent influence on price.

The equality of wages and profits once established, it is easy to see that variations in the demand and supply of commodities can exert no lasting influence over price. The cost of production, denominated by Smith and the Marquis Garnier necessary or natural price, is the ultimate regulator of the value of every commodity not subject to a monopoly, of which the quantity may be indefinitely increased by the application of fresh capital and labour to its production. The market price of such commodities and their cost do not always coincide; but they cannot for any considerable period be far separated, and have a constant tendency to equality. Commodities will not continue to be produced if they sell for *less* than the cost of their production; that is, for less than will repay the outlay upon them, including the ordinary rate of profit on the capital employed. This is a limit below which it is plain prices cannot be permanently reduced; and it is equally plain that were they for any considerable period to rise above it, additional capital would be attracted to the advantageous business, and the competition of the producers would lower prices.

A demand, to be effectual, must be such as will cover the expense of production. If it be insufficient to do this, it is insufficient to make commodities be produced and brought to market. A real demander must have the *power*, The will and the power to purchase necessary to constitute demand.

as well as the *will*, to purchase. A person with a sovereign in his pocket may be as anxious—nay, he may be ten times more anxious—to become the purchaser of a coach than of a hat. But while a sovereign will pay the expense of producing a hat, it will not pay the expense of producing a coach; and hence, though he may have the former, he cannot have the latter. Were such an improvement made in the art of coachmaking as should enable coaches to be manufactured as cheaply as hats, then a sovereign would buy a coach as easily as it now buys a hat. The demand for any particular commodity may become ten or twenty times more extensive, or it may decline in the same proportion; but if the cost of its production continue the same, its price will not permanently vary. If, for example, the demand for hats were suddenly doubled, their price would rise, and the hatters would make large profits; but this rise would only be of very limited duration; for the large profits, by attracting additional capital to the hat trade, would make an increased supply of hats be speedily brought to market; and if no variation took place in the cost of their production, their price would sink to its former level. Suppose, on the other hand, that the demand for hats is increased fivefold, and that the cost of their production is diminished in the same proportion: we should, notwithstanding the increased demand, be able in a short while to buy a hat for the fifth part of what it now costs. Again, suppose the demand for hats to decline, and the cost of producing them to increase, the price would, notwithstanding the diminished demand, gradually rise till it had reached the point at which it would yield the hatters the ordinary rate of profit on their capital. It is admitted that variations of demand and supply occasion temporary variations of price. But it is essential to observe that these variations are only temporary. The cost of production is the grand regulator of price—the centre of all those transitory and evanescent oscillations on the one side and the other; and wherever industry is free, the competition of the producers will always elevate or sink prices to this level.

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In branches of industry, such as agriculture, which are liable to be seriously affected by variations of the seasons, and from which capital cannot be easily withdrawn, there is a longer interval than in others before the market price of produce and the cost of its production are equalized. But such an equalization is sure to be brought about in the end. No farmer, and no producer of any description, will continue to bring corn, cattle, and other products to market, unless they sell for a price sufficient to pay the expense of their production, including the common and average rate of profit on the capital employed.[1] An excess of supply occasionally depresses the prices of corn and other farm produce below this level; and the occupiers of land are in consequence involved in difficulties; but such gluts do not continue. The cultivators of the worst soils are driven from their employment; a smaller supply is in consequence brought to market; and prices are adjusted so as to yield customary profits to the agriculturists who continue to prosecute their business. The interest of the cultivators will not permit prices to be permanently depressed below this level; and the interest of the public will not permit them to be permanently raised above it; for if they were raised above it, the cultivators would gain more than the common and average rate of profit, and capital would of course be attracted to agriculture, and would continue flowing in that direction until the equilibrium of profit had been restored—that is, as will be afterwards seen, until the price of agricultural produce had fallen to such a sum as would yield ordinary profits to the occupiers of the worst soils in cultivation, or the improvers of the best. This is the point at which *average* prices continue stationary, or about which market prices oscillate, until the cost of production increase or diminish. Were any great discovery made in agriculture—such, for instance, as would reduce the cost of cultivation a half, the price of agricultural produce would speedily fall in the same proportion, and it would continue to sell at that reduced rate till the stimulus which this fall would give to population, and the consequently greater demand for supplies of food, forced recourse to soils of less fertility. Whenever this took place, prices would again rise, unless the influence of the decreased fertility of the land were countervailed by some new improvement. Why is the price of corn almost invariably higher in England than in Russia and Poland? Is it not because of the greater cost of its production in this country?

Reason why gold is more valuable than silver.

A pound-weight of gold is at present worth about *fourteen* or *fifteen* pounds of silver. It cannot, however, be said that this is a consequence of the demand for gold being greater than that for silver, the reverse being the fact. Neither can it be said to be occasioned by an absolute scarcity of gold; for those who choose to pay a sufficient price for it may obtain it in any quantity they please. The cause of the difference in the price of the two metals consists entirely in the circumstance of its costing about *fourteen* or *fifteen* times as much to produce a pound of gold as to produce a pound of silver. That this is the case, is plain from the admitted fact, that the producers of gold do not gain any greater profit than the producers of silver, iron, lead, or any other metal. They have no monopoly of the business. Every one may go or send capital to California and Australia, and become a producer of gold; and wherever this is the case, competition will always make the product be sold at such a price as will pay the expenses of its production, and no more. Were a gold-mine discovered of equal productiveness with the silver-mines, the production of gold would immediately become the most advantageous of all businesses; an immense supply of that metal would in consequence be thrown upon the market, and its price would be gradually reduced to the same level as silver.

Reason why cottons have declined in price.

In further illustration of this principle, take the case of cottons. None can deny that the demand for them has been prodigiously augmented within the last ninety or a hundred years; and yet their price, instead of increasing, as it should have done had the popular theory of demand and supply been well founded, has been constantly and rapidly diminishing. If it be said that this is a consequence of the supply of cottons having augmented in a still greater ratio than the demand, we answer that this is not enough to explain the fall of price. The supply would not have been brought to market had not the diminution of prices, which has been constantly going on since the invention of spinning-jennies in 1767, been balanced by an equal diminution of their cost. It is to this principle — to the vastly increased facility of production, occasioned by the stupendous inventions and discoveries of Hargreaves, Watt, Arkwright, Crompton, and others—that the lower price and increased demand for cottons are wholly owing. Their extraordinary cheapness has brought them within reach of all classes; and enabled the poorest individuals to clothe themselves in a dress which, at the accession of George III., was fully as expensive as silk.

A like reduction of price, though seldom to the same extent, has been occasioned by the introduction of improved machinery and processes into most departments of manufacturing industry. And we may take this opportunity of observing, that this circumstance shows the error of those who estimate the condition of the labouring classes by comparing their wages with the price of corn; and who contend, if the former have not increased as much as the latter, that their condition has deteriorated. But this conclusion is not necessarily true, unless these classes subsisted on corn only, which, as everybody knows, is not the case. Other articles as well as bread enter largely into their food; and they must in addition be clothed, housed, and supplied with fuel, while they generally also have some command over luxuries. Hence it is apparent, that though wages should not have done more than preserve their former relation to corn, or should even have declined as compared with it, the condition of the labourers may, notwithstanding, have been very materially improved; inasmuch as what they have not gained or lost in corn, they may have more than gained in their greater command over the many other things required for their subsistence and wellbeing. And it would be easy to show that such has been the case, though not to the extent that might be wished for, here and in most other countries. But to return—

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[1] Some of the advocates of the agricultural interest have represented this as one of the "dangerous dogmas" of the Scotch Economists! But it can boast of a much more remote origin:—"*Nemo enim sanus*," says Varro, "*debet velle impensam ac sumptum facere in culturam, si videt non posse refici.*" (*De Re Rustica*, lib. i., § 2.)

Competition of the producers in a civilized society will always sink prices to the cost of production.

If a set of men were brought together from various countries, ignorant of each other's wants, and of the labour and expense necessary to produce the commodities which each possesses, these would be bought and sold according to the wants and fancies of the parties. In such circumstances, a pound of gold might be given for a pound of iron, and a gallon of wine for a gallon of small beer. As soon, however, as a commercial intercourse is established, and as the wants of society and the powers of production come to be well and generally known, an end is put to this method of bartering. Thousands of sellers then enter the market; and when such is the case, it is no longer possible to sell a pound of gold for a pound of iron; and why? because the producers of iron will undersell each other until they have, by their competition, reduced its price to such a sum as will suffice to pay the expense of its production. This, in every advanced society, is the pivot on which exchangeable value always turns. A civilized man may obtain articles from a savage, in exchange for toys or trinkets which it cost infinitely less to produce; but if he try to obtain the same advantage over his own countrymen, a very short experience will satisfy him that they are quite as clear-sighted and attentive to their own interests as he is.

Thus, then, it appears that no variation of demand, unaccompanied by a variation in the cost of production, has any lasting influence over price. If the cost of production be diminished, price will equally decline, though the demand should be increased to any conceivable extent. If the cost of production be increased, price will equally rise, though the demand should sink to the lowest possible limit.

Influence of monopolies.

It must always be remembered that this reasoning applies only to those commodities on which competition is allowed to operate without restraint, and whose quantity may be indefinitely increased by the application of fresh capital and industry to their production. When an individual, or class of individuals, obtains the exclusive privilege of manufacturing certain species of goods, the principle of competition is suspended with respect to them, and their price depends on the proportion in which they are brought to market compared with the demand. If monopolists supplied the market liberally, or kept it as fully stocked as it would be under a free system, their commodities would sell at their natural price, and the monopoly would have no disadvantage other than the exclusion of the public from an employment which every one should have leave to carry on. In point of fact, however, the market is never fully supplied with monopolized commodities. Producers universally endeavour to obtain the highest prices for their commodities; and when they are protected by a monopoly against being undersold by others, they either keep the market understocked, or supply it with inferior articles, or both. Under such circumstances, the prices of articles which cannot be easily smuggled from abroad, or clandestinely produced at home, may be elevated to the highest point to which the competition of the buyers can raise them; and may in consequence amount to five, ten, or twenty times the sum they would fetch were competition permitted to operate in their production. The *will* and *power* of the purchasers to offer a high price forms the only limit to the rapacity of monopolists.

Besides the articles produced under artificial monopolies, there is another class whose quantity cannot be increased by human industry, and whose price is not therefore dependent on the cost of production. Ancient statues, vases, and gems, the pictures of the great masters, some species of wines produced in limited quantities from soils of a particular quality and exposure, and a few other articles, come under this description. As their supply cannot be increased, their price varies inversely as the demand, and is totally unaffected by anything else.

It must also be understood, in saying that the cost of production is the regulating principle of value, that the statement applies to those articles only, the demand for which is sufficient to pay this cost, or to make them be produced. When corn falls or rises in price because of a good or a bad harvest, or black cloth or silk rises or falls because of the occurrence of a public mourning or a rejoicing, everybody is aware that the disturbance is temporary only, and that prices will be speedily adjusted to their common and ordinary level. But when, owing to a change of fashion or other cause, the demand for furniture, books, prints, and articles of a durable description, falls considerably off, their price sinks permanently below the cost of their production. The latter, indeed, has no influence over the price of articles which have ceased to be in efficient demand. Some half dozen or dozen individuals may be anxious to procure copies of a book, or of an edition of a book, which has been long out of print. But as the demand of the parties would not suffice to defray the cost of reprinting the work, the stray copies that may occasionally cast up are sold for the highest price the buyers are disposed to offer, without their being affected in any degree by the original cost of the book, of which, indeed, they most probably know nothing. And supposing, on the other hand, that a considerable impression of a book has been thrown off, and that the anticipated demand for it has not been realized, it will in no very lengthened period come to be sold for a third or a fourth part, or less, of its cost. Hence when it is affirmed that, in the long run, the prices of commodities or services are determined by their cost, it is always to be remembered that the principle is limited to those products or services for which there is a demand considerable enough to make them be supplied. If such be not the case, their prices may continue sunk far below, though they cannot exceed, what it would take to bring them to market. Suppose that an article would cost 20s. for its production, but that, from its getting out of fashion, none will give more than some 15s. or 16s. for the quantities of it on hand: in such circumstances, no more of it will be produced, and its price will no longer be dependent in any degree on the sum required to furnish the market with fresh supplies. But articles of this description make a comparatively unimportant class. They have ceased to be produced; and for all practical purposes it is true to say that in periods of average duration the prices of products and services are determined by the cost of their production.

Average price always coincident with cost of production.

When a fall takes place in the price of a commodity which is in efficient demand, it cannot be said whether it be really advantageous until it be learned whether its cost has been equally diminished. If this be the case, the fall of price will not be disadvantageous to the producers, and will be permanent; but if this be not the case,—if the cost of production continue the same, or has not fallen in the same ratio as the price,—the fall must be injurious to the producers, and prices will in no very lengthened period attain to their former level. It is the same with a rise of prices. No rise can be permanent unless the cost of production be proportionally increased. If it remain stationary, or do not increase in a corresponding degree, prices will decline as soon as the ephemeral causes of enhancement have disappeared.

The extreme importance of having correct opinions respecting the regulating principle of price, and the discordant and erroneous opinions so very prevalent with regard to it, will, we hope, be deemed a sufficient apology for the length of the previous remarks, and for the insertion of the following paragraph from the *Histoire de la Monnaie* of the Marquis Garnier, in which the doctrine we have been endeavouring to establish is enforced with equal ability and eloquence.

Opinion of the Marquis Garnier.

"Mais les producteurs tendent continuellement à régler la quantité des productions sur la somme des demandes; ils ne resteront pas au-dessous de ce point, sans être tentés d'accroître la masse de leurs produits; et ils ne peuvent le dépasser sans s'exposer à perdre. Ces deux quantités, celle des produits et celle des demandes, s'efforcent donc à se mettre en équilibre l'une avec l'autre. Il existe donc un point de repos vers lequel elles gravitent chacune de son côté; un point qui est leur niveau, et c'est ce point qui constitue le *prix naturel* de la chose vénale. Quelle est la limite au-délà de laquelle le producteur ne peut porter la quantité de ses produits? C'est le prix naturel; car, s'il ne peut obténir ce prix pour tout son produit, il sera en perte. Quelle est la borne des demandes du consommateur? C'est le prix naturel; car il ne veut pas donner plus que l'équivalent de ce qu'il reçoit. Si, par une découverte, ou par un perfectionnement de l'industrie, le producteur est mis à même d'établir l'article sur lequel il s'exerce à moins de temps et de dépense, alors le prix naturel baissera, mais aussi la somme des demandes accroîtra dans une proportion pareille, parce que plus de consommateurs seront en état de payer ce prix naturel, moins élevé que l'ancien. Le prix naturel sera toujours, pour chaque chose vénale, la limite commune au-délà de laquelle la somme des demandes de cette chose et la quantité de sa production ne devront plus faire de progrès. Quand le prix courant est le prix naturel, le producteur et le consommateur se donnent réciproquement l'équivalent de ce qu'ils reçoivent. Quand le prix courant s'écarte du prix naturel, ou c'est la consommation qui souffre au profit de la production, ou c'est la production qui souffre au profit de la consommation. Cet état de souffrance ne peut durer, et de-là procèdent les variations du prix courant. Ces variations, que Smith a expliquées et analysées avec une si parfaite lucidité, ne sont autre chose que les efforts pour revenir au prix naturel. Tenter d'expliquer ces variations, sans reconnaître l'éxistence d'un prix naturel, ce serait vouloir expliquer les oscillations du pendule sans convenir de sa tendance vers un centre de gravitation; ce serait supposer un effort sans but et sans mobile; ce serait admettre le mouvement et nier le repos; enfin, en voyant les phénomènes du cours des fluides et de l'équilibre des solides, ce serait contester les lois du niveau et de la pesanteur. Si les choses vénales n'ont point de prix naturel, alors les mouvements de la circulation seront dirigés par une force aveugle et inconnue; les prix moyens ne seront plus que le résultat de chances purement fortuites; il n'y aura plus d'équivalent réel; les valeurs n'auront plus de mesure naturelle; l'économie politique ne pourra plus aspirer à être au rang des sciences, puisqu'elle manquera du caractère essentiel qui les constitue telles, et que les faits dont elle traite ne seront plus fondés sur les lois immuables de la nature." (Tome i., Introduction, p. 62.)

Having thus shown that the *cost of production* is the regulating principle of price, we shall now proceed to investigate the elements which enter into and constitute this cost in an advanced state of society, when rent is paid for land, and circulating and fixed capital employed to assist the labour of workmen. This is, of all others, the most important, as it is the most radical inquiry in that part of the science which treats of the distribution of wealth; and it is indeed impossible, without possessing accurate notions on this subject, to advance a single step without falling into errors. We shall begin by endeavouring to ascertain whether rent enters into the cost of production.

SECT. III.—*Nature, Origin, and Progress of Rent.—Not a Cause, but a Consequence, of the High Value of Raw Produce.—Does not enter into Price.—Distinction between Agriculture and Manufactures.—Practical Considerations.*[1]

Definition of rent.

Rent is properly "that portion of the produce of the earth which is paid by the occupier to the landlord for the use of the *natural and inherent* powers of the soil." If buildings have been erected on a farm, or if it have been inclosed, drained, or in any way improved, the sum which a farmer will pay to the landlord for its use will be composed not only of what is properly rent, but also of a remuneration for the use of the capital laid out on its improvement. In common language, these two sums are always confounded under the name of rent; but in an inquiry of this nature it is necessary to consider them as perfectly distinct. The laws by which rent and profits are regulated being totally different, those which govern the one cannot be ascertained if it be not considered separately from the other.

No rent paid on the first settling of any country.

On the first settling of any country abounding in large tracts of unappropriated land, no rent is paid; and for the obvious reason, that no person will pay rent for what may be procured in unlimited quantities for nothing. Thus, in New Zealand, where there is an ample supply of unappropriated land, it is certain that, until the best lands are cultivated, no such thing as rent will ever be heard of. Suppose, however, that tillage has been carried to this point, and that the increasing demand can, in the actual state of agriculture, be no longer supplied by the best lands; it is plain that either the increase of population must cease, or the inhabitants consent to pay such an additional price for raw produce as will enable the *second* quality of land to be cultivated. No advance short of this will procure them another bushel of corn; and competition will not, as will be immediately seen, allow them to pay more for it. They have therefore but one alternative. If they choose to pay a price sufficient to cover the expense of cultivating land of the second quality, they will obtain additional supplies; if they do not, they must want them.

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[1] The theory of rent explained in this chapter was first promulgated and satisfactorily established in a tract on the Corn Laws, Edinburgh, 1777 (see pp. 45–47). The author of this original and most important theory, Dr James Anderson, was a native of Hermandston in Mid-Lothian, and subsequently editor of the *Bee* and other publications; in one of which (*Observations on Agriculture and Natural History*, &c., v., pp. 401–405) he gave a new exposition of his theory. But notwithstanding the clear and able manner in which he explained his doctrines, and their ingenuity and importance, they do not appear to have attracted the least attention, and seem to have been completely forgotten. So much so was this the case, that when Mr Malthus (*An Inquiry into the Nature and Progress of Rent*) and Sir Edward West (*Essay on the Application of Capital to Land*, by a Fellow of University College, Oxford) published tracts in 1815 explaining the nature and origin of rent, they were universally believed to be the authors of the theory. There is, we believe, no doubt as to their originality. Still, however, they were merely expositors of what had been clearly and ably explained about forty years previously to the publication of their pamphlets.

Origin of rent.

Suppose, now, that the consumers offer such a price as will pay the expense of producing corn on soils which, in return for the same expenditure as would have produced 100 quarters on lands of the *first quality*, will only yield 90 quarters; it is plain it will then be indifferent to a farmer whether he pay a rent of ten quarters for the first quality of land, or farms the second quality, which is unappropriated and open to him without paying any rent.

Progress of rent.

If the population went on increasing, lands which would yield only 80, 70, 60, 50, &c. quarters in return for the same expenditure that had obtained 100 quarters from the best lands, might be successively brought under cultivation. And when recourse had been had to these inferior lands, the rent of the higher qualities would plainly be equal to the difference, or the value of the difference, between their produce and the produce of the worst quality under cultivation. Suppose, for example, that the worst quality under cultivation yields 60 quarters, then the rent of the *first* quality will be 40 quarters, or $100 - 60$; the rent of the *second* quality would, in like manner, be equal to the difference between 90 and 60, or 30 quarters; the rent of the third quality to $80 - 60$, or 20 quarters, and so on. But it is material to remark, that the produce raised on the land last cultivated, or with the capital last applied to the soil, is always sold at its *necessary price*, or at that price which is just sufficient to yield the cultivators the common and average rate of profit, or, which is the same thing, to cover the cost of its production. If the price were above this level, then agriculture would be the best of all businesses, and tillage would be immediately extended; while, on the other hand, if the price were below it, capital would be withdrawn from the soil, and the poorer lands thrown out of cultivation. Under such circumstances, it is clear that no rent would enter into the price of the produce raised by means of the capital last applied to the soil. It is entirely made up of wages and profits. The proprietors of the superior lands obtain rent; but this is the result of their greater fertility. The demand cannot be supplied without cultivating inferior soils; and, to enable them to be cultivated, their produce must fetch such a price as will afford the ordinary rate of profit to their cultivators. This price will, however, yield a surplus, over and above the ordinary rate of profit, to the cultivators of the more fertile lands, and *this surplus is rent.*

An increase of rent is not, therefore, as is very generally supposed, occasioned by improvements in agriculture, or by an increase in the fertility of the soil. It results from the necessity of resorting, as population increases, to soils of a *decreasing* degree of fertility, and from the inability to apply capital indefinitely to the best land without a diminished return. Rent varies inversely as the amount of produce; that is, it increases when the produce of agricultural labour diminishes, and diminishes when the produce increases. That labour is best rewarded in countries like New Zealand, Indiana, and Minnesota, and generally in all situations in which no rent is paid, and the best lands only are cultivated.

A quarter of wheat may be raised in the Vale of Gloucester or the Carse of Gowrie, for perhaps a *fourth* or a *fifth* part of the expense necessary to raise it on the worst soils in cultivation in other parts of the kingdom. There cannot, however, be at the same time two or more prices for the same article in the same market. And it is hardly necessary to say, that unless the price of wheat be such as will indemnify the producers of the portion of the crop which is raised on the worst soils, they will cease bringing it to market, and the required supplies will not be obtained; and it is equally plain, that if its price exceed this sum, fresh capital will be applied to its production, and competition will eventually sink prices to their natural level,—that is, to a sum sufficient to afford ordinary profits to the growers of that portion of the required supply which is raised in the most unfavourable circumstances, and at the greatest expense. The cost of producing this portion determines the price of the rest. And hence it is indifferent to the consumers whether, in an advanced stage of society, the excess of return over the cost of production on the best lands belong to a non-resident landlord or an occupier. It must belong to the one or the other. Corn is not high because a rent is paid, but a rent is paid because corn is high—because the demand is such that it cannot be supplied without cultivating soils of a diminished degree of fertility as compared with the best. Suppose there is an effectual demand for ten millions of quarters, of which *one* million must be raised on lands that yield nothing but the ordinary rate of profit to their cultivators: it is clear that, though the rents payable by the cultivators of the superior lands were relinquished, that would be no boon to the cultivators of the inferior lands. It would not lessen their expenses; that is, it would not lessen the amount of capital and labour required to produce that portion of the necessary supply that is raised under the most unfavourable circumstances; and, unless it did this, it is impossible, supposing the demand not to decline, that it should lower prices. Although, therefore, landlords were to give up the whole of their rents, their ill-judged liberality would not cheapen anything. It would turn farmers into landlords, and landlords into beggars; but there its effect would stop. But the case is altogether different when the cost of production varies. If it be diminished, the competition of the producers never fails to sink prices in an equal degree; while, if it be increased, supplies will cease to be brought to market, unless the price rise to a corresponding level. In no case, therefore, whether the demand be great or small,—whether for a million or ten million quarters,—can the price of raw produce permanently exceed or fall below the cost of producing that portion of the necessary supply which is raised on the worst land, or with the last capital laid out on the soil.

Objections to this theory.

Various objections have been made to this theory. In the *first* place, it has been said that, though it may hold in a country like Australia, where land is not appropriated, yet that the worst land in civilized and appropriated countries, like England, always yields some small rent to the proprietor; and that therefore it cannot be said that the price of produce is, in such countries, determined by the cost of raising it on that quality of land which pays no rent.

It has been justly observed of this objection, that even were it well founded, it would not practically affect any of the conclusions we have endeavoured to establish. There are in England and Scotland thousands of acres of land which do not let for L.100; but to cultivate them would require an outlay of many thousands, and the rent would consequently bear so small a proportion to the expenses of production as to become altogether evanescent and inappreciable.

Land in every extensive country which yields no rent.

There can be no doubt, however, that there is in this, and most other extensive countries, a great deal of land which yields no rent. In the United States and Russia this is unquestionably the case; and yet no one presumes to say that the laws which regulate rent in these countries are different from those which regulate it in England and France. The poorest lands are always let in immense tracts. If it were attempted to let particular portions of these tracts separately, they would bring no rent; but they appear to yield rent, because, though rent is not paid for

Payment of rent on all soils not inconsistent with the principle that rent does not enter into price.

them, it is paid for the more fertile spots intermixed with them. But though it were true that every rood of land in Britain paid rent, it is easy to see that that payment would not affect the price of raw produce. The rent of a country consists of the difference, or the value of the difference, between the produce obtained from the capital first applied to the land and that which is last applied to it. It would, as already seen, be exactly the same thing to a cultivator whether he paid a rent of ten quarters for land yielding, with a certain outlay, a hundred quarters of corn, or employed the same capital in cultivating inferior land yielding only ninety quarters, for which he paid no rent. Were it possible always to obtain the same amount of produce for every equal additional capital applied to the superior soils, those of an inferior quality would never be cultivated. But the fact that, in the progress of society, new and less fertile land is always brought into cultivation, demonstrates that additional capital and labour cannot be indefinitely applied with the same advantage to the old land. The population of a particular country may be so dense, and the demand for agricultural produce so great, that every quality of land may actually yield rent; but it is indifferent if capital be employed on land which yields only the return of stock with its ordinary profits, whether it is employed on old or new land. Now, that there is a very large amount of capital employed in such a manner in this and every other country is abundantly certain. A farmer who rents a farm, besides employing on it as much capital as will, at the current prices, enable him to pay his rent, obtain average profits, and replace his stock previously to the expiration of his lease, will employ additional capital, if it will only replace itself, and afford ordinary profits. His employing this additional capital depends entirely on prices being such as will repay his expenses and profits; for he knows he will have no additional rent to pay. The true and universal theorem is, that if the last capital carried to agriculture yield more than the ordinary rate of profit, it will be increased till prices sink so as to yield that rate only; and that, in the event of their sinking so as to yield a less rate, the outlay of capital on the land will cease, and portions of it engaged in farming will be carried to other businesses, till prices and profits have been raised to their proper level. Hence, speaking generally, it appears that in every case, whether the last quality of land taken into cultivation yield rent or not, the last capital applied to the soil yields only ordinary profits; and consequently, the price of the produce which it yields, and which regulates the price of the rest, is totally unaffected by rent.

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It has, in the *second* place, been objected to this account of the nature and causes of rent, that it takes for granted that landlords in extensive countries permit the farmers of the worst lands to occupy them without paying any rent. But it is easy to see that this is a mistake. Raw produce is kept down to its necessary price by the competition of farmers, and not by that of landlords. Though there is a very wide difference, in extensive countries, between the best and worst soils, the gradation from the one to the other is gradual, and almost imperceptible. The best differ but little from those immediately inferior to them, and the worst from those immediately above them. And hence it is as impossible to show where the first quality ends and the second begins, or where the second ends and the third begins, as it is to point out the line of demarcation between the contiguous colours of the rainbow. Now, suppose that the numbers 1, 2, 3, 4, 5, 6, 7, &c., designate the different qualities of soil in an extensive country, and suppose that the effectual demand for raw produce is such as will afford the common and average rate of profit to those who cultivate land of the *fifth* degree of fertility, or that represented by No. 5: when such is the case, there can be no doubt that No. 5 will be cultivated; for, besides the peculiar attractions which agriculture possesses, it would be quite as advantageous to cultivate it as to engage in any other business. It would not, however, be more advantageous; for its produce would yield no surplus in the shape of rent. But suppose that a combination took place among the proprietors of Nos. 1, 2, 3, 4, and 5, to withhold a portion of their produce from market; and that, in consequence of this or any other cause, the price of corn is raised a little above the expense of its production on No. 5; in that case it is obvious that soils of the *very next* degree of fertility, or that portion of No. 6 which, in point of productive power, differs extremely little from No. 5, would be brought under cultivation, and the increased supply would infallibly sink prices to the level that would afford the average rate of profit, and no more, to the cultivators of No. 5, or of the poorest soils which the supply of the effectual demand renders it necessary to cultivate. It is quite the same, therefore, in so far as price is concerned, whether a country be appropriated or not. When it is appropriated, prices are kept down to their lowest limit by the competition of the landlords. And it is by the same principle,—the cost of producing the portion of the necessary supply which is raised under the most unfavourable circumstances,—that the price of raw produce is determined in England and France, and in New Holland and Minnesota.

Does not account both for a rise and fall of price in the same way.

But then it is said that this reasoning involves a contradiction; that it accounts for a rise and a fall of price in the same way, or by an extension of cultivation! In truth and reality, however, it does no such thing. The market price of corn will always be low where it is cheaply produced, as in Poland; and it will occasionally be low where it costs a great deal to produce it, when a redundant supply is brought to market. Suppose, as before, that the effectual demand for corn in Great Britain is such as will enable lands of the *fifth* degree of fertility to be cultivated; but that, owing to variable harvests, to injudicious encouragement held out by the legislature, the ardour of speculation, the miscalculation of farmers, or any other cause, lands of the *sixth* degree of fertility have been cultivated; the increased quantity of produce that must thus be thrown on the market will plainly depress prices to such an extent that, instead of yielding average profits to the cultivators of No. 6, they will not yield them to the cultivators of No. 5. But they will yield *more* to them than to the cultivators of No. 6. The latter, therefore, will be first driven from their business; and when they have retired, prices will rise, not indeed to such a height as to enable No. 6 to be cultivated, but so high as to enable the cultivators of No. 5 to continue their business; that is, as has been already shown, to such a sum as will enable the raisers of the last portion of the necessary supply to obtain the common and average rate of profit. Should the demand, instead of continuing stationary, increase so that it could not be supplied without cultivating Nos. 6 and 7, the price will rise in proportion to the increased expense of their cultivation. But to whatever extent the demand might increase, still, were such an improvement made in agriculture, or in the art of raising corn, as would enable the supply to be raised from No. 1 only, the price would infallibly fall to the sum that paid the expenses of its cultivators, and rent would entirely disappear.

Answer to the objection, that the best lands are not always first cultivated.

The intelligent trader will easily perceive, when it is said that superior lands are the first to be brought into cultivation, that the statement is not made absolutely, but with reference to the capacities of the cultivators. Lands endowed with a high degree of natural fertility are often, in thinly-peopled countries, either heavily timbered or so very wet as to be totally unfit for tillage; and wherever this is the case, cultivation is confined at first to open, dry, or down lands. The latter are, in fact, the most fertile which it is in the power of the inhabitants to cultivate. After population has become denser, and capital been accumulated, the neglected lands will most likely be cleared, drained, and brought into tillage. But it by no means follows, though they may yield a greater amount of produce per acre, that they are therefore more fertile than those first cultivated. The presumption, indeed, is all the other way. Fertility, it is to be remembered, does not depend merely on quantities of produce, but on the quantities compared with the outlay required for their production; so that, if an acre of a certain description of land produce 50 bushels of wheat to an outlay of L.100, and an acre of a different description produce 35 or 40 bushels to an outlay of L.50, the latter is by far the more fertile of the two; and when both qualities of land are cultivated, the last will bring a large rent. It is, indeed, absurd to suppose that men will resort in preference to what is really inferior land. Whatever Mr Carey[1] or any one else may say to the contrary, such folly must be of rare occurrence, and it may be safely laid down that those lands which, all things considered, are the most fertile, will be first brought into cultivation.

Distinction between agriculture and manufactures and commerce.

Tendency of manufactured products to fall in price.

This analysis of the nature and causes of rent discovers a fundamental distinction between agricultural and commercial and manufacturing industry. In manufactures, the worst machinery is first set in motion; its powers are progressively improved by new inventions; and it is rendered capable of yielding a greater amount of produce with the same expense. And as no limits can be assigned to the quantity of improved machinery that may be introduced; as a million of steam-engines may be constructed for the same, or rather for a less, proportional expense than would be required for the construction of one; the competition of capitalists never fails to reduce the price of manufactured commodities to the sum which the least expensive method of production necessarily requires for their production.

Tendency of agricultural products to rise in price.

In agriculture, on the contrary, the best machinery, that is, the *best soils*, are first brought under cultivation, and recourse is afterwards had to inferior soils, requiring a greater expenditure of capital and labour to produce the same supplies. The improvements in the construction of farming implements, and the meliorations in agricultural management, which occasionally occur, countervail to a greater or less extent the decreasing fertility of the soil. But the fall of price, which is permanent in manufactures, is only temporary in agriculture. A fall in the price of raw produce, by enabling every class to obtain greater quantities than before for their products or their labour, raises the rate of profit, and leads of course to an increased accumulation of capital; and this necessarily leads to a greater demand for labour, to higher wages, to an increased population, and consequently to a further demand for raw produce and an extended cultivation. Agricultural improvements check for a while the necessity of having recourse to inferior soils and the rise of rents; but the check cannot be lasting. The stimulus which they at the same time give to improvement and population is sure in the end to raise prices, and, by forcing recourse to poor lands, to raise rents.

Earth compared by Malthus to a series of machines endowed with different productive powers.

Malthus, in illustrating this important distinction between agricultural and manufacturing industry, set the doctrine of rent in a striking point of view. "The earth," he observes, "has been sometimes compared to a vast machine, presented by nature to man for the production of food and raw materials; but to make the resemblance more just, as far as they admit of comparison, we should consider the soil as a present to man of a great number of machines, all susceptible of continued improvement by the application of capital to them, but yet of very different original qualities and powers.

"This great inequality in the powers of the machinery employed in procuring raw produce, forms one of the most remarkable features which distinguishes the machinery of the land from the machinery employed in manufactures.

"When a machine in manufactures is invented which will produce more finished work with less labour and capital than before, if there be no patent, or as soon as the patent is over, a sufficient number of such machines may be made to supply the whole demand, and to supersede entirely the use of all the old machinery. The natural consequence is, that the price is reduced to the price of production from the best machinery; and if the price were to be depressed lower, the whole of the commodity would be withdrawn from the market.

"The machines which produce corn and raw materials, on the contrary, are the gifts of nature, not the works of man; and we find by experience that these gifts have very different qualities and powers. The most fertile lands of a country, those which, like the best machinery in manufactures, yield the greatest products with the least labour and capital, are never found sufficient to supply the effective demand of an increasing population. The price of raw produce, therefore, naturally rises till it becomes sufficiently high to pay the cost of raising it with inferior machines, and by a more expensive process; and as there cannot be two prices for corn of the same quality, all the other machines, the working of which requires less capital compared with the produce, must *yield rents in proportion to their goodness.*

"Every extensive country may thus be considered as possessing a gradation of machines for the production of corn and raw materials, including in this gradation not only all the various qualities of poor land, of which every large territory has generally an abundance, but the inferior machinery which may be said to be employed when good land is further and further forced for additional produce. As the price of raw produce continues to rise, these inferior machines are successively called into action; and as the price of raw produce continues to fall, they are successively thrown out of action. The illustration here used serves to show at once the necessity of the actual price of corn to the actual produce, and the different effect which would attend a great reduction in the price of any particular manufacture, and a great reduction in the price of raw produce.

"I have no hesitation, then, in affirming, that the reason why the real price of corn is higher, and continually rising, in countries which are already rich, and still advancing in prosperity and population, is to be found in the necessity of resorting constantly to poorer land,—to machines which require a greater expenditure to work them,—and which consequently occasion each fresh addition to the raw produce of the country to be purchased at a greater cost:—in short, it is to be found in the important truth, that corn is sold at the price necessary to yield the actual supply; and that, as the production of this supply becomes more and more difficult, the price rises in proportion.

"I hope to be excused for having dwelt so long, and presented to the reader in various forms, the doctrine that corn, in reference to the *quantity actually produced*, is sold at its necessary price, like manufactures, because I consider it as a truth of the highest importance, which has been entirely overlooked by the economists, by Dr Smith, and all those writers who have represented raw produce as selling always at a monopoly price." (*Inquiry into the Nature and Progress of Rent*, p. 37.)

It appears, therefore, that in the earliest stages of society, and when only the best lands are cultivated, no rent is paid. The landlords, as such, do not begin to share in the produce of the soil until it becomes necessary to cultivate lands of an inferior degree of fertility, or to apply capital to the superior lands with a diminished return. Whenever this is the case, rent begins to be paid; and it continues to increase according as cultivation is extended over poorer soils, and diminishes according as they are thrown out of cultivation. Rent therefore depends exclusively on the extension of tillage. It is high where tillage is widely extended over inferior lands, and low where it is confined to the superior descriptions only. But in no case does rent enter into price; for the price of that portion of the required produce which is raised on the poorest lands, or with the capital last applied to the soil, determines the price of the whole, and that portion yields no surplus above the common and average rate of profit.

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[1] An American, the author of a great many crude and indigested economical works.

nfluence f situation n rent.

In estimating rent, difference of situation has in many cases an influence similar to difference of fertility. Lands that are situated in the immediate vicinity of a large town uniformly bring higher rents than those that are situated some twelve, twenty, or thirty miles off, provided the latter have no other market. The town affords a ready outlet for a great variety of articles for which there is little or no demand in the country; and though each of these may be trifling, yet their aggregate amount is usually considerable. Inasmuch, too, as the cost of conveying articles varies with the distance and difficulty of the roads along which they have to be carried, the less charge on those raised in the vicinity of markets enables their growers to pay a proportionally greater amount of rent. To preserve this advantage, the landlords of the counties contiguous to the metropolis opposed in 1767 the extension of turnpike roads to those situated at greater distances. But though their selfish policy had been in so far successful, it would not have gained their object unless they had been able to get obstructions laid on the navigation of the Thames. And had these also been imposed, the result would have been, that by checking or preventing the growth of the city, they would not have realized a tenth part of the advantage from their monopoly that they now reap from the all but boundless market which it affords for all the products, whether of the nearest or most distant parts of the empire.

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To prevent misapprehensions, it may be as well, perhaps, to repeat that the theory of rent which has now been explained refers only to the sums paid for the use of the soil, without including those which are also paid under the name of rent for the services rendered by the capital that has been expended upon the soil. But in all tillage farms this latter portion makes a part, and often a very large part, of what is popularly called rent. Even in the best farms the payments on account of houses, fences, and roads are usually far from being an inconsiderable portion of the rent; while the rent of such naturally inferior farms as have been highly improved, consists almost entirely of the profit of the outlay upon them. Hence the necessity, if we would avoid falling into the most serious errors, of distinguishing between the different constituents of the gross rent paid for lands. It may be supposed, perhaps, that if two farms let for the same sum—as L.500 or L.1000 a year each—that they are therefore of the same value; and this would be the case if they were of the same or nearly the same quality. But if they be of different qualities, the one consisting of fine and the other of poor but highly-improved land, they would, if offered for sale, bring very different prices. For, as the rent of the superior farm consists mainly of a payment for the use of the natural powers of the soil, it may be considered as a perennial source of income; whereas the rent of the inferior farm, being derived from improvements which wear out and require to be renewed, is of comparatively transient duration, and worth so much less.

The circumstances now mentioned ought always to be taken into account when taxes and other burdens are imposed on land. And the all but insuperable difficulty of making proper allowances for their influence has been a main cause of the unjust and pernicious operation of such taxes.

It may further be observed, that the theory of rent now explained is practically applicable only to countries in something like the same condition as England; that is, to countries in which the tenants and occupiers of land farm it to realize ordinary profits on their capital, under a system of free competition. But in many countries of Europe the occupiers have little or no capital except what is furnished to them by the landlords, the produce being divided between them in certain proportions, of which the least generally goes to the tenant. In India and the greater number of eastern countries the sovereign is held to be the proprietor of all the lands of the empire; and the exorbitant amount of the land-tax or rent imposed on the cultivators, added to the impossibility of its being fairly assessed, make it a powerful obstacle to improvement, and a fruitful source of barbarism. But it is enough to have indicated the nature and importance of some of the practical questions connected with the theory of rent; to enter further into their enumeration or discussion would be inconsistent with the objects and limits of this article.

It being thus established that the circumstance of land being appropriated, and rent paid to the landlords, does not affect the price of commodities, or the principle which determined their exchangeable value in the earliest stages of society, we have next to inquire into the effects of the accumulation and employment of capital, and of the rise and fall of wages on the value of commodities.

Sect. IV.—*Influence of the Accumulation and Employment of Capital, and of Fluctuations in the Rate of Wages on Exchangeable Value.*

Value of commodities regulated by the amount of immediate labour and capital expended in their production.

It will be remembered that the quantity of labour required to produce commodities and bring them to market, formed, in the earliest stages of society, and before capital was accumulated, the standard by which their exchangeable value was regulated. But capital is merely the accumulated produce of *anterior labour;* and when it is employed in the production of commodities, their value is not determined by the quantity of immediate labour only, but by the total quantity of immediate and accumulated labour or capital necessarily laid out on them. Suppose that an individual can by a day's labour, without the assistance of capital, kill a deer; but that it requires a day's labour to construct the weapons necessary to enable him to kill a beaver, and another day's labour to kill it; it is evident, supposing the weapons to have been rendered useless in killing the beaver, that it took as much labour to kill the latter as was required to kill two deer, and the beaver would therefore be worth the two deer. The durability of the weapons, or capital of the beaver hunter, is obviously an element of the greatest importance in estimating the value of the animals he has killed. Had the weapons been more durable than has been supposed,—had they served, for example, to kill twenty beavers instead of one, then it is plain the quantity of labour required to kill a beaver would only have been one twentieth part, or five per cent., more than that required to kill a deer, and the animals would of course have been exchanged in that proportion. With every extension of the duration of the weapons, the value of the deer and the beaver would be brought still nearer to equality.

It appears, therefore, inasmuch as capital is nothing but the produce of anterior labour, that its accumulation and employment is consistent with, or rather is embodied in, the proposition, that the value of commodities depends on the labour required for their production. A commodity may be altogether produced by capital, without the co-operation of any immediate labour; and if so, its value will be determined by the quantity of capital, that is, of antecedent labour expended on its production: or it may be partly produced by capital, and partly by immediate labour, and then its value will be proportioned to the sum of the two; or, which is the same thing, to the total amount of labour bestowed upon it. The principles now laid down are almost self-evident, and have been generally assented to; but a considerable difference of opinion is entertained respecting the influence which the employment of workmen by capitalists, and the fluctuations in their wages, have over value.

The employment of workmen by capitalists does not raise the price of commodities.

It does not, however, seem that there is much room for these differences. Suppose that a certain quantity of goods, say twenty pairs of stockings, manufactured by independent workmen, freely exchange for forty pairs of gloves, also manufactured by independent workmen: they would continue to be exchanged on this footing, provided the quantity of labour required for their production continued unchanged, though the workmen should be employed by master manufacturers. In the first case, it is true, as Adam Smith has observed, that the goods produced by the workmen belong wholly to themselves; and that, in the second case, they have to share them with others. But it must be recollected, that in the first case the capital made use of in their production also belonged to the workmen, and that in the latter case it has been supplied to them by others. The question then comes to be,—Does the circumstance of labourers voluntarily agreeing to give a portion of the commodities produced by them as an *equivalent* or compensation for the use of capital supplied to them by others, afford any ground for raising the price of such commodities? It is evident it does not. The profits of stock are only another name for the wages of accumulated labour. They enter into the price of every commodity in the production of which any portion of capital has been expended. But whether the capital belong to the labourer, or is furnished to him by another, is obviously of no consequence. When the capital does not belong to the labourer, the commodities he produces are divided into *two* portions, whereof one is the return for the immediate labour, and the other for the capital or accumulated labour required for their production. But the value of the produce is the same, into how many portions soever it may be divided. A shoemaker who manufactures shoes on his own account obtains the same profits on their sale that would accrue to the master-shoemaker who should employ him as a workman. He must have capital to maintain himself and his family until his shoes are disposed of, to provide himself with a workshop and tools, to advance money to the tanner to pay his leather, and to meet other outgoings. If he did not, exclusive of the ordinary wages of labour, realise a profit or a return for his capital equal to the profit obtained by the master-shoemaker, it would be for his advantage to lend his capital to the latter, and to work on his account: and it is plain, inasmuch as his shoes would not sell for a higher price than those of the capitalist, that he could not realise a greater profit. It is immaterial, therefore, whether the accumulated labour or capital, and the immediate labour employed in the production of commodities, be furnished by the same or by different parties. It is by the total quantity of labour necessarily expended upon them, and not by the channels through which it is supplied, that their value is determined.

It now only remains to trace the influence of fluctuations of wages on price. When this is done, the subject will be exhausted.

To simplify this inquiry, we shall divide it into two branches. We shall inquire, *first*, whether fluctuations of wages have any, and if any, what effects, on the value of commodities produced by the aid of capitals of equal degrees of durability; and *second*, whether these fluctuations have any, and if any, what effects, when the capitals employed are of unequal degrees of durability.

Effect of fluctuations in the rate of wages on exchangeable value:—1. Effect of these fluctuations when the capitals employed in production are of the *same* degree of durability.

I. When all classes of producers employ fixed or circulating capitals of the same degree of durability, they must be all equally affected by a rise or fall of wages. This principle is admitted by every one, and is indeed self-evident. But when such is the case, it is plainly impossible that a rise or fall of wages should occasion any variation in the value of commodities. To revert to our former example: let it be supposed that wages, at the rate of a shilling a day, were paid by the stocking manufacturer, a pair of whose stockings exchanged for two pairs of gloves, and that, from some cause or other, the wages of his workpeople have been doubled, or raised to two shillings; the question is, will he now obtain a greater quantity of gloves for his stockings? It is obvious he will not. He cannot urge the fact of his having to pay higher wages as a reason why the glove manufacturer should give him more gloves in exchange for stockings; for the latter would have it in his power to reply, that the same rise of wages affected him to precisely the same extent! If, therefore, one pair of stockings were previously worth two pairs of gloves, they would continue to preserve that relation so long as the quantities of labour required for their production did not vary, whatever might be the fluctuation of wages,—whether they fell to a sixpence, or rose to five shillings a day. Even if the price of commodities rose, which it does not, when wages rise, that would be no advantage to the producers. Commodities are always bought by commodities or by labour. Of what consequence, then, would it be to a capitalist to sell, when wages rose, his commodities at an equal advance, seeing that he, in his turn, would be obliged to give so much more for every article which he has to purchase? Were wages to rise ten per cent., a producer—a hatter for example—would be in precisely the same condition whether he sold his hats for ten per cent. advance, and gave an additional ten per cent., as he would be obliged to do, for his food, shoes, clothes, &c., &c., or sold his hats at their former price, and bought the articles for which he has occasion at the prices he formerly paid for them.

In order farther to illustrate this principle, we may be allowed to make a supposition, which, though it cannot actually take place, will serve to set this doctrine in a clearer point of view. Should the quantities of labour required for the production of all sorts of commodities be increased in exactly the same proportion, their exchangeable values would plainly remain unaltered. Their cost would, however, be augmented. A bushel of corn would not then exchange for a greater quantity of muslins or of broad cloth than it did before the increased expense of its production; but each would be the produce of more than the former quantity of labour. Under such circumstances, the prices of commodities would remain stationary, while the wealth and comforts of the society would be materially diminished. Every person would have to make greater exertions to obtain a given supply of any one commodity; but as the expense of producing *all* commodities is, by the supposition, equally increased, it would not be necessary to make any greater exertions to obtain one than another, and their values, as compared with each other, would be totally unaffected.

In these statements it is taken for granted that the value of money has been invariable. But if it become either more or less valuable, then undoubtedly the rate of wages and the prices of commodities will both vary. They will do so, however, not because the labourer gets a greater or less amount of wages, but because the value of the commodity or standard in which wages and prices are estimated has varied. Wages, though most commonly paid in money, really consist of a portion of the produce of industry. And hence, to avoid falling into endless mistakes, it is best, in theoretical investigations with respect to value, to consider wages as constituting a certain share of the produce of industry; as being really invariable, so long as this share continues unchanged; and as having really risen when it is increased, and really fallen when it is diminished.

The mistaking of fluctuations in the rate of money wages for fluctuations in the rate of real wages, has been the source of much error and misapprehension. A man whose wages are one shilling a day, must get two shillings to keep them at the same level, should the value of money decline a half; and the hat which now sells for ten shillings must then, for the same reason, sell for twenty shillings. It is obviously wrong to call this a real rise, either of wages or prices; this, however, is what is generally done. The manufacturer who gives sixpence a day more to his men, and who sells his goods at a proportionally higher price because of a fall in the value of money, rarely suspects that there has been any such fall, and generally concludes that the rise of wages has been the cause of the rise of prices, overlooking entirely the real cause of the rise of both—the decline in the value of the money or commodity in which wages and prices are rated.

It has been seen that a general and equal increase of the labour required for the production of commodities does not alter their relation to one another; and it is consequently obvious that this relation cannot be altered by a general and equal increase of the wages paid for that labour. Fluctuations in the rate of wages affect the proportion in which the produce of industry, under deduction of rent, is divided between capitalists and labourers—diminishing the proportion belonging to the capitalists when they rise, and increasing it when they fall. But as these changes in the distribution of commodities neither add to nor take from the quantity of labour required to produce them and bring them to market, they neither affect their real nor exchangeable value.

. Effect of hese fluctuations hen the apitals mployed n production are of *ifferent* degrees of urability.

II. We have seen by the investigation under the preceding head, that, where the capitals employed in production are of *equal* degrees of durability, fluctuations of wages affect all classes of producers to the same extent, and have, therefore, no influence on the value or price of commodities. But when the capitals employed are of *different* degrees of durability, this is not the case. Fluctuations in the rate of wages do not, in such cases, equally affect all producers, and the natural equilibrium of profit cannot be maintained without a variation in the value of their products. To illustrate this, let it be supposed that a quantity of goods, the produce of fixed capital or machinery fitted to last many years, freely exchanges for a quantity of other goods entirely produced by manual labour. It is plain they would not be exchanged on this footing after a rise or fall of wages; for the proprietor of the machinery would be very little affected by such fluctuations, whereas they would very seriously affect the proprietor of the goods produced by manual labour. And, therefore, when wages fluctuate, the values of the goods produced by capitals of different degrees of durability must also fluctuate —that is, they must be adjusted so that they may continue to yield the same average rate of profit. Let us endeavour to trace the mode in which this adjustment is effected.

The arguments now brought forward, to show that fluctuations in the rate of wages do not affect the value of commodities produced by capitals of the same durability, were first advanced by Mr Ricardo. He, too, was the first who endeavoured to analyse and discover the influence of fluctuations in the rate of wages on commodities, when the capitals employed in their production were *not* of the same degree of durability. The results of his researches in this more difficult branch of the science were still more important, and more at variance with the previously received opinions of economists. Ricardo not only showed that it was impossible for any rise of wages to raise the price of *all* commodities; but he also showed, that in many cases a rise of wages led to a *fall* of prices, and a fall of wages to a *rise* of prices! The novelty of these opinions, and the talent and ingenuity with which they were supported, immediately recommended them to general notice, and the repeated examinations to which they have since been subjected have confirmed their truth, and set them in a clearer point of view.

If a rise of wages lowers profits, it must lower the value of goods chiefly produced by fixed capital or machinery.

Suppose a manufacturer has a machine worth L.20,000, of a high degree of durability, and which can, without any, or with but little, manual labour, produce commodities: If profits were at ten per cent., the commodities annually produced by this machine would sell for L.2000, together with a small addition to replace its wear and tear.[1] Now, it is clear, that when profits either rise or fall, the price of the goods produced by this machine will also rise or fall. If profits were to rise to fifteen per cent., the goods produced by the machine would, in order that its owner may obtain the same profit with other capitalists, rise to L.3000; and if, on the other hand, profits fell to five per cent., the goods would, for the same reason, fall to L.1000. If, therefore, it be true that a rise of wages reduces the rate of profits, it will also reduce the price of such commodities as are chiefly produced by machinery, or fixed capital of a considerable degree of durability, or by circulating capital returnable at distant periods, and *vice versa.* And it is not difficult to see that this is really the case, and that, in point of fact, profits, supposing other things to continue the same, fall when wages rise, and rise when wages fall.

It results from what has been previously stated, that to whatever extent wages might rise, no class of producers, whether their capitals were returnable in a day, a week, or any other period, would obtain any larger share of the commodities produced by others of the *same class,*—that is, whose capitals were returnable in *equal periods* with their own. Suppose wages rise ten or twenty per cent., that would not enable a manufacturer whose capital was returnable in a month, or in twelve months, to obtain in exchange for his goods, any greater portion of the goods of such manufacturers as were affected to the same extent as himself by the rise of wages,—that is, whose capitals were returnable in the same period as his own. This is as impossible as it is to change the relation of numbers by multiplying or dividing them by the same number; and therefore it is not true that a rise of wages will raise the price of any one commodity, as compared with all other commodities.

But if a rise of wages cannot do this, it is demonstrably certain it must lower profits. Suppose that the numbers 1, 2, 3, 4, 5, 6, 7, 8, 9, and 10, represent capitals of corresponding degrees of durability. When wages fluctuate, the proprietors of the least durable capitals, numbers 1, 2, 3, 4, and 5, are plainly more affected thereby than the proprietors of the more durable capitals, numbers 6, 7, 8, 9, and 10. Suppose, now, that wages rise, and let us endeavour to discover what would be the effect of this rise on the holder of a capital of the *tenth* degree of durability. It has been already seen that, whatever might be the amount of the rise—whether it were one, ten, or a hundred per cent.—the holder of such capital would not get any additional quantity of the commodities belonging to other producers whose capitals were also of the *tenth* degree of durability; and in so far, therefore, as this class of commodities is concerned, profits will be reduced to the precise extent that wages have risen. But the holders of the other capitals are all of them *more* affected by the rise of wages than the holders of No. 10; and if we took any one of them as a standard by which to measure profits, they would appear to have fallen in a still greater proportion.

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[1] So small a sum as two shillings and elevenpence would be sufficient for this purpose if the machine would last for 100 years; for an annuity of two shillings and elevenpence, accumulating for 100 years at ten per cent., would at the end of that period amount to L.20,000.

Profits vary inversely as wages.

Hence it is plain, that while other things remain the same, profits vary inversely as wages—that is, they fall when wages really rise, and rise when wages really fall. But, owing to the different and ever-varying proportions in which fixed and circulating capital and immediate labour are employed in the production of commodities, it is extremely difficult to discover the precise extent to which any given fluctuation in the rate of wages affects profits. We shall, however, state three different cases, which will briefly, and, it is hoped, satisfactorily, elucidate the manner in which fluctuations in the rate of wages always operate, and the method to be followed in estimating their influence on profits.

Method of estimating the effects of fluctuations in the rate of wages on profits.

1. If all commodities were produced by immediate labour, or by capital employed in the payment of wages, it is obvious that every rise of wages would cause an equal fall of profits. A capitalist who employed L.1000 in the payment of wages must, if profits were at ten per cent., sell the commodities at L.1100. But when wages rise five per cent., or to L.1050, he would not be able to sell his commodities for more than L.1100; for money is itself a commodity, and as, by the supposition, all commodities are produced by immediate labour, the rise of wages would affect the producers of money in the same degree that it affects other producers. In this case, therefore, it is plain that a rise of wages will equally sink profits, and that a fall of wages will equally raise them.

2. If all commodities were produced, *half* by immediate labour, and the *other half* by capital, profits would only fall to half the extent that wages rose. Suppose a capitalist employs L.500 in the payment of wages, and L.500 as a fixed capital, when profits are at ten per cent., the commodities produced must, as before, sell for L.1100. If wages rose five per cent., the capitalist would have to pay L.525 as wages, and would, consequently, retain only L.75 as profit. In this case, therefore, a rise of wages to the extent of five per cent. would, because of equal quantities of capital and immediate labour being employed in the production of commodities, only sink profits two and half per cent.

3. If *all* commodities were produced by capital of a high degree of durability, capitalists, it is obvious, would not be at all affected by a rise of wages, and profits would, of course, continue as before.

Now, suppose that commodities, instead of being wholly produced by immediate labour, as in the first case, or wholly by equal quantities of immediate labour and of capital, as in the second, or wholly by fixed capital, as in the third, are partly produced in the one mode and partly in the other, and let us see what effect an increase of five per cent. in the rate of wages would have on their relative values. To facilitate this inquiry, we shall distinguish these three descriptions of commodities by the Nos. 1, 2, and 3. Now, it is quite evident that the rise of wages has affected No. 1 two and a half per cent. more than it has affected No. 2, and five per cent. more than it has affected No. 3. No. 1 must, therefore, as compared with No 2, have risen two and a half per cent. in value, and, as compared with No. 3, it must have risen five per cent.; No. 2 must have fallen two and a half per cent. as compared with No. 1, and risen two and a half per cent. as compared with No. 3; and No. 3 must have fallen five per cent. as compared with No. 1, and two and a half per cent. as compared with No. 2. If wages, instead of rising, had fallen, the same effects would obviously have been produced, but in a reverse order. The proprietors of the commodities of the class No. 1 would gain five per cent. by the fall, those of No. 2 would gain two and a half per cent., and those of No. 3 nothing; and the relative values of their commodities would be adjusted accordingly.[1]

General rule on the subject of all fluctuations.

Thus, then, it appears, inasmuch as a commodity taken for a standard by which to estimate the values of other commodities must itself be produced by capital returnable in a certain period, that when wages rise those commodities which are produced by less durable capitals than those which produce the standard will rise in exchangeable value, and those produced by more durable capitals will fall; and conversely when wages are reduced. Suppose, as before, that the Nos. 1, 2, 3, 4, 5, 6, 7, 8, 9, and 10, represent capitals of corresponding degrees of durability: If a commodity produced by the least durable capital No. 1, which may be supposed to be wholly employed in the payment of wages, be taken for a standard, all commodities produced by the other and more durable capitals would fall in value when wages rose; and if we suppose those produced by No. 2 to decline one per cent., those produced by No. 3 would decline two per cent., those produced by No. 4 three per cent., and so on until we arrive at No. 10, which will have fallen nine per cent. If, on the other hand, a commodity produced by the most durable capital No. 10, which may be supposed to consist wholly of highly durable machinery, be made the standard, all the commodities produced by the other and less durable capitals would rise when wages rise; and if those produced by No. 9 rose one per cent., those produced by No. 8 would rise two per cent., and those produced by No. 1 nine per cent. If a commodity produced by capital of a medium degree of durability, as No. 5, which may be supposed to consist half of circulating capital employed in the payment of wages, and half of fixed capital or machinery, be taken as a standard, the commodities produced by the less durable capitals, Nos. 4, 3, 2, and 1, will rise with a rise of wages, on the former hypothesis,—the first, or No. 4, one per cent., the second, or No. 3, two per cent., &c.; while those produced by the more durable capitals, Nos. 6, 7, 8, 9, and 10, will fall,—the first, or No. 6, one per cent., the second, or No. 7, two per cent., &c., exactly the reverse of the other.

Hence it is obvious that the influence which variations in the rate of wages have on price will principally depend on the nature of the capital employed in the production of gold and silver. Whatever may be the proportions of circulating and fixed capital employed in the production of money, all commodities produced by the agency of a greater quantity of manual labour, and with less fixed capital and machinery, will rise when wages rise, and fall when wages fall; but those that are produced by the agency of a less quantity of manual labour, and with more fixed capital or machinery, will fall when wages rise, and rise when wages fall. Those that are produced in nearly the same circumstances, or by the agency of the same quantities of circulating and fixed capital as money, will not be affected by fluctuations of wages.

It should be observed, however, that variations in the values of most commodities, caused by variations in the

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[1] These examples are substantially the same with those given by Mr James Mill. See *Elements of Political Economy*, p. 77.

Variations of exchangeable value caused by fluctuations in the rate of wages confined within narrow limits.

rate of proportional wages, are confined within comparatively narrow limits. It has been seen that were all commodities produced wholly by immediate labour, or wholly by capital, or wholly by equal quantities of both, variations of wages would have no influence on their value. But a very large class of commodities are produced by means of nearly equal portions of fixed and circulating capital; and as every rise of real wages that may take place under such circumstances will be balanced by a fall in the rate of profit, or by a proportional increase in the productiveness of industry, it is evident that the value of the commodities in question, as compared with each other, would remain nearly stationary. Although, therefore, a rise of wages has a necessary tendency to raise the exchangeable value of one class of commodities, and consequently to lower that of another, the fall of profits, which inevitably follows every rise of wages that is not accompanied by an increased productiveness of industry, has a contrary effect, and tends to sink the value of the commodities which the increased rate of wages would raise, and to elevate the value of those which the same increased rate would sink. And it is only in extreme cases, or in the case of commodities produced almost wholly by direct manual labour on the one hand, or in that of those produced almost wholly by the aid of fixed capital or machinery on the other, that a variation in the rate of wages occasions a considerable variation in their values.

It must also be observed, that though fluctuations in the rate of wages may occasion variations in the values of particular commodities, they neither add to nor take from the total value of the entire mass. If they increase the value of those produced by the least durable capitals, they equally diminish the value of those produced by the more durable capitals. Their aggregate value continues, therefore, the same after a rise or fall of wages as before. And though it may not be strictly true of a particular commodity, that its exchangeable value is directly as its cost or real value, or as the quantity of labour required to produce it and bring it to market, it is most true to affirm this of the mass of commodities taken together.

In thus endeavouring to trace the cost of all descriptions of non-monopolized commodities to the quantity of labour required for their production, it is not meant to deny that a very large portion of the useful or desirable qualities of such commodities may be the result of the action or influence of natural agents. But it is, as was previously seen, the peculiar and distinguishing feature of natural agents or powers, that they render their services gratuitously. Whatever they do is done without fee or reward. And hence, though their co-operation be necessary to the production of all things that are either useful or desirable, they add nothing to their value. This is a quality that can be communicated only by the labour of man, or by the capital appropriated or accumulated by his labour. In estimating, for example, the cost or value of a quantity of corn, we include only the wages paid to the individuals employed in raising it, as ploughmen, reapers, thrashers, &c., with the value of the corn used as seed, and that of the services rendered by the horses and instruments made use of in the different operations. The influence of the vegetative powers of nature, and of the sun and showers, is ignored, or goes for nothing; for though without their powerful assistance the crop could not be obtained, and our utmost exertions would be altogether fruitless, yet, as they are the free gift of Providence, they add nothing to the value of the produce,—that is, they add nothing to its power of exchanging for or buying labour, or other things procured by the intervention of labour.

It may be thought, perhaps, that this principle is at variance with what is observed to take place in the production of certain descriptions of commodities. Thus, if a cask of new wine be kept for a definite period, or till it arrive at maturity, it will acquire a higher value: now, as the change produced on the wine is entirely brought about by the operation of natural agents, and as without the change the wine would have no higher value, it has been contended that this is a case in which the labour of natural agents is plainly productive of an increased value. It is easy, however, to see that this is a mistake. The cask of wine is a capital, being the result of the labour employed in cultivating, gathering, pressing, and otherwise preparing the grapes from which it was made. But the processes of fermentation, decomposition, &c., do not act instantaneously; and to enable them to effect the changes in the wine, it is necessary that it should be laid aside until they are completed. The merchant would not, however, employ his capital in this way, unless it were to yield the same return as other businesses. And hence, though the processes carried on inside the cask render the wine more desirable without adding anything to its value, the latter is increased by the amount of profit accruing on the capital subjected to the processes.

In estimating the cost of grinding corn, or spinning cotton, or forging anchors by the agency of wind or water-wheels, nothing is set down to the account of the wind or water. And such is invariably the case. Natural powers, however efficient and indispensable, are always left out of view in estimating the value of the products or results of undertakings. That is wholly dependent on the labour, including capital necessarily expended in bringing them about.[1]

Sect. V.—*Division of the Produce of Industry, under deduction of Rent, between Capitalists and Workmen.—Definition of Profits.—Mr Ricardo's Theory of Profits; Sense in which it is true.—Causes which occasion a Rise or a Fall of Profits.—Influence of the Decreasing Fertility of the Soil and of Taxation on Profits.*

Division of the produce of industry between capitalists and workmen.

Before attempting to investigate the circumstances which determine the rate of profit, it is necessary to be aware of those which determine the proportions in which the whole produce of industry, under deduction of rent, is divided between labourers and capitalists.

This preliminary inquiry may be disposed of in a few words. We have seen that the whole produce of the land and labour of every civilized society is always divided, in the first instance, into three, and not more than three, portions; the first of which goes to the labourers, the second to the capitalists or proprietors of stock, and the third to the landlords; and we have also seen that the portion of the produce of industry, or the rent, which belongs to the landlords, as proprietors of the soil, and not as capitalists, is altogether extrinsic to the cost of production; and that, though the landlords were to give it up, such self-immolation on their part would not occasion any change in the productiveness of industry, or any reduction in the price of raw produce. Supposing, then, that rent is deducted or set aside, it is obvious that the remaining produce of the land and labour of every country must be primarily divided between the two great classes of labourers and capitalists. And it is further obvious that were there no taxes in a country, or were the rate of taxation invariable, the proportion of the entire produce of industry, under deduction of rent, falling to the share of the labourers, could not be increased except by an equivalent reduction in the proportion falling to the share of the capitalists, and *vice versa*. Suppose, still better to illustrate this proposition, that the whole produce of industry in Great Britain is represented by the number 1000; suppose, farther, that the landlords get 200 of this sum as rent, and that the remaining 800 is divided in equal portions between labourers and capitalists. Under these circumstances, it is obvious that nothing could be added to the proportion of the produce, or to the 400, falling to the labourers, except at the expense of the capitalists; nor to the proportion, or 400, falling to the latter, except at the expense of the former.

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[1] Sir William Petty stated, so early as 1667, that the value of commodities is always regulated by the quantity of labour required to produce them; there is, however, the same difference between his statements and the analysis and investigations of Mr Ricardo, whom we have principally followed in this section, that there is between the conjectures of Pythagoras respecting the true system of the world, and the demonstrations of Newton. But as the statement of Petty is curious, we subjoin it:—"If," says he, "a man can bring to London an ounce of silver out of the earth in Peru in the same time that he can produce a bushel of corn, then one is the natural price of the other; now, if, by reason of new and more easy mines, a man can get two ounces of silver as easily as formerly he did one, then corn will be as cheap at 10s. the bushel as it was before at 5s., *cæteris paribus*." (*Treatise of Taxes and Contributions*, ed. 1679, p. 31.)

Whether the 800 were increased to 1600, or reduced to 400, so long as those between whom it must be divided receive each a half, their relative condition must continue the same. And hence the propriety of distinguishing between proportional and real wages, that is, between wages estimated in parts of the produce raised by the labourer, and those estimated in definite quantities of money or produce. If the productiveness of industry were to diminish, proportional wages might rise, notwithstanding that real wages, or the amount of the produce of industry received by the labourer, might be diminished; and if, on the other hand, the productiveness of industry were to increase, proportional wages might be diminished, while real wages might at the same time be increased.

Hence it follows that, were taxation unknown or constant, the whole produce of industry, under deduction of rent, would be divided between capitalists and labourers; and that the proportion thereof falling to either party would vary inversely as the proportion falling to the other—that is, the proportion falling to the capitalists would be increased when that falling to the labourers was diminished, and diminished when it was increased.

Definition of profits.

Profits must not, however, be confounded with the produce of industry primarily received by capitalists. They really consist of that produce, or its value, which remains to the capitalists, after their necessary payments to others have been deducted, and after the capital wasted or used in industrial undertakings has been replaced. If the produce derived from an undertaking, after defraying the necessary outlay, be insufficient to replace the capital expended, a loss will have been incurred; if the capital be merely replaced, and there is no surplus, there will be neither loss nor profit; and the greater the surplus, the greater of course will be the profit. Profits are not measured by the proportion which they bear to the rate of wages, but by the proportion which they bear to the capital by the agency of which they have been produced. Suppose an individual employs a capital equivalent to 1000 quarters of corn in the cultivation of a farm, that he expends 700 quarters in the payment of wages and 300 in seed and other outgoings, and that the return to this capital is 1200 quarters. Under these circumstances, the proportion of the produce falling to the labourers as wages will be to that falling to the capitalists as seven to two; for of the 1200 quarters that go in the first instance to the capitalist, 200 only are profits, 1000 being required to replace the capital he has expended. In this case, therefore, the rate of profit would be said to be twenty per cent., meaning that the excess of produce belonging to the cultivator, after the capital employed in its production was fully replaced, amounted to twenty per cent. upon that capital.

Mr Ricardo's theory of profits.

We have been thus particular with respect to the definition of profits, because, from not keeping it sufficiently in view, Mr Ricardo has been led to contend that a rise of profits cannot be brought about except by a fall of wages, nor a fall of profits except by a corresponding rise of wages. It is evident, however, that this theory is true only in the event of our attaching a radically different sense to the term profit from what is usually attached to it, and supposing it to mean the proportion of the produce which goes to the share of the capitalist, without reference to the ratio which it bears to the capital employed in its production. If we understand the terms in this sense, Ricardo's theory will hold universally; and it may be affirmed that so long as the proportion in which the produce of industry, under deduction of rent, is divided between capitalists and labourers, continues the same, no increase or diminution of the amount of that produce, or of the powers of production, will occasion any variation in the rate of profit. But if we consider profits in the light in which they are invariably considered in the real business of life—as the produce accruing to the capitalists after the capital expended by them in payments and outgoings of all sorts is fully replaced—it will immediately be seen that there are innumerable exceptions to Ricardo's theory.

Profits in agriculture.

It will facilitate the acquisition of precise ideas respecting the circumstances which determine the rate of profit in different employments, as that term is commonly understood, if we confine our attention, in the first place, to those which determine profits in agriculture,—both because the latter admit of being accurately measured, and because they may be taken as representing profits in other businesses. Agriculture is a branch of industry that must be carried on at all times, and under all circumstances; but it would not be carried on unless it did, at an average, yield as great a return to the capital vested in it as other businesses; nor would the latter be carried on if they yielded a less return than is derived from agriculture. Hence it follows that the returns obtained from agricultural industry or agricultural profits may, in ordinary cases, be considered as identical with the returns or profits obtained from other businesses. Whenever, for example, the average return to an outlay of capital or labour worth 100 quarters of wheat, employed in the cultivation of the soil, amounts to 110 quarters, we may safely infer that L.100 employed in manufactures is also yielding L.110; for a regard to their own interest will not permit those engaged in such departments to prosecute them for less profit than is obtained in agriculture, and the competition of the agriculturists will not permit them to obtain more.

Circumstances which occasion a rise or fall of profits.

Taking, then, as we are entitled to do, agricultural profits as a standard for profits in general, let us suppose that a landlord employs a capital equivalent to 10,000 quarters, or L.10,000, in the cultivation of an estate; that he expends 5000 quarters, or L.5000, of this capital in seed, in the keep of horses, and in defraying the wear and tear of implements and machines; and 5000 quarters, or L.5000, in paying the wages of labourers. Suppose, now, that the return obtained by this landlord is 12,000 quarters, or L.12,000; of which 10,000 quarters, or L.10,000, go to replace his capital, and 1000 quarters, or L.1000, to pay his taxes,—leaving 1000 quarters, or L.1000, as profits, being ten per cent. on the capital employed: it is plain from this case (and this case is, in point of principle, the actual case of all cultivators) that the rate of profit may be increased in three, but only in one or other of three, ways, —viz., 1, by a fall of wages; 2, by a fall of taxes; or, 3, by an increased productiveness of industry.

Thus it is obvious (1.), that if wages were reduced from 5000 to 4000 quarters, profits, supposing other things to continue the same, would be increased from 1000 to 2000 quarters, or from ten to twenty per cent.: if (2.) the burden of taxation were reduced from 1000 to 500 quarters, profits would be increased from 1000 to 1500 quarters, or from ten to fifteen per cent.: and if (3.), owing to the introduction of an improved system of agriculture, the return to a capital of 10,000 quarters were increased from 12,000 to 13,000 quarters, profits, supposing wages still to amount to 5000 and taxes to 1000 quarters, would be increased to 2000 quarters, or to twenty per cent.: And though, in this case, after the productiveness of industry had been increased, wages form a less proportion of the whole produce than they did previously, it is to be observed, that this less proportion is the consequence, and not the cause, of profits having risen; and, therefore, in such cases as this, and they are of very frequent occurrence, it is true to say, that proportional wages fall because profits rise: but the converse of the proposition is not true; for the rise of profits was occasioned by causes that had nothing whatever to do with wages, and which were, in fact, totally independent of them.

It is indeed true, inasmuch as the rise of profits is the result of an increased productiveness of industry, that the real value of the 13,000 quarters will not exceed the real value of the 12,000 previously obtained by the same quantity of labour; but profits, in the sense in which they are practically understood, and as we understand them, do not depend on real values, but on the excess of the commodities produced above the capital expended in their production; and whenever this excess is augmented, without any previous depression of the rate of wages, the rate of profit is evidently increased by the operation of causes extrinsic to variations in that rate.

Nor is this all. The rate of profit may remain stationary, or rise, though the proportion of the produce of industry falling to the share of the labourer be actually increased. Suppose, to exemplify this, that a landlord employs 1000 quarters of wheat as a capital, 500 of which are expended in seed, keep of horses, &c., and 500 in paying wages; if the produce be 1200 quarters, and the taxes to which he is subjected 100, his profits will amount to 100 quarters, or ten per cent.: suppose now that, owing to the introduction of improved machinery, or improved methods of culture, he only requires to expend 400 quarters in seed, keep of horses, &c., but that wages rise from 500 to 550 quarters, and that the same return is obtained; in this case, supposing taxation to be constant, the profits of the landlord will be increased from ten to fifteen three-fourths per cent., though proportional wages have risen from five-twelfths to five and a half twelfths of the whole produce.

If this increased productiveness were confined to agriculture, without extending to other important businesses, the price of agricultural produce would fall, while that of other produce would remain stationary; and, in such a case, it may be said that the profits of the agriculturists, if estimated in money, or in any commodity other than corn, would be diminished in consequence of the rise of wages. This is true; but Ricardo made no exception, in laying down his theory, in favour of those possible, and indeed frequently occurring cases, when, from any single circumstance, or combination of various circumstances, industry becomes generally more productive, and when, consequently, profits generally rise, without that rise being occasioned by a fall of wages. And it is also true, that an increased productiveness of agriculture, whether caused by improvements made in it, or by the repeal of restrictions on the importation of corn, most commonly extends itself to other businesses, and has the effect of bringing about an universal rise of profits; for, as farm produce forms the principal part of the labourer's subsistence, and as he obtains a larger quantity thereof in exchange for the same amount of money after it has fallen in price, his condition is in so far improved; and a stimulus being, in this way, given to population, the supply of labour is increased, and wages being reduced, the rate of profit is universally raised.

When industry, instead of becoming more becomes less productive, the opposite effects follow. Profits then fall, without any fall having previously taken place in the rate of wages. It is evident, therefore, that the proposition that a rise of profits cannot be brought about otherwise than by a fall of wages, nor a fall of profits otherwise than by a rise of wages, is true only in those cases in which the productiveness of industry and the burden of taxation remain constant. So long as this is the case, or, which is the same thing, so long as the same capital is employed, and the same quantity of produce has to be divided between capitalists and labourers, the share of the one cannot be increased without that of the other being equally diminished: and, it is also true, that if profits depended on the division of the produce of industry between capitalists and labourers, they could not be affected by variations in its productiveness, but would be determined wholly by the proportion of the produce set apart as wages. But profits depend, as has been already seen, on none of these things, but on the proportion which they bear to the capital by which they are produced. Suppose an individual employs a capital of 1000 quarters, or L.1000, in cultivation; that he lays out half this capital in the payment of wages, and obtains a return of 1200 quarters, or L.1200; in this case, assuming he is not affected by taxation, his profits will amount to 200 quarters, or L.200, being at the rate of twenty per cent., and will be to wages in the proportion of two to five. Suppose, now, that the productiveness of industry is universally doubled, and let it be farther supposed, that the additional 1200 quarters, or L.1200, is divided between the capitalist and his labourers in the former proportion of two to five, or that the capitalist gets 343 quarters, or L.343, of additional profits, and the labourers 857 quarters, or L.857, of additional wages: in this case, both parties will still obtain the same proportions of the produce of industry as before; and if we look only to them, we must say that neither profits nor wages have risen. But when we compare, as is invariably done in estimating profits, the return obtained by the capitalist with the capital he employs, it will be found, notwithstanding the constancy of proportional wages, that the rate of profit has really increased from twenty to fifty-four per cent.

Thus, then, it appears, as was previously stated, that profits rise in one or other of the three following ways, viz.,—(1.), from a fall of wages; (2.) from a fall of taxes, directly or indirectly affecting capitalists; or (3.), from an increased productiveness of industry: and they fall (1.), from a rise of wages; or (2.), from an increase of taxes; or (3.), from a diminished productiveness of industry. But they can neither rise nor fall, except from the operation of one or more of the causes now stated.

Extra profits—on what they depend.

In the previous observations we have, to simplify the subject, considered profits as arising from the employment of capital by persons of ordinary skill and intelligence in the usual pursuits of industry. But, in addition to these, very considerable amounts of capital are employed by parties who possess superior knowledge and ability in the callings in which they engage, and who, in consequence, obtain proportionally large returns. It has been disputed whether these extraordinary returns should be considered as profits or wages. And we are disposed to think that, in as far as they result from the better training and instruction of those who superintend the employment of the capital, they should be considered as the profit upon, or return to, the extra outlay on their education. But in cases where the parties possess, as they sometimes do, any peculiar talent or genius, by which they are enabled to strike out new and better methods of production, the results must be considered as the fruit of natural gifts of which they are the exclusive possessors. The profits realized by such parties are not subject to any ordinary rule or law. Everything depends on the peculiar genius and intelligence with which they are endowed. If it be far above the common level, and applicable to the production of articles or services for which there is a great demand, their gains will be proportionally great, and may far exceed, even when the things they supply have little intrinsic worth, those realized by ordinary people.

But though these extra profits are always being made, and amount in the aggregate to a very great sum, yet there are no good grounds for thinking that they bear any very large proportion to the vast amount of profits produced in businesses and professions conducted in the ordinary way, and with ordinary talent and attention. And it is also to be borne in mind that if there be, on the one hand, individuals who, by dint of superior skill and ability, make large profits and accumulate fortunes, there are, on the other hand, a great number of individuals who, from want of the requisite capacity or care, make little or no profit, and not unfrequently sink into the abyss of bankruptcy. The losses incurred by the latter class go far to balance, if they do not exceed, the extraordinary gains of the other. And though fortunes made, like those of Arkwright and Watt, by the exertion of genius and invention, attract and fix the public attention ; yet there can be no manner of doubt that the great bulk of the public wealth is the result of ordinary skill and industry, backed up and assisted by the general disposition to save and amass. For one fortune that owes its existence to superior talent, ten owe theirs to a long-continued course of economy. But having already seen that parsimony is the main source of national riches, it is needless to enlarge further on this topic.

Influence of the decreasing fertility of the soil on profits.

It is consistent with the widest experience, that profits are invariably higher in colonies, and thinly-peopled countries, than in countries that have been long settled, and where the population is compatively dense: and that (referring to periods of average duration) their tendency is to fall in the progress of society. This sinking of profits in rich and populous countries was ascribed by Smith to the competition of capitalists. He supposed that when capital is augmented, its owners endeavoured to encroach on each other's employments; and that, in furtherance of their object, they were tempted to offer their goods at a lower price, and to give higher wages to their workmen ; which has a twofold influence in reducing profits. This theory was long universally assented to. It has been espoused by MM. Say, Sismondi, and Storch, by the Marquis Garnier, and, with some trifling modifications, by Malthus. But, notwithstanding the deference due to these authorities, it is easy to see that competition cannot bring about a general fall of profits. It prevents an individual, or set of individuals, from monopolizing a particular branch of industry, and reduces the rate of profit in different businesses nearly to the same level ; but this is its whole effect. It has no tendency to lessen the productiveness of industry, or to raise wages or taxation ; and unless it do one or other of these things, it cannot affect profits. So long as an individual, employing a capital of 1000 quarters, or L.1000, obtains from it a return of 1200 quarters, or L.1200, of which he has to pay 100 quarters, or L.100, as taxes, so long will his profits continue at ten per cent., whether he has the market to himself, or has 50,000 competitors. The increase of taxation, and the necessity under which a growing society is placed of resorting to soils of less fertility to obtain supplies of food, or of bringing them from greater distances, are the great causes of that reduction in the rate of profit which usually takes place in advanced periods. When the last lands taken into cultivation are fertile, there is a comparatively large amount of produce to be divided between capitalists and labourers ; and both profits and real wages may, consequently, be high. But with every successive diminution in the fertility of the soils to which recourse is had, the quantities of produce obtained by the same outlays of capital and labour necessarily diminish.[1] And this diminution will obviously operate to reduce the rate of profit—(1.), by lessening the quantity of produce to be divided between capitalists and labourers ; and (2.), by increasing the proportion falling to the share of the latter.

The influence of the decreasing productiveness of the soil, as well on the condition and fortunes of society, as on the rate of profit, is so very powerful, that we shall endeavour to exhibit its operation a little more in detail. It has been shown over and over again, that the principle of increase in the human race is so very strong, as not only to keep population steadily up to the means of subsistence, but to give it a tendency to exceed them. A peculiar combination of favourable circumstances sometimes makes capital increase faster than population, and wages are in consequence augmented. But such augmentation is rarely permanent, at least to the whole extent ; for the new stimulus it gives to population seldom fails, by proportioning the supply of labour to the increased demand, to reduce wages to their old level, or to one not much above it. If, therefore, it were possible to continue to employ additional capital with an equal return in raising raw produce, in manufacturing it when raised, and in conveying the raw and manufactured products from place to place, it is evident, if we suppose taxation to be invariable, that, speaking generally, the greatest increase of capital would not occasion any sensible fall in the rate of profit. So long as labour may be obtained at the same rate, and as its productive power is undiminished, so long will the profits of stock continue unaffected. It is evident, then, that the mere increase of capital has of itself no lasting influence over wages ; and it is the same thing, in so far as the rate of profit is concerned, whether one hundred or one thousand millions be employed in the cultivation of the soil, or in the manufactures and commerce of this or any other kingdom, provided the last million so employed be as productive, or yield as large a return, as the first. And this is invariably the case with manufactures and commerce. Inasmuch, too, as future Watts, Arkwrights, and Wedgwoods will no doubt arise, and as no limits can be assigned to the improvement of the arts, and of the skill and dexterity of workpeople, it may be confidently predicted that equal amounts of capital and labour employed in manufactures and commerce will continue to furnish increasing quantities of produce. But such is not the case with agriculture. Here, and here only, the bounty of nature is limited, and she deals out her gifts with a frugal and parsimonious hand,

> " Pater ipse COLENDI
> Haud facilem esse viam voluit."

Equal quantities of capital and labour do not always produce equal quantities of raw produce. The soil is of limited extent and limited fertility ; and this limitation is the real check—the insuperable obstacle, which prevents the means of subsistence, and consequently the inhabitants of all countries, from increasing in a geometrical proportion, until the space required for carrying on the operations of industry becomes deficient.

It may be observed, that while this decreasing productiveness of the soil lessens the produce to be divided between profits and wages, it increases the proportion thereof which goes to the latter. It is evidently impossible that the price of raw produce, which is the principal part of the subsistence of the labourer, should be progressively increased by forcing good or taking inferior lands into cultivation, without raising wages. Their rise is seldom indeed exactly coincident with a rise in the price of necessaries, but they can never be very far separated. The price of necessaries forms, in fact, the cost of producing labour. The labourer cannot work or continue his race if he be not supplied with the means of subsistence. And though a certain period of varying extent, according to the circumstances of the country at the time, must generally elapse, when necessaries are rising in price, before wages are augmented, such augmentation must, in all ordinary cases, be eventually brought about, if not to the whole, at least to some considerable extent.

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[1] This supposes, of course, either that no improvements are made, or that their influence has been taken into account.

Without, however, dwelling on these considerations, and apart from the political revulsions which sometimes act injuriously on industry, it may be safely concluded that the decreasing fertility of the soil, or its inability to continue permanently to yield the same quantities of produce in return for the same outlays, is at bottom the great cause, the *causa causans*, of that fall of profits which uniformly takes place in the progress of society. Other causes may, and frequently do, conspire to bring about this result, but this only is necessary and inherent in the order of nature.

But though this cause of the reduction of profits be "of such magnitude and power as finally to overwhelm every other,"[1] its energy is at all times liable to be counteracted or facilitated by extrinsic circumstances. It is obvious, for example, that every improvement or discovery in husbandry which enables a greater quantity of produce to be obtained for the same expense, has an influence similar to what would result from an addition being made to the area of the superior lands, and may, for a lengthened period, raise the rate of profit or hinder its fall.

Had the inventive genius of man been limited in its powers, and had the various machines and implements used in agriculture, and the skill of the husbandman, speedily attained to perfection, the rise in the price of raw produce, and the fall of profits consequent to the increase of population, would have been so apparent as to force themselves on the attention of every one. When, in such a state of things, it became necessary to resort to poorer soils to raise additional quantities of food, a corresponding increase of labour would have been required; for, supposing the perfection of art to be attained, nothing except greater exertion can overcome fresh obstacles. Not only, therefore, would additional labour have been required for the production of a greater quantity of food, but it would have been required in the precise proportion in which the difficulty of its production was increased; so that, had the arts continued stationary, the price of corn and other raw products would have varied directly with every variation in the qualities of the soils successively brought under tillage.

But the circumstances which really regulate the value of raw produce are extremely different. It is true, indeed, that even in those societies that are most rapidly improving, it has, as previously shown, a constant tendency to rise; for the rise of profits consequent to every invention, by occasioning a greater demand for labour, gives a fresh stimulus to population; and thus, by increasing the demand for food, again inevitably forces the cultivation of poorer soils, and raises prices. But these effects of this great law of nature, from whose all-pervading influence the utmost efforts of human ingenuity cannot enable man to escape, are rendered far less palpable and obvious, and sometimes, indeed, are entirely defeated by means of improvements. After inferior soils are cultivated, more labour is required to raise the same quantities of food; but as the powers of the labourer, and the implements he employs, are gradually improved, a smaller number of work-people is required, in proportion to the work to be performed, than if no improvements had taken place. The tendency to an increase in the price of raw produce is countervailed by an opposite tendency. The productive energies of the earth gradually diminish, and we are compelled to resort to less fruitful soils; but the productive energies of the labour employed in their tillage are as constantly augmented by the discoveries and inventions that are always being made. Two opposite and continually acting principles are thus set in motion. From the operation of fixed and permanent causes, the increasing sterility of the soil is pretty sure, in the long run, to overmatch the improvements that occur in machinery and agriculture, so that prices experience a corresponding rise, and profits a corresponding fall. Occasionally, however, these improvements more than compensate, during lengthened periods, for the deterioration in the quality of the soils successively cultivated, and a fall of prices and rise of profits take place, until the renewed pressure of population once more forces the cultivation of still poorer lands.

In so far as the general principle is concerned, the previous reasoning is applicable alike to the commercial world and to a single nation. It is plain, however, that the fall of profits, and the check to the progress of society, originating in the necessity of resorting to poorer soils, will be earlier and more severely felt in improving countries which exclude foreign corn from their markets, than in those which maintain an unfettered intercourse with their neighbours. When a great manufacturing and commercial country deals with all the world on fair and liberal principles, she avails herself of the various capacities of production which Providence has given to different countries; and besides obtaining supplies of food at the cheapest rate at which they can be raised, the numberless markets to which she can resort prevents her from feeling any very injurious consequences from the occasional failure of her own harvests, or from deficiencies in one or a few of the sources whence she draws her foreign supplies; so that in this way she goes far to secure for herself constant plenty, and, what is of hardly less importance, constant steadiness of price. Such a nation has the foundations of her greatness established on a broad and solid basis; for they rest, not on the productive powers of her own soil only, but on those of all the countries of the world. And supposing her not to be involved to an unusual degree in war, or subjected to comparatively heavy taxes, her profits would not be reduced, nor would she get clogged in her progress, until the increase of population forced the cultivation of inferior soils in the countries whence she was in the custom of importing corn. And even then she would not be surpassed by her neighbours; her progress being retarded by a cause which equally affected them, her relative power would not be impaired; and should new markets be opened or new discoveries made, in any quarter of the world, she would reap her full share of the advantage, and be renovated and strengthened for a new career of exertion.

But the case is very different when foreign raw produce is excluded from the markets of a nation which has made an unusual progress in commerce and manufactures, and whose population is therefore comparatively dense. A government which prevents its subjects from exchanging their manufactured goods for the corn of more fertile or less densely-peopled countries, compels them to a premature resort to poor soils at home; and profits being consequently reduced, the country is made to approach the stationary state at a period when, had the legislature acted on more enlarged principles, she might have been advancing with the same rapidity as before in the career of improvement.

It is needless, however, to dwell on these circumstances, or to show the influence of restrictions on the trade in raw produce in aggravating the evils of scarcity, and occasioning fluctuations of price. These and other important correlative matters are discussed in the article CORN LAWS AND CORN TRADE in this work. In it the reader will find the history as well as the principles and practical operation of the late Corn Laws, treated of at considerable length.

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[1] Malthus' *Principles of Political Economy*, &c., p. 317.

PART IV.

CONSUMPTION OF WEALTH.

Having in the previous parts endeavoured to explain the means by which labour is facilitated, and wealth produced, and to investigate the laws which regulate its distribution among the various classes of society, we come now to the *fourth* and last division of the science, or to that which treats of the CONSUMPTION of Wealth.

Definition of Consumption.—Consumption the end of Production.—Test of Advantageous and Disadvantageous Consumption.—Error of Dr Smith's Opinions with respect to Unproductive Consumption.—Error of those who contend, that to facilitate Production, it is necessary to encourage Consumption.—Cause of Gluts.—Consumption of Government.—Conclusion.

Definition of consumption.

It was formerly seen, that by production in this science, is not meant the production of matter, that being the prerogative of Omnipotence, but the giving to matter such a shape as might fit it for ministering to our wants and enjoyments. In like manner, by consumption is not meant the consumption or annihilation of matter, that being as impossible as its creation, but *the consumption or annihilation of the qualities which render commodities useful and desirable.* To consume the products of art or industry, is to deprive them of the utility, and consequently of the value, communicated to them by labour. And hence we are not to measure consumption by the magnitude, weight, or number of the products consumed, but exclusively by their value. Large consumption is the destruction of large value, however small the bulk in which it may happen to be compressed.

Consumption the end of production.

Consumption, in the sense in which the word is used by political economists, is synonymous with use. We produce commodities only that they may be used or consumed. Consumption is the end and object of human industry ; production is merely a means to attain that end. It matters nothing in this respect whether commodities are of the class called durable or perishable. The bread that is baked in the morning may be made use of in the course of the day ; whereas the use of other articles may extend over weeks, or months, or even many years. But, however widely they may differ in their qualities, and whether they are employed to satisfy the urgent wants, to increase the riches, or to gratify the social or the selfish passions of their possessors, they are all destined to be used or consumed ; to be made serviceable in some way, or for some purpose or other.

Test of advantageous consumption.

But though commodities are produced only to be consumed, we must not fall into the error of supposing that all consumption is equally advantageous to the individual or the society. If a gentleman employ a set of labourers to build him a house the one summer, and to pull it down the next, the wages paid them while they are engaged in this futile occupation are evidently lost to their employer and the public ; whereas had he employed them in husbandry or manufactures he would most likely have obtained products equal to, or more valuable than, their wages. The value of the return, or the advantage obtained from consumption, is the true test whether it is advantageous or disadvantageous, or as it is more commonly termed, productive or unproductive. Commodities are consumed productively when the advantage or benefit, whether material or otherwise, accruing in consequence to their possessors, exceeds their value ; and they are consumed unproductively when such advantage or benefit is less than their value. The prosperity and decay of nations depends on this balance. If, in given periods, the commodities produced in a country exceed those consumed in it, the means of increasing its capital are provided, and its population will increase, or the actual numbers be better accommodated, or both. If the consumption in such periods fully equals the reproduction, the stock or capital of the nation not being increased, society will be at a stand. And if the consumption exceed the reproduction, every succeeding period will see the society worse supplied ; its prosperity and population will evidently decline, and pauperism will gradually spread itself over the country.

It is impossible, however, to fix on any standard by a comparison with which even a tolerable approximation may be obtained of the value or advantage of different kinds of consumption. This is a point on which the sentiments of no two individuals ever exactly coincide. The opinions of each always depend more or less on the situation in which he is placed. A rich man is inclined to give a greater extension to the limits of advantageous consumption than a man of middling fortune ; and the latter than he who is poor. And it is a truism to say that a man's expenses should always bear some proportion to his fortune and condition in society ; and that what might be proper and advantageous expenditure in one case, might be exceedingly improper and indeed absurd in another. Hence it is quite impracticable to frame any system of rules with regard to expenditure applicable to all individuals ; and were it practicable, there is no ground for thinking that they would be of the smallest utility. The public interest requires that the national capital should, if possible, be constantly kept on the increase ; or, which is the same thing, that the consumption of any given period should become the means of reproducing a greater value. But it has been sufficiently proved that this desirable result cannot, under any circumstances, be brought about by a system of *surveillance* and restriction. Industry and frugality never have been, and never will be, promoted by such means. To render a man industrious, secure him the peaceable enjoyment of the fruits of his industry :—to wean him from extravagance, and make him frugal and parsimonious, allow him to reap all the disadvantage of the one line of conduct, and all the advantage of the other. The poverty and loss of station that inevitably result from improvident and prodigal consumption are a sufficient security against its becoming injuriously prevalent. Wherever the public burdens are moderate, property protected, and industry free, the efforts of the body of the people to rise in the world and improve their condition occasion the continued increase of national wealth. It is idle to expect that all unproductive and unprofitable expenditure should ever be avoided ; but the experience of all tolerably well governed states proves, that the wealth which is productively expended, greatly exceeds that which is expended unproductively.

Luxury not disadvantageous.

It was long a prevalent opinion among moralists, that the production and consumption of luxuries was essentially unproductive. But this opinion is now almost universally abandoned. Unless, indeed, all comforts and enjoyments are to be proscribed, it is not possible to say where necessaries end and luxuries begin. But if we are to understand by necessaries such products only as are absolutely required for the support of human life, everything but wild fruits, roots, and water, must be deemed superfluous ; and in this view of the matter, it would follow that the peasantry of Ireland when they lived only on potatoes and butter-milk, had much more of the character of productive labourers than those of Britain! The mere statement of such a doctrine is sufficient for its refutation. Everything that stimulates exertion is advantageous. The mere necessaries of life may be obtained with comparatively little labour; and those savage and uncivilized hordes, who have no desire to possess its comforts, are proverbially indolent and dissipated. To make men industrious,—to make them shake off what seems to be their natural lethargy,—they must be inspired with a taste for the luxuries and enjoyments of civilized life. When this is done, their artificial wants become equally clamorous with those that are strictly necessary, and they increase exactly as the means of gratifying them increase. Wherever a taste for comforts and conveniences is generally diffused, the wants and desires of man become altogether illimitable. The gratification of one leads directly to the formation of another. In civilized societies, new products and new modes of enjoyment are constantly presenting themselves as motives to exertion, and as means for its reward. The operations of industry are prosecuted without intermission, and idleness, with its attendant train of evils, almost entirely disappear. "What," asks Paley, "can be less necessary, or less connected with the sustentation of human life, than the whole produce of the silk, lace, and plate manufactory? Yet what multitudes labour in the different branches of these arts! What can be imagined more capricious than the fondness for tobacco and snuff? Yet how many various occupations, and how many thousands in each, are set at work in administering to this frivolous gratification!" The stimulus given to industry by the desire to possess these articles renders their introduction advantageous. The earth is capable of furnishing food adequate for the support of a much greater number of human beings than can be profitably employed in its cultivation. But its owners will not part with their produce for nothing; or rather they will not raise what they can neither use themselves nor employ to buy what they want. As soon, however, as a taste for conveniences and luxuries is introduced, this difficulty is got over. The occupiers of the ground forthwith endeavour to raise from it the most that it can be made to produce, that they may exchange the surplus for the articles offered to them by manufacturers and merchants. And hence, though the latter have neither property in the soil, nor any concern in its cultivation, they are regularly and liberally supplied with its produce. In this way the quantity of necessaries, as well as of useful and agreeable products, is vastly increased by the introduction of a taste for luxuries; and while the people are infinitely better provided for, their numbers are greatly augmented.

So long, therefore, as the consumption of luxuries is confined within proper limits, it is quite unexceptionable. But when it exceeds these limits, that is, when it is greater than the consumers can afford, it becomes injurious. The injury, however, would be quite as great if they consumed an equivalent amount of necessaries. The mischief consists in the cost or value of the articles consumed exceeding the means of the consumers, and not in their belonging to this or that description or species of articles. But, except in cases where credit has been obtained through fraudulent representations, this is a fault which may be safely left to be dealt with by those concerned. The poverty and degradation that are sure to result from reckless consumption is a sufficient guarantee against its being carried to an injurious extent. To attempt to lessen it by proscribing luxury, is like attempting to enrich a country by taking away some of the most powerful motives to production.

Smith's criterion of productive and unproductive consumption.

Adam Smith has given another criterion of productive and unproductive consumption. But though exceedingly ingenious, and supported with his usual ability, his opinions on this point appear to rest on no solid foundation. He divides society into two great classes. The *first* consists of those who fix, or, as he terms it, "realize their labour in some particular subject, or vendible commodity, which lasts for some time at least after that labour is past;" the *second*, of those whose labour leaves nothing in existence after the moment of exertion, but perishes in the act of performance. The former are said by Smith to be *productive*, the latter *unproductive* labourers. Not that, in making this distinction, he meant to undervalue the services rendered by the latter, or to deny that they are frequently indispensable. But he contends that, how advantageous soever, these services not having any results of a fixed and transferable character, add nothing to the wealth of a country; and that, consequently, the labour of those by whom they have been rendered has been unproductively expended. To avoid, however, all chance of misrepresentation, we shall give Smith's opinions in his own words.

"There is one sort of labour," says he, "which adds to the value of the subject upon which it is bestowed; there is another which has no such effect. The former, as it produces a value, may be called productive, the latter unproductive labour. Thus the labour of a manufacturer adds generally to the value of the materials which he works upon, that of his own maintenance, and of his master's profit. The labour of a menial servant, on the contrary, adds to the value of nothing. Though the manufacturer has his wages advanced to him by his master, he in reality costs him no expense, the value of those wages being generally restored, together with a profit, in the improved value of the subject upon which his labour is bestowed. But the maintenance of a menial servant never is restored. A man grows rich by employing a multitude of manufacturers; he grows poor by maintaining a multitude of menial servants. The labour of the latter, however, has its value, and deserves its reward, as well as that of the former. But the labour of the manufacturers fixes and realizes itself in some particular subject, or vendible commodity, which lasts for some time at least after that labour is past. It is, as it were, a certain quantity of labour stocked and stored up, to be employed, if necessary, upon some other occasion. That subject, or, what is the same thing, the price of that subject, can afterwards, if necessary, put into motion a quantity of labour equal to that which had originally produced it. The labour of the menial servant, on the contrary, does not fix or realize itself in any particular subject or vendible commodity. His services generally perish in the very instant of their performance, and seldom leave any trace or value behind them for which an equal quantity of service could afterwards be procured.

"The labour of some of the most respectable orders in the society is, like that of menial servants, unproductive of any value, and does not fix or realize itself in any permanent subject or vendible commodity, which endures after that labour is past, and for which an equal quantity of labour could afterwards be procured. The sovereign, for example, with all the officers both of justice and war who serve under him, the whole army and navy, are unproductive labourers. They are the servants of the public, and are maintained by a part of the annual produce of the industry of other people. Their service, how honourable, how necessary, or how useful soever, produces nothing for which an equal quantity of service can afterwards be procured. This protection, security, and defence of the commonwealth, the effect of their labour this year, will not purchase its protection, security, and defence for the year to come. In the same class must be reckoned some both of the gravest and most important, and some of the most frivolous professions: churchmen, lawyers, physicians, men of letters of all kinds; players, buffoons, musicians, opera-singers, opera-dancers, &c. The labour of the meanest of these has a certain value, regulated by the very same principles which regulate that of every other sort of labour; and that of the noblest and most useful produces nothing which could afterwards purchase or produce an equal quantity of labour. Like the declamation of the actor, the harangue of the orator, or the tune of the musician, the work of all of them perishes in the very instant of its production." (*Wealth of Nations*, p. 146.)

Smith's distinction between the different classes of society shown to be ill-founded.

It will not, we think, be very difficult to show the fallacy of the distinction which Smith has endeavoured to establish in the paragraphs now quoted, between the labour, and consequently also the consumption of the different classes of society. To begin with the case of the menial servant:—His labour is said to be unproductive, because it is not realized in a vendible commodity, whereas the labour of the manufacturer is productive, because it is so realized. But of what, may we ask, is the labour of the manufacturer really productive? Does it not consist of comforts and conveniences required for the use and accommodation of society? The manufacturer is not a producer of matter, but of utility only. And is it not obvious that the menial servant is also a producer of utility? If the labour expended in converting the wool when in the fleece into a coat be, as no one doubts, productive, then surely the labour expended in cleaning and brushing the coat, and rendering it fit to be worn, must be so too. And if the husbandman who raises corn, beef, and other articles of provision, be a productive labourer, why is the menial servant who performs the indispensable task of dressing these articles, and fitting them to be used, to be stigmatized as unproductive? It is clear there is no substantial difference between their employments—that they are either both productive, or both unproductive. To have a fire, it is quite as necessary that coals should be brought from the cellar to the stove, as that they should be brought from the bottom of the mine to the surface of the earth. And if it be said that the labour of the miner is productive, must we not say as much of that of the servant employed to make and mend the fire? The whole of Smith's reasoning proceeds on a false hypothesis. He has made a distinction where there is none, and can be none. The end of all human exertion is the same—that is, to increase the sum of necessaries, comforts, and enjoyments; and it must be left to the judgment of every man to determine what portion of these he will have in the shape of services, and what in the shape of material products. A man is not more readily impoverished by maintaining menial servants than by indulging in any other species of expense. Doubtless he will be ruined if he keep more of them than he has occasion for, or can afford to pay; but his ruin will be equally certain if he purchase an excess of food or clothes, or engage a greater number of workpeople in his business than are required to carry it on, or his capital can employ. The keeping of two ploughmen when one only might suffice, is as improvident and wasteful as the keeping of two footmen to do the business of one. It is in the extravagant quantity or cost of the things or services we require, irrespective of anything else, that we must seek for the causes of impoverishment.

Case of the physician.

The same reasoning applies to all the instances mentioned by Smith. Take, for example, the case of the physician. He is classed, like the menial servant, among the unproductive labourers, because the bodies on which he exerts his art are not vendible or exchangeable. But if so, then it is plain that the veterinary surgeon who has charge of horses and dogs, will be entitled to rank in the productive class; and when the physician prescribes for and cures a slave, he also will become productive! Without, however, insisting on such self-contradictory statements, is it not clear that if the exertions of the physician conduce to health, and if he enable others to produce more than they could do without his assistance, he is, indirectly at all events if not directly, a productive labourer? Smith makes no scruple about admitting that a workman employed to repair a steam-engine should be enrolled in the productive class; and yet he would place a physician, who had been instrumental in saving the life of an Arkwright or a Watt among those that are unproductive! It is singular that he was not struck by such flagrant inconsistencies. And the errors into which he has fallen in treating this important branch of the science, set in a strong light the necessity of advancing with extreme caution, and of subjecting every theory, how ingenious soever it may appear when first stated, to a severe and patient examination.

The amusements furnished by players, singers, and so forth, come under the description of luxuries, and have the same effect on the public wealth as a taste for champagne, tobacco, tea, or other superfluities. They create new wants, and, by so doing, stimulate industry to procure the means of gratifying them. They are really, therefore, a means of production; and while they furnish fresh comforts and amusements, they add to the mass of useful products.

Public functionaries productive labourers.

The productiveness of the higher class of functionaries is still more obvious. Far, indeed, from being unproductive, they are, when they properly discharge the duties of their high station, the most productive labourers in a state. Smith says, that the results of their service, that is, to use his own words, "the protection, security, and defence of the commonwealth any one year, will not purchase its protection, security, and defence for the year to come." But this is plainly an error. He allows that the food and other articles produced by society in any given year, furnish in great part the means of producing its supplies of the same articles for the succeeding year. But without the security and protection afforded by government, these articles would either not exist at all, or their quantity would be very greatly diminished. How, then, is it possible to deny that those by whom this security is afforded are productively employed? Take the case of the labourers who construct fences: no one ever presumed to doubt that their labour is productive; and yet they do not contribute directly to the raising of corn or anything else. The object of their industry is to give security; to guard the fields that have been fertilized and planted from depredation, and to enable the husbandman to prosecute his employments without being distracted by the care of watching. But if those who defend a single corn field against the neighbouring crows and cattle, are justly said to be productive labourers, on what pretence shall we deny that title to the judges and magistrates, the soldiers and sailors, who protect every field in the empire?—to those to whose exertions we are indebted for our independence, and the free enjoyment of our property and privileges?

That much wealth has been unproductively consumed by the servants of the public, both in this and other countries it is impossible to doubt. But we are not to argue, from abuses extrinsic to a benefical institution, against the institution itself. If the public pay their servants excessive salaries, or employ more than are required for the purposes of good government and security, it is their own fault. Their conduct is similar to that of a manufacturer who should pay his labourers comparatively high wages, and employ more of them than he had occasion for. But though a state or an individual may act in this foolish and extravagant manner, it would be not a little rash thence to conclude that all public servants and all manufacturing labourers are unproductive! If the establishments which provide security and protection be formed on an extravagant scale, if there are more judges and magistrates, more soldiers or sailors, than are necessary, or if they receive larger salaries than would suffice to procure the services of others quite as competent to discharge their duties, let their numbers and their salaries be reduced. The excess, if there be any, is not a fault inherent in the nature of such establishments, but results entirely from the extravagant scale on which they are arranged.

Consumption ought not to be encouraged for the sake of stimulating production.

But, in showing that Smith was mistaken in calling the consumption of menial servants, lawyers, physicians, and public functionaries, unproductive, we must beware of falling into the opposite extreme, and of countenancing the erroneous and infinitely more dangerous doctrine of those who contend that consumption, even when most unproductive, should be encouraged as a means of stimulating production, and of increasing the demand for labour! The consumption of the classes mentioned by Smith is advantageous, because they render services in return, which those who employ them, and who are the only proper judges, consider of greater value than the wages they pay them. But the case would be totally different were government, capitalists, and others, to employ labourers not to profit by their services, but to stimulate production by their consumption. It is a fallacy to suppose, as many do, that production is encouraged by a wasteful consumption of the products of industry. A man is stimulated to produce when he finds a ready market for the produce of his labour—that is, when he can readily exchange it for other products. And hence the only legitimate encouragement of industry consists in the increase of production, and not in the increase of wasteful and improvident consumption. Every new article forms a new equivalent for, or means of purchasing some other article. It must always be remembered, that the mere existence of a demand, how intense soever it may be, cannot of itself be a means of encouraging production. "The sale of articles," to use the words of Paley, "depends upon the number, not of those who want, but of those who have something to offer in return for what they want; not of those who would consume, but of those who can buy; that is, upon the number of those who have the fruits of some other kind of industry to tender in exchange for what they stand in need of."[1] The more, therefore, that these fruits are increased, that is, the more industrious individuals become, their power to buy or to offer products of one sort or other in exchange for what they stand in need of, will be proportionally increased, and the market rendered so much the more extensive.

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It was contended by Sismondi and Malthus, in opposition to this doctrine, that the productiveness of industry may be carried to excess, and that where it is peculiarly efficient a large unproductive consumption is necessary to prevent the overloading of the market. But if we attend to the motives which make men engage in industrial undertakings, we shall be satisfied that the apprehensions of these writers are unfounded, and that the greatest facility of production cannot occasion a permanent glut of the market, or require to be countervailed by means of unproductive expenditure. In exerting his productive powers, every man intends either to consume the produce himself, or to exchange it for such articles as he wishes to get from others. If he do the first,—if he consume the articles he produces, there is an end of the matter, and it is evident that no conceivable increase of such articles could occasion a glut: If he do the second, —if he bring them to market, and offer them in exchange for other things, then, and then only, there may be glut. But why? Not because there has been an excess of production, but because the proper things have not been produced. A., for example, wished to obtain silks, and he manufactured cottons, and offered them in exchange to the holders of silks. But the latter did not want cottons, but broad cloths. And hence the glut in this case (and what is true of it, is true of every other case) does not originate in over-production, but in the production of articles which were not wanted, instead of articles which were. Let this error be rectified, and the glut will disappear. Even on the very improbable supposition that the holders of silks are supplied with cloth and everything else which those who wished to trade with them had it in their power to offer, the principle for which we are contending would not be in any degree invalidated. Such parties as cannot get the articles they want by means of an exchange are not at their wits' end; but would forthwith turn their industry into other channels, and, instead of producing their equivalents, would set about directly producing the articles themselves, or substitutes that might be used in their stead. Production is never carried on except as a means to an end; and if it be rightly adapted to compass that end, it is contradictory to suppose it can be too great. Owing to miscalculations of one sort and another there is often an excess of one or of a few articles; but it is quite impossible that there should be an universal glut. For every surplus, on the one hand, there must be a corresponding deficiency on the other. The fault is not in producing too much, but in producing commodities which are not suited to those to whom we wish to sell them, or which we cannot ourselves make use of. If we attend to these two grand requisites, we may increase the power of production ten or twenty times, and yet be as free of all excess as if we diminished it in the same proportion. Unproductive consumption is not therefore required to prevent the overloading of the market; and though it were, no government would be justified in carrying it on for such a purpose.[2]

It must, however, be remembered, consistently with what has been previously advanced, that in deciding as to the character of the consumption or expenditure of wealth, we must look at its indirect and ultimate, as well as its direct and immediate effects. An expenditure which, if we take its immediate results only into account, we should pronounce improvident and unproductive, may yet be discovered, by looking at it in its different bearings, and in its remote influences, to be distinctly the reverse; and it is also true that cases frequently occur in which that expenditure which is ruinous to the individual may, by stimulating industry in others, be beneficial to the state.

Montesquieu has said, "*Si les riches ne dépensent pas beaucoup, les pauvres mourront de faim.*"[3] The truth of this proposition has, however, been disputed; and this is not to be wondered at, as it may be either true or false, according to the sense in which it is understood. If it be construed to mean that a rich man will be able continuously to employ a greater number of servants or labourers if he spend his revenue in luxurious accommodations than if he lay out a part of it on the improvement of his estate, or in accumulating a provision for his younger children, it is plainly erroneous. An increased demand for labour is the effect of an increased amount of capital; and as those who spend their whole incomes cannot amass capital, so neither can they employ a greater number of labourers. But the proposition advanced by Montesquieu should not be interpreted in this confined sense, or as being restricted to the direct influence of the demand of the rich for the services of the poor, but as also referring to and comprising its indirect influence over the demand of the middle classes and society in general for these services. And if we so interpret it, and suppose it to mean that the lavish expenditure and luxury of the great and affluent becomes a means of materially benefiting the poor, by exciting the emulation of others, who cannot expect, except through an increase of industry and economy, to be able to indulge in a similar scale of expense, it will, we apprehend, be found to be perfectly correct. To suppose, indeed, that the passion for luxurious gratifications should decline amongst the rich, and that men should, notwithstanding, continue equally industrious, is a contradiction. Riches are desirable only because they afford the means of obtaining these gratifications; and so powerful is the influence of a taste for them, that it may be doubted whether the extravagance which has ruined so many individuals has not been, by giving birth to new arts and new efforts of emulation and ingenuity, of material advantage to the public.

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[1] *Moral Philosophy*, b. vi., cap. 11.

[2] M. Say was the first who showed in a satisfactory manner that effective demand depends upon production. (See his chapter *De Debouchés.*) But the principles from which his conclusions are drawn had been stated so early as 1752 in a tract of Dean Tucker, entitled *Queries on the late Naturalization Bill.* As this tract is now become of rare occurrence, we subjoin the queries referred to:—"Whether it is possible in the nature of things for all trades and professions to be overstocked? and whether, if you were to remove any proportional number from each calling, the remainder would not have the same grounds of complaint they had before?—Whether, in fact, any tradesman thinks there are too many of other occupations to become his customers; though narrow selfish views lead him to wish there were fewer of his own trade?—If a particular trade be at any time overstocked, will not the disease cure itself? that is, will not some persons take to other trades, and fewer young people be bred up to that which is least profitable? and whether any other remedy but this is not in fact curing one transient disorder by bringing on many which are dangerous, and will grow inveterate?—Whether it is not an infallible maxim that one man's labour creates employment for another?" p. 13. For a further demonstration of the same principle see Mill's *Commerce Defended*, p. 80.

[3] *Esprit de Loix*, liv. vii., cap. 4.

These remarks are not made in the view of countenancing extravagant expenditure, but to show that those who attempt to decide as to the influence, in a public point of view, of an outlay of wealth, without endeavouring to appreciate and weigh its remote as well as its immediate effects, must, when they are right in their conclusions, be so only through accident. But without insisting farther on this point, it is abundantly certain that there is nothing to fear from the improvidence of individuals. No people, as has been already observed, ever misses an opportunity to save and amass. In all tolerably well-governed countries the passion for accumulation has always had a decided ascendancy over the passion for expense.

The incomes of individuals being, in the vast majority of cases, the result of their own industry and frugality, they are fully conscious of the sacrifice which their expenditure compels them to make, and endeavour, with but few exceptions, to confine it within the narrowest limits. This, however, is but seldom the case with the consumption of governments and their servants. They do not consume their own wealth, but that of others; and this circumstance prevents them from being so much interested in its profitable outlay, or so much alive to the injurious consequences of wasteful expenditure, as their subjects. But, though more difficult to practise, economy on the part of governments is of infinitely greater importance than economy on the part of individuals. A private gentleman, being master of his own fortune, may dispose of it as he pleases. He may act on the erroneous principle of profusion being a virtue, or he may attempt to excite the emulation and industry of his fellow-citizens by the splendour of his equipages and the magnificence of his mode of living. But government can with propriety do none of these things. It is merely a trustee for the affairs of others, which it is bound to administer as economically as possible. Were the principle admitted, that money might be raised to excite industry and ingenuity by the pressure of taxation or the luxury of public functionaries, an avenue would be opened to every species of malversation. It is, indeed, pretty certain that no people would submit to be taxed for such purposes; but if they did, the flagrant abuses to which it would inevitably lead could hardly fail of ending either in revolution or in national poverty and degradation. Economy in expenditure is, upon all occasions, the first virtue of a government, and the most pressing of its duties.

Conclusion.

We have now seen how labour may be rendered most productive of wealth—how that wealth is distributed among the various classes of society—and how it may be most advantageously consumed. We have seen the indissoluble connection between private and public opulence; that whatever has any tendency to increase the former, must to the same extent increase the latter; and that SECURITY OF PROPERTY, FREEDOM OF INDUSTRY, AND MODERATION IN THE PUBLIC EXPENDITURE, are the only, as they are the certain means by which the various powers and resources of human talent and ingenuity may be called into action, and society made continually to advance in the career of wealth and civilization. Owing to the different dispositions and capacities of individuals, and the widely different circumstances under which they are placed, they will no doubt continue to exhibit in time to come, as they have done hitherto, great differences in their situation and conduct. But the adoption of a well-digested system of public economy is sure, notwithstanding, to conduce to their general well-being. While it adds to the numbers and wealth of the rich, it makes still greater additions to the numbers and wealth of the middle classes, and raises the poor more nearly to a level with the others. The latter, indeed, are now in possession of a vast number of conveniences and luxuries which formerly could not be commanded even by the richest lords. In a well-constituted society, all who pursue their occupations with diligence, perseverance, and economy, may reasonably expect to realize the advantages attached by Providence to such conduct. At all events, that is the only way in which their condition can be honourably, and therefore beneficially improved, and the public wealth augmented. It is by the spontaneous and unconstrained, but well-protected efforts of individuals to improve their condition and rise in the world that nations become rich and powerful. Their labour and their savings are at once the source and the measure of national opulence and public prosperity. They may be compared to the drops of dew, which invigorate and mature all vegetable nature. None of them has singly any perceptible influence; but we owe the foliage of summer and the fruits of autumn to their combined action. (J. R. M.)

POLL, a word used in ancient writings for the head. Hence *to poll* is either to vote, or to enter down the names of those persons who give their votes at an election.

POLLA, La, a town of Naples, in the province of Principato Citra, on a hill at the entrance of the beautiful, fertile, and populous Val di Diano, 10 miles N.N.W. of La Sala. It has a number of churches and monastic institutions; and there are manufactures of silk and coarse woollen cloth. The Negro, which is here a considerable river, suddenly disappears at the foot of the hill on which the town is built, and flows underground for 2 miles as far as Pertosa. Pop. 5000.

POLLEN. See Botany.

POLLAJUOLO, Antonio, an eminent goldsmith and painter, was born at Florence in 1426. Apprenticed in his youth to the famous goldsmith Lorenzo Ghiberti, he soon rose to the place that was suitable for the exercise of his genius. The exquisite touch of his chisel immediately marked him out among his fellow-pupils. In the fabrication of the celebrated bronze gates of San Giovanni he became his master's chief assistant, and surpassed all the other coadjutors in correct design and patient execution. His increasing excellence soon enabled him to open a shop for himself, and to take the first place in his profession. He established his reputation and immortalized his name by working in silver, for the altar of San Giovanni, a series of stories representing the "Feast of Herod" and the "Dance of Herodias' Daughter." Pollajuolo next became a competitor for the fame of a painter. Placing himself under the tuition of his younger brother Pietro, he acquired the art in a few months. Then applying himself to anatomy, a subject which no artist had ever studied before him, he became especially excellent in representing the action of the muscles. A work representing the martyrdom of St Sebastian, and called by Lanzi "one of the best pictures of the fifteenth century," still remains in the church of San Sebastiano de' Servi, to be a specimen of his artistic skill. Pollajuolo spent his last years in Rome, working in bronze the tomb of Sextus IV. He died in that city in 1498. Intimately associated with the name of Antonio Pollajuolo is that of his brother Pietro. Only two years his junior, Pietro instructed him in painting, assisted him in executing many of his pictures, died in the same year, and was buried in the same tomb in San Pietro in Vincoli. (See Lanzi's *History of Painting*, and Vasari's *Painters*, &c.)

POLLENZA, a town in the island of Majorca, on the north coast, 28 miles N.E. of Palma. The houses are well built, and the streets paved. There are a handsome church, a town-hall, hospital, prison, and schools. Black woollen cloth is made here, as well as some other articles; and there is some trade in oil and wine. The bay, 2 miles to the east, is large, and sheltered on all sides but the N.E. Pop. 6402.

POLLIO, Caius Asinius, a distinguished orator, poet, and historian of the Augustan age, was descended from a family of the Marrucini, and was born B.C. 76. He had consequently frequent opportunities during his youth of hearing Cicero, Cæsar, Hortensius, and the other great orators of his day. He attempted early to signalize himself by accusing C. Cato, B.C. 54, when in his twenty-second year, but the powerful influence of Pompey proved too great for him. He espoused Cæsar's party when a rupture took place between Pompey and Cæsar, joined his army in Cisalpine Gaul, accompanied him across the Rubicon, served with him in the campaign against Pompey at Pharsalia, B.C. 48, and fought at his side against the Pompeian party in Africa. On his return to Rome, he was created *prætorius*, B.C. 44; and shortly after was sent to Spain. March of the same year saw the death of Cæsar; and Asinius Pollio well-nigh lost his life in fighting against Sextus Pompey. He joined the triumvirate of Octavian, Antony, and Lepidus, and had assigned to him the difficult task of being administrator of Transpadane Gaul. It was at this juncture that he saved the property of the poet Virgil at Mantua from being confiscated. On his return to Rome, he became consul, and had the honour to have addressed to him the fourth Eclogue of Virgil. In 39 B.C. Antony sent him with a portion of his army to fight against the Parthini; and his success was the means of gaining him a triumph, and the eighth Eclogue of Virgil. From this time he seems to have withdrawn altogether from political life, and to have devoted himself to the study of literature. He lived to see Augustus fully established in his reign, when he died at his Tusculan villa, A.D. 4.

Asinius Pollio was the first to establish a public library at Rome. He was likewise the patron of Virgil and Horace (*Carmen* ii. 1), not to speak of other eminent poets and writers. None of Pollio's works have come down to us. Besides his speeches, he was author of a history of the civil wars, in seventeen volumes, besides tragedies, which have led his contemporaries and successors to class his name with those of Cicero, Virgil, and Sallust, as an orator, a poet, and a historian. The reader may consult Eckhard's *Commentatio de C. Asinio*, Jena, 1793; Thorbecke's *Commentatio de C. Asinii Pollionis Vita et Studiis*, Lugd. Batav., 1820; and Smith's *Dictionary of Biog. and Myth.*, London, 1851.

POLLOCKSHAWS, a burgh of barony and town of Scotland, in the county of Renfrew, on the White Cart, here crossed by an old bridge of two arches, 2½ miles S.W. of Glasgow. It consists of one long irregular street, and other smaller ones. The town has recently been much improved, and many good houses have been built. The Established Church and the Free Church have each two places of worship, and the United Presbyterians, Original Seceders, and Roman Catholics have one each. Pollockshaws contains also an old town-house, a bank, and several schools. The prosperity of the town depends chiefly on the cotton-spinning which is carried on here, and in which most of the inhabitants are employed. Silk and cotton are woven by hand and power looms; and bleaching, dyeing, and calico-printing are carried on in the town. Coal mines are worked and stone is quarried in the vicinity of Pollockshaws. Pop. (1851) 6086.

POLLOK, Robert, the author of *The Course of Time*, was born at Moorhouse, in the parish of Eaglesham in Renfrewshire, in 1798, and received his elementary education at the school of Mearns. His characteristic love of learning displayed itself when he was still a rough rustic boy, hoeing and weeding in his father's fields. From that time it was his chief ambition to train himself for being a literary man, and especially a poet. While preparing for the university at the parish school of Fenwick, he gave his days and nights to the Latin language and to English poetry. While studying at Glasgow college, between 1817 and 1822, he kept the great authors ever standing as models before his mind's eye. His master-passion assumed a more decided form when he had taken the degree of Master of Arts, and had become a theological student in the United Secession Church. He then produced those stories which were afterwards published together under the title of *Tales of the Covenanters*, and set himself to evolve by degrees the ambitious plan of a great poem. At length, in July 1826, just when he was on the eve of taking license as a preacher, his *Course of Time*, a poem written in blank verse, and consisting of ten books, was completed. The circumstances attending this work's appearance before the public were very favourable. Blackwood the publisher, to whom it was first sent, submitted the manuscript to the perusal of Professor Wilson. That genial critic discovered its merit immediately, and recommended that it should be printed. Accordingly, the book was published in March

Pollux ‖ Polna.

1827, and was at once received as a poem of no ordinary merit. It is true that, to a discriminating eye, the design appeared unwieldy, the execution unequal, the images confused, indistinct, and distorted, and the diction frequently mere empty turgidity. Yet there were many qualities which secured the approbation of a wide circle of readers. Those who were fond of religious verse were delighted to find so much deep piety and orthodox sentiment joined with such a fresh and vigorous genius. Those who indulged in general literature admired the bold and striking imagination, the touches of tender feeling, and the signs of a strong crude power which the author everywhere displayed. The consequence was, that the edition was sold rapidly; the poem was favourably treated by the reviews; and the new poet was even placed by some thorough-going admirers on a level with Dante and Milton. It soon appeared that poor Pollok had purchased fame with his precious life. As his reputation began to increase, his body began to sink. In the course of a few months symptoms of consumption, the effect of his intense mental toil, became apparent. Several eminent and rich patrons rose up to assist him; but their assistance was too late. As a last resource, it was determined to send him to the mild climate of Italy; but his death-stricken frame could not be carried any farther than Southampton. There, on a September morning, six months after the publication of his great poem, he breathed his last; and there a granite obelisk erected over his grave, and bearing an inscription by the late Dr John Brown of Edinburgh, still tells of his untimely fate. The Life of Pollok, by his brother, appeared at Edinburgh in 1843. The twenty-first edition of his *Course of Time*, beautifully illustrated, was also published by Blackwood in 1857.

POLLUX. See DIOSCURI.

POLLUX, *Julius*, a Greek writer of antiquity, was born at Naucrates, a town in Egypt, and flourished in the reign of the Emperor Commodus, A.D. 183. He was educated under the Sophists, and made great progress in grammatical and critical learning. Having taught rhetoric at Athens, he became so famous that he was made preceptor of the Emperor Commodus. He drew up for the use of the latter, and inscribed to him, whilst his father Marcus Antoninus was living, an *Onomasticon*, or Greek vocabulary, which he divided into ten books. It is extant, and contains a vast variety of synonymous words and phrases, ranged under the general classes of things. It was intended to facilitate the knowledge of the Greek language to the young prince; and it is still very useful to all who have a mind to be perfect in that tongue. The first edition of the *Onomasticon* was printed at Venice by Aldus in 1502, and a Latin version was afterwards published along with it; but there was no correct and handsome edition of this work till that of Amsterdam, 1706, in folio, by Lederlinus and Hemsterhusius. Lederlinus went through the first seven books, and corrected the text and the version, subjoining his own along with the notes of Salmasius, Vossius, Valesius, Jungermann, and Kuhnius. This was followed by the edition of W. Dindorf, Leipsic, 5 vols. 8vo, containing the works of previous commentators. The last edition is that of Bekker, Berlin, 1846, which contains only the Greek text. Pollux wrote nine other works, none of which remains. He lived to the age of fifty-eight. Philostratus and Lucian have both treated him with much contempt and ridicule. (Philostrat. *de Vit. Sophist.*, lib. ii.; and Lucian *in Rhetorum Præceptore.*)

POLNA, a town of Bohemia, in the circle of Czaslau, not far from the Moravian frontier, 31 miles S.S.E. of Czaslau. It contains a church and a princely palace. The manufacture of cloth is carried on; this, together with agriculture and mining, occupying the most of the inhabitants. Pop. 6000.

Polo.

POLO, MARCO, a celebrated traveller, was the son of a Venetian merchant, and was born about 1250, at a time when his father was absent in the East. He was approaching the age of manhood when his parent, Niccolo Polo, and his uncle, Maffio Polo, returned to Venice in 1269 with a long account of their many travels and adventures. They had repaired, in pursuit of commerce, to Bolgar, on the Volga, the seat of the khan of the Western Tartars. A fierce war in the neighbourhood had cut off their return, and had left them no alternative but to travel round the northern shore of the Caspian Sea, and take refuge in Bokhara. After residing there for three years, they had been persuaded, in 1264, by a Persian ambassador to accompany him to Kemenfu in Chinese Tartary, the court of Kublai, the grand khan. Taking their lives in their hands, they had passed through severe snow-storms and over flooded rivers to their destination, a place that had never been visited before by any European. The great potentate had received them with condescension and affability, had shown a deep interest in the institutions of the western nations, and had sent them back to Europe on an embassy to the Pope. The brothers Polo now resolved to take young Marco with them on their return. Accordingly, in 1272, the three set out from Acre, bearing letters and presents from the newly-elected supreme pontiff, Gregory X. A journey of three years and a half, over toilsome deserts and through dangerous defiles, brought them to Tai-yuen-foo, the city where the grand khan was then holding his court. They were welcomed with the most distinguished honours, and were immediately raised to places of dignity and trust. Marco soon found himself in the most favourable circumstances for obtaining correct and extensive information regarding the land of his sojourn. The natives, gratified with the easy manner in which he assumed their language and manners, admitted him into their society, and treated him as one of themselves. The khan himself was constantly sending him on confidential missions to the most distant parts of the empire. The government of the city of Yang-tchoo-foo was even entrusted to him for the space of three years. At the same time, he was encouraged by his sovereign employer to take notes of everything that seemed rare or remarkable. Marco Polo had been employed in this manner for seventeen years, when he and his companions set their minds upon returning home. Kublai was at first unwilling to gratify their request. A circumstance, however, soon occurred which compelled him to yield. A Persian embassy, who were charged with conducting home a bride to their native prince from the court of the khan, found that they could not proceed by land, on account of the prevalence of hostilities along their route. At the same time, it was evident that they could not journey by sea, except under the guidance of those who were more skilful in navigation than the natives. There was therefore no resource but to allow the three Europeans to depart, in order that they might pilot the ambassadors as far as the Persian Gulf. Accordingly, in 1295, after an absence of twenty-four years, they arrived in Venice, complete foreigners in dress, appearance, and language, and without a single home-bred feature to recall them to the remembrance even of their nearest relations. Marco Polo, however, during the rest of his life, was treated with great honour and respect by all classes of people. Many of his fellow-citizens repaired to his house to drink in his wonderful stories about the grand khan and the far-distant Cathay. Still more went to pay court to the priceless wealth which he had brought home with him, and to bask in the delicious atmosphere of luxury which he had spread around him. No less consideration was paid to him when he had been taken prisoner in a sea-fight, and consigned to a prison in Genoa. It soon became fashionable among the Genoese to visit the cell of the far-travelled Venetian. So often was he called upon to tell his adventures that he grew tired, and resolved to recount them once for all in a written narrative. Rusticien de Pise, a well-known mediæval writer, was employed to put the facts into a legible form; and in 1298 the manuscript was circulated, to the great delight and satisfaction of the traveller's numerous admirers. At length, after a lapse of four years, the public interest in his welfare became so great that he was released, and sent home to his native Venice to live to a good old age.

During the three centuries after Marco Polo's death, his narrative continued to be very popular in different countries. In fact the translations into various languages became so numerous that there is a difficulty of determining what tongue is the original, and what text is the most correct. Yet it seems to be ascertained that the original language was French, and that the best edition is that in Italian, by Count Baldelli, in 4 vols. 4to, Florence, 1827. The latest English translation of the Travels of Marco Polo is that of Marsden, edited by Thomas Wright, Esq., and published in Bohn's "Antiquarian Library," London, 1854.

POLOTZK, a town of European Russia, in the government of Vitebsk, on both sides of the Polota, at its confluence with the Düna, 60 miles W.N.W. of Vitebsk. It is surrounded by fortifications, and has a ruined castle and numerous churches and convents. The most remarkable building is the college and beautiful church that formerly belonged to the Jesuits, but now to the Piarists. An active trade is carried on in flour, hemp, and other produce of the country; and annual markets are held, which are much frequented. Polotzk is a very ancient town; it existed as early as the time of Rurik, the founder of the Russian power. Battles were fought here in July and October 1812 between the French and the Russians. On the former occasion the French were successful, and took possession of the town; but on the 20th of October it was stormed and retaken by the Russians. Pop. (1851) 11,131.

POLTAVA, or PULTAVA, a government of European Russia, lying between N. Lat. 48. 48. and 51. 4., E. Long. 30. 25. and 36; bounded on the N. by the government of Tchenigov, E. by those of Kursk and Charkov, S. by those of Ekaterinoslav and Kherson, and W. by that of Kiev; length, from N.W. to S.E., 212 miles; greatest breadth, 145 miles; area, 19,059 square miles. The whole surface consists of an extensive plain, sloping gradually from the N.E. towards the Dnieper, which forms the S.W. boundary of the government. Along the banks of this and the other rivers, its tributaries, in the country, there are a few hills, but these are the only interruptions to the monotonous flatness which prevails throughout the country. The principal affluents of the Dnieper in the government are the Sula, Psiol, Vorskla, and Orel, all flowing from the N.W. The Dnieper is navigable all along the frontier of Poltava; and the Sula and Psiol are likewise navigable during the spring. The whole of the arable and meadow land is very rich and fertile. A small part of the country is occupied by forests; and a much larger portion consists of grass-covered steppes. The government contained in 1849, 5,397,198 acres of arable land; 3,279,915 of meadow land; 1,640,467 of wood; and 1,006,685 of waste land. The quantity of corn produced in the same year was 40,883,029 bushels, and of potatoes 2,842,535 bushels. There were at the same time in the government 173,352 horses, 661,061 horned cattle, 1,704,294 sheep, 410,050 swine, and 3702 goats. The kinds of grain principally raised here are rye, oats, barley, wheat, buckwheat, and millet. Tobacco, linseed, rapeseed, peas, and other vegetables are grown, as well as many kinds of fruit. Bees are kept in large numbers; many farmers have more than 100 hives; and the honey that is produced is of very excellent quality. Hares and partridges are numerous; and fish abound in the rivers. The climate is mild and healthy; but the cold in winter is sometimes severe when the north wind prevails. The only mineral productions are clay, lime, chalk, and saltpetre. Neither manufactures nor commerce are extensively carried on. There were, however, in 1849, 166 manufactories, employing 8014 hands. Among the former there were 55 of saltpetre, 24 of tallow and candles, 22 of tiles, 18 of cloth, 17 of sugar, and 9 of leather. The principal articles of export are corn and other rural produce, tallow, horses, cattle, wool, hemp, and flax. The majority of the inhabitants belong to the Greek Church; there are, however, 24,354 Jews, and a few Protestants and Roman Catholics in the country. Education is very much neglected, though nominally under the charge of the university of Charkov. There were in 1854, besides a gymnasium and other superior schools, 89 village schools, with 99 teachers, and 3643 scholars. Pop. (1851) 1,668,694.

POLTAVA, the capital of the above government, stands on a hill near the confluence of the rivers Poltawka and Vorskla, 445 miles S.S.W. of Moscow. It is walled, and defended by a castle in the centre occupying the summit of the hill. The streets are broad and straight, and the houses are for the most part of wood, though some of them are of stone or brick. Near the middle is the fine Alexander Square, with a granite monument to Peter the Great, commemorative of his victory at Poltava in 1709. Among the public institutions of the town are a cathedral and numerous other churches, a convent, several schools, a museum of industry, a lunatic asylum, and other benevolent establishments. In the vicinity there are large saltpetre works and extensive plantations of cherry trees. There are here also tanneries and distilleries. Some trade is carried on in the produce of the country with Turkey and Germany. The town was besieged by Charles XII. in 1709; but Peter the Great, advancing to raise the siege, totally defeated the Swedish monarch in the vicinity. This decisive battle forced Charles to take refuge in Turkey, and securely established the power of Russia. An obelisk has been erected on the field of battle, near which high mass is annually performed. Pop. (1851) 20,071.

PÖLTEN, ST (contracted for *St Hippolyt*), a town of Lower Austria, capital of the circle of Ober Wienerwalde, on the left bank of the Trasen, 35 miles W. of Vienna. It contains a splendid cathedral, an episcopal palace, several schools, an hospital for the deaf-and-dumb, a town-hall, theatre, and ball-room. In the principal square in the town stands a triangular column in honour of the Trinity (*Dreifaltigkeitssäule*). St Pölten has potteries, glass-works, cotton factories, and paper-mills. Pop. 5800.

POLYÆNUS, the name of many famous men recorded by the ancient writers. Amongst them was Julius Polyænus, of whom we have some Greek epigrams extant in the first book of the *Anthologia*. The Polyænus whom it most concerns us to know about is the author of the eight books of the *Stratagems of Illustrious Commanders in War*. He was probably a Macedonian, and perhaps a soldier in the early part of his life; but of this there is no certainty. He was undoubtedly a rhetorician and a pleader of causes; and, from the dedication of his work to the emperors Antoninus and Verus, he appears to have lived towards the latter part of the second century. The Στρατηγήματα were published in Greek by Isaac Casaubon, with notes, 1589, in 12mo; but no good edition of them appeared till that of Pancratius Maasirtius, Leyden, published in 1690, in 8vo. This work was translated into English by R. Shepherd, London, 1793.

We have in this work the various stratagems employed by above three hundred captains and generals of armies, chiefly Greeks and barbarians, for the Romans seldom resorted to such arts; and, besides, Polyænus has shown that he was little acquainted with Roman affairs. A great number of these stratagems appear to us to be ridiculous or impracticable; and neither the generals nor common soldiers of our day would be found simple enough to be caught by them. Few of the latter order indeed are capable of reading Polyænus' *Stratagems;* and if they were, they would reap but little benefit from the book. It is useful, however, to such as study the Greek language and antiquity; for many things will be found in it illustrative of the customs and opinions of ancient times. The sixth and seventh books are both imperfect. Polyænus composed several other works besides the *Stratagemata.* Stobœus has produced some passages out of a book *De Republica Macedonum;* and Suidas mentions a piece concerning the Thebans. If death had not prevented him, he would have written Memorabilia of the Emperors Antoninus and Verus, which he promised to undertake in the Preface to his sixth book of *Stratagems.* Casaubon, in the Dedication of Polyænus to Mornæus, calls him an elegant, acute, and learned writer.

POLYBIUS, a celebrated Greek historian, was the son of Lycortas, a native of Megalopolis in Arcadia, who succeeded Philopœmen in the chief direction of the Achæan League. His father, therefore, must have been one of the most distinguished men of his time; and we find him accordingly taking part in the principal transactions of his country. The exact date of his birth is unknown, but it is generally believed that it took place between 210 and 200 B.C.; and his death was therefore not earlier than 129 B.C., as he lived to the advanced age of eighty-two. Plutarch tells us that the character of Polybius was formed under the eye of Philopœmen; and that at the funeral of that general he carried the urn which contained his ashes, 182 B.C. The following year he was, along with his father and the son of the celebrated Aratus, appointed as ambassador to return thanks to Ptolemy Epiphanes for the assistance which he had offered to the Achæans; but the death of that prince took place before the ambassadors left the Peloponnesus. In the war which arose between the Romans and Perseus, King of Macedonia, the opinion of Polybius and his father Lycortas was, that the Achæans should observe a strict neutrality; but they were overruled, and the Achæans were implicated in the ruin of Perseus. To break the spirit of the Achæans, and to prevent any further attempts at insurrection, more than a thousand of the principal citizens were sent to Rome, and afterwards dispersed throughout the different cities of Italy. Polybius was one of these exiles; but he was so far favoured that he was allowed to remain in Rome, where he resided for sixteen years, from 167 to 151 B.C. He became the intimate friend and instructor of Scipio the younger, at that time only eighteen years old, and who afterwards showed how much benefit he had derived from the care Polybius bestowed on his education. At last, through the influence of Scipio and Cato, the Senate was prevailed on to allow the Achæan exiles to return to their country; but of the original thousand only three hundred survived to enjoy the permission thus granted to them. Polybius seems now to have employed his time chiefly in travelling, with the view of acquiring more accurate notions of geography. He examined with great care and minuteness the passes of the Alps, that he might be enabled to give a correct account of the passage of Hannibal. He afterwards visited Gaul, Spain, and Africa, to which latter country he accompanied Scipio, 146 B.C., when that general took and destroyed Carthage. But the calamities of his own unhappy country called him away, and he hurried to the Peloponnesus, where his presence, however, was unable to save Corinth from the fate which had overtaken Carthage. He did all in his power to prevail on his countrymen to submit to a fate which they only made worse by resistance; and the Roman deputies felt such reliance on his good intentions, that they appointed him to the office of judge in all disputes that might arise in any part of the Peloponnesus. He gradually acquired the esteem of his countrymen, and many of the cities of Greece erected statues to his honour. He subsequently extended his travels into Egypt, which he visited in the reign of Ptolemy Physcon. Whether he was present with Scipio at the siege of Numantia, B.C. 134, we are nowhere told; but he left behind him a work on the subject. He also wrote a biographical sketch of Philopœmen, a work on *Military Tactics,* and another on the *Equatorial Regions.*

His principal work, however, was entitled *General History,* though it referred more particularly to a space of fifty-three years (from 220 to 168 B.C.), from the commencement of the second Punic war, where the historian Timæus, and Aratus of Sicyon, had stopped, to the defeat of Perseus, King of Macedonia, by the Romans. It was divided into forty books, of which we now only possess the first five entire, and rather long fragments of most of the others. The first two books are occupied with introductory matter, giving a sketch of the events that happened anterior to the second Punic war. He explains the causes which gave rise to the first Punic war, and then relates the various events which took place during the twenty-four years it lasted. He gives also some account of the contest which arose between the Carthaginians and their stipendiaries. The second book contains the wars of the Æolians, Illyrians, Achæans, the expeditions of the Romans against the Illyrians and Gauls, and the transactions of Antigonus, King of Macedonia, and Cleomenes, King of Sparta, occupying a period of seventeen years, from 237 B.C. to 220. The third book enters into what is more properly the subject of his history, and, after explaining what he considers to be the true causes of the second Punic war, follows the path of Hannibal's victories as far as the battle of Cannæ, 216 B.C. Yet it would appear that he was defective in method, as the fourth book carries us back to anterior events, which had happened in 220, 219, 218 B.C. After a sketch of the people of the East during the reign of Philip, son of Demetrius, King of Macedonia, of Ariarathes, King of Cappadocia, of Antiochus, King of Syria, and Ptolemy Philopater, King of Egypt, this book traces the history of wars and seditions in Greece. In the fifth book we have the victories of Philip, the wars in Syria between Antiochus and Ptolemy, and the confederated arms of Greece turned against Rome. It would be useless to give any detailed account of the fragments of the thirty-five books that have been preserved; but we know that the thirty-ninth book ended with the destruction of Corinth, 146 B.C. There have been many editions of this work, but the most critical is that of J. Schweighäuser, 8 vols. 8vo, Leipsic, 1789–1795. The last edition is that of Immanuel Bekker, Berlin, 1844, 2 vols. 8vo. It has been translated into English by Hampton, 1772, 2 vols. 4to; into French by Thuillier, 7 vols., Par. 1759, with numerous plates and critical annotations; into German by Chr. Seybold, Lemgo, 1779–1783, and by L. Storch, Prenzl. 1828.

POLYCARP, one of the most ancient fathers of the Christian Church, was born towards the end of the reign of Nero, probably at Smyrna, where he was educated at the expense of Calista, a noble matron distinguished alike by her piety and charity. He was unquestionably a disciple of St John the Evangelist, and he conversed familiarly with others of the apostles. When of a proper age, Bucolus ordained him a deacon and a catechist of his church; and upon his death he succeeded Bucolus in the bishopric, to which he is said to have been consecrated by St John, who also directed his Apocalypse, amongst others, to him, under the title of "the angel of the church of Smyrna." When the controversy about the observation of Easter began to run high between the eastern and western churches, he went to Rome to discourse with those who were of the opposite party. The Roman see was then occupied by Anicetus, with whom he had many conferences, which were carried on in the most amicable manner; and though neither of them could bring the other to embrace his opinion, they both retained their own sentiments without violating that charity which is the great law of religion.

Whilst at Rome he particularly opposed the heresies of Marcion and Valentinus. His conduct on this occasion is related by Irenæus, who informs us that when Polycarp passed Marcion in the street without speaking, Marcion said, "Polycarp, own us;" to which he replied with indignation, "I own thee to be the first-born of Satan." Irenæus adds, that when any heretical doctrines were spoken in his presence, he would stop his ears, and say, "Good God, to what times hast thou reserved me, that I should hear such things," and immediately left the place. He was accustomed to mention that St John, going into a bath at Ephesus, and finding in it Cerinthus the heretic, immediately started back without bathing, crying out, "Let us run away, lest the bath should fall upon us whilst Cerinthus, the enemy of truth, is in it." Polycarp governed the church of Smyrna with apostolic purity till he suffered martyrdom in the seventh year of Marcus Aurelius. The manner of his death is thus related:—The persecution waxing hot at Smyrna, and many having sealed their faith with their blood, the general cry was, "Away with the impious; let Polycarp be sought for." Upon this he privately withdrew into a neighbouring village, where he continued for some time praying day and night for the peace of the church. He was thus employed when one night he fell into a trance, and dreamed that his pillow took fire and was burned to ashes. When he awoke he told his friends the circumstance, and pronounced it a presage that he should be burned alive for the cause of Christ. Three days afterwards, in order to escape the incessant search after him, he retired into another village. His enemies, however, were at hand, and having seized upon two youths, one of whom they forced by stripes to confess, they were by these lads conducted to his lodging. He might have saved himself by getting into another house; but he submitted, saying, "The will of the Lord be done." He therefore came down from his bed-chamber, and saluting his persecutors with a serene and cheerful countenance, he ordered a table to be set before them with provisions, invited them to partake, and only requested for himself one hour for prayer; after which he was set upon an ass, and conducted towards Smyrna. On the road he met Herod, a justice of the province, and his father, who were the principal instigators of the persecution. Herod took him up into his chariot, and strenuously endeavoured to undermine his constancy; but having failed in the attempt, he thrust him out of the chariot with so much violence and indignation, that his thigh was bruised by the fall. When at the place of execution, there came, as is said, a voice from heaven, saying, "Polycarp, be strong, and quit thyself like a man." When before the tribunal, he was urged to swear by the genius of Cæsar. "Repent," said the proconsul, "and say with us, take away the godless." Upon this the martyr, looking round at the crowd with a severe and angry countenance, beckoned with his hand, and looking up to heaven, said with a sigh, in a very different tone from what they expected, "Take away the godless." At last, having confessed himself to be a Christian, the crier thrice proclaimed his confession, and the people shouted, "This is the great doctor of Asia, and the father of the Christians; this is the destroyer of our gods, who teaches men not to do sacrifice to or worship the deities." When the fire was prepared, Polycarp requested not to be nailed, as usual, but only tied to the stake; and after a short prayer, which he pronounced with a clear and audible voice, the executioner blew up the fire, which increasing to a mighty flame, "Behold a wonder seen by us, who were purposely reserved," says the relator, "that we might declare it to others; the flames, disposing themselves into the resemblance of an arch, like the sails of a ship swelled with the wind, gently encircled the body of the martyr, who stood all the while in the midst, not like roasted flesh, but like the gold or silver purified in the furnace, his body sending forth a delightful fragrance, which, like frankincense or some other costly spices, presented itself to our senses. The infidels, exasperated by the miracle, commanded a spearman to run him through with a sword; which he had no sooner done, than such a vast quantity of blood flowed from the wound as extinguished the fire, and then a dove was seen to fly from the wound, which some suppose to have been his soul, clothed in a visible shape at the time of its departure." The Christians endeavoured to carry off his body entire, but were not allowed by the irenarch of justice, who commanded it to be burned to ashes. The bones, however, were gathered up, and decently interred by the Christians.

Thus died Polycarp, on the seventh of the kalends of May, in the year 167. The amphitheatre on which he suffered was mostly remaining not many years ago; and his tomb, which is in a little chapel in the side of a mountain, on the south-east of the city, was solemnly visited by the Greeks on the festival day; whilst, for maintaining and repairing it, travellers were wont to throw a few aspers into an earthen pot which stands there for the purpose. He wrote some homilies and epistles, which are now lost, except that to the Philippians, which is a truly pious and Christian production, containing short and useful precepts and rules of life, which Jerome informs us was even in his time read in the public assemblies of the Asiatic churches. It is singularly useful in proving the authenticity of the books of the New Testament; for he has cited several passages and expressions from St Matthew, St Luke, the Acts, St Paul's Epistles to the Philippians, Ephesians, Galatians, Corinthians, Romans, Thessalonians, Colossians, the first Epistle to Timothy, first Epistle of St John, and first Epistle of Peter; and makes particular mention of St Paul's Epistle to the Ephesians. Indeed the whole of this epistle consists of phrases and sentiments taken from the New Testament. (See Halloix, *Illustr. Eccles. Orient. Scriptorum Vitæ;* Cave, *Apostolici, or the Lives, &c., of the Primitive Fathers;* Tillemont, *Memoirs,* vol. ii.; Lardner, *Credibility,* part ii.; Neander, *Hist. of the Church,* vol. i.; Milman, *Hist. of Christianity,* b. ii., c. 7.)

POLYCLETUS, one of the most celebrated statuaries of the ancient world, was named of Sicyon, probably by birth, and of Argos, probably by citizenship. This celebrated sculptor, architect, and artist is said to have been the pupil of the great Argive statuary Ageladas, where he had Phidias and Migron for his fellow-disciples. Of his personal history nothing is known. As an artist he stood at the head of the schools of Argos and Sicyon; and he was judged to have surpassed his great Athenian rival Phidias on one occasion (if only on one)—the famous competition of the Amazons. The essential difference between these artists lay in this, that Phidias was unsurpassed in making the images of the gods, Polycletus in those of men.

The praises heaped upon Polycletus by ancient critics are numerous, and of the very highest order. Pliny has recorded of him that he brought the art of statuary to perfection, and Cicero supports the judgment. Dionysius of Halicarnassus, Quintilian, Lucian, and the poets of the Anthology, are all loud in his praise; while Xenophon, Plato, and Lysippus speak of him in terms implying an equality with Phidias. As a toreutic artist, Pliny believed him to have perfected the art which Phidias had begun. As an architect, Polycletus designed the theatre, and the circular building which he raised in the sacred inclosure of Æsculapius at Epidaurus. The former Pausanias thought the best worth seeing of all the theatres, whether of the Greeks or of the Romans.

The work which he probably designed to be the greatest of all his performances was his statue of Hera in ivory and gold, in her temple between Argos and Mycenæ. It was doubtless meant to rival Phidias's chryselephantine statues of Athena and Zeus, which, in the judgment of Strabo (viii., p. 372), it equalled in beauty, though surpassed by them in costliness and size. The goddess was seated on a throne, her head crowned with a garland, on which were worked the Graces and the Hours,—the one hand holding the symbolical pomegranate, the other a sceptre surmounted by a cuckoo. The lower part of the figure was robed from the waist downwards. In short, she was the white-armed goddess of Homer, with beautiful eyes, a splendid robe, a queen-like figure, and seated on a golden throne. (See an excellent essay on this statue by Böttiger, *Andentungen*, pp. 122–128.)

POLYCRATES, a Greek tyrant, was celebrated for the uninterrupted course of success which characterized his life. With the aid of no more than fifteen armed men he seized the sovereignty of Samos, and held it for some time in conjunction with his brothers Pantagnotus and Syloson. He then managed to get rid of the one brother by assassination and of the other by banishment, and to retain the entire power for himself. This was only the preparation for a more vigorous and efficient system of policy. The city was strengthened, 100 fifty-oared galleys were manned, and 1000 archers were enlisted. His fleet scoured the seas, sweeping before it all opposition, capturing many of the islands in the neighbourhood, and taking some of the cities in the mainland. In fact, so invariable was his good fortune that Amasis, King of Egypt, looking upon him as the future victim of the joy-avenging Nemesis, broke off an alliance which had subsisted for some time between the two kingdoms. Polycrates, however, although standing alone against his enemies, continued to be as successful as ever. In vain did some malcontents among his subjects attempt to raise a general revolt. Incarcerating the women and children of the city, he threatened to set fire to the former if any more should join the insurrection. In vain did the rebels, repulsed from the town, return banded with the Spartans and Corinthians. A beleaguerment of forty days ended only in complete failure. The Samian tyrant was fast increasing in power; and no enterprise now was a fitting object for his ambition but the conquest of Ionia and of the islands in the Ægean Sea. Yet just at this crisis the bright career of Polycrates was doomed to be suddenly extinguished in darkness. Oroetes, the satrap of Sardis, for some reason unknown, allured him over to Magnesia by the promise of a large sum of money. No sooner had he set foot within that city than he was seized and crucified in 522 B.C. (See Herodotus, iii. 39–47, 54–56, 120–125.)

POLYDORE, Virgil. See Virgil.

POLYGAMY, a plurality of wives or husbands in the possession of one man or woman at the same time. Polygamy has found favour in Asia from time immemorial, and the Mohammedans adopted and confirmed it. Montesquieu holds that it is owing to the greater number of female births in the East; but this is by no means proved. Another more plausible reason may be found in the premature old age of the female sex in these countries. Niebuhr, in his *Travels in Arabia*, gives a curious piece of conversation which he had with an Arab on polygamy. Selden, in his *Uxor Hebraica*, has shown that a plurality of wives was allowed among the Hebrews. It has to be noticed, however, that polygamy was not countenanced by the Greeks or Romans. It is remarked by Tacitus in his *Germania*, that the Germans "alone, among all the barbarians, are content with a single wife." Bernardus Ochinus, general of the Order of the Capuchins, and afterwards a Protestant, published, about the middle of the sixteenth century, *Dialogues in favour of Polygamy*, which were replied to by Beza. About the close of the seventeenth century an artful treatise on polygamy was published at London by John Lyser, under the title *Polygamia Triumphatrix*, and assigned to "Theophilus Aletheus," which has been replied to by several writers. Bruce has introduced the argument, that in some parts of the world the proportion of female children is much superior to that of the male; and the Rev. W. Madan, in his *Thelyphthora*, has come forward more boldly in favour of polygamy than any other modern writer. In Christianity, polygamy receives no countenance; and in Christian countries it has been long since forbidden.

POLYGLOT, or Polyglott (πολὺς, *many*, γλῶττα, *a tongue*), a word generally applied to Bibles printed with the text represented in various languages. The idea of a Polyglot seems first to have occurred practically to Origen in the third century, who spent much time in forming the Old Testament into such a work. This is commonly known as the *Biblia Hexapla*, or the Bible in six columns, of which various imitations have been published since the invention of printing. The fragments of Origen which remain were published by Montfaucon, in 2 vols., Paris, 1714, under the title of *Hexaplorum Origenis quæ supersunt.* The principal Polyglots printed since the time of Origen are:—1. *The Complutensian Polyglot*, named from *Complutum*, the Latin name of Alcala de Henares in Spain. It was printed under the superintendence of Cardinal Ximenes in 1502-17, in four languages, comprehending 6 vols. folio. 2. *The Antwerp Polyglot*, printed by Christopher Plantin, under the editorship of Arias Montanus, and with the sanction of Philip II. of Spain. It was published at Antwerp in 8 folio vols., 1569–72. 3. *The Parisian Polyglot*, printed at Paris by Antony Vitre, and edited by Guido Michael Le Jay, 1628–45, 10 vols. folio. This splendid performance, besides containing all that is in the former two polyglots, has the addition of an Arabic version of the Old and New Testaments, a Syriac version of the Old Testament, and the Samaritan Pentateuch. 4. *The London Polyglot* was edited by Brian Walton, in 6 vols. folio. It was published between 1654–57. It consists occasionally of nine languages,—namely, Hebrew, Chaldee, Samaritan, Syriac, Arabic, Persian, Ethiopian, Greek, and Latin. Dr Edmund Castell, one of Walton's assistants, afterwards published a *Lexicon Heptaglotton*, 2 vols. folio, 1669, with grammars of all the languages prefixed. This work is by no means equal in appearance to the foregoing; but for solid usefulness it is greatly their superior. Its history is recorded at length in Archdeacon Todd's *Memoir of the Life and Writings of the Right Rev. Brian Walton, D.D., Lord Bishop of Chester*, 2 vols. 8vo, London, 1821. 5. *Bagster's Polyglot* was published by Bagster the bookseller in 1 vol. folio, London, 1831. The Old Testament is in eight languages and the New in nine,—viz., Hebrew, Greek, English, Latin, German, Italian, French, Spanish, and Syriac, the New Testament being given in the last language by way of appendix. Prefixed to the work are fifty pages of prolegomena in Latin, by Professor Lee of Cambridge. The entire volume presents a very attractive appearance. (On the entire subject of Polyglots the reader may consult Horne's *Introduction*, Butler's *Horæ Biblicæ*, and Clarke's *Bibliographical Dictionary*.)

POLYGNOTUS, a famous painter of Thasos, flourished about 422 years before the Christian era, and was the son and scholar of Aglaophon. He adorned one of the public porticos of Athens with his paintings, in which he had represented the most striking events of the Trojan war. The Athenians were so pleased with him that they offered to reward his labours with whatever he pleased to accept, but he declined the offer; and the Amphictyonic Council, which was composed of the representatives of the principal cities of Greece, ordered that Polygnotus should be maintained at the public expense wherever he went. Of the talents of

Polygnotus much honourable mention is made by many of the best authors of antiquity,—as Aristotle and Plutarch, Dionysius of Halicarnassus, Pliny, and others. Pausanias speaks of his pictures of the events of the Trojan war, and in his tenth book introduces a long description of other pictures by the same artist, painted also from Homer, in the temple at Delphi. The passage, however, gives but a confused and imperfect idea of the painter's performance. How much the art is indebted to this ancient master, what grace and softness he gave to the human countenance, what embellishments he added to the female figure and dress, are much more happily described by Pliny.

POLYGON (πολύς, *many*, γωνία, *an angle*), according to Euclid, is any plane rectilineal figure having more than four sides or angles; but geometers generally treat of the triangle and the quadrangle under polygons.

POLYHEDRON (πολύς, *many*, ἕδρα, *a seat*), in Solid Geometry, denotes a solid bounded by many faces or planes. When all the faces are regular the solid becomes a regular body.

POLYHISTOR, the surname of Alexander Cornelius, a native of Ephesus, or, according to some, of Cotyacum. The first part of his career was attended with misfortune. Enrolled in the forces of Mithridates the Great, he was taken prisoner in Greece by the army of Sylla, and was exposed for sale as a slave. Cornelius Lentulus bought him, and taking him to Rome, employed him as a *pædagogus*. In course of time, however, fortune began to smile upon the enslaved Alexander. His master liberated him; and Sylla is said to have bestowed upon him the Roman franchise. His varied and extensive learning, and the many miscellaneous works which he produced, secured for him the surname of *Polyhistor*, and introduced him to the notice of patrons. He was living in easy circumstances at his villa at Laurentum when he perished in a fire which consumed his household effects. A list of the works of Polyhistor is given in *De Historicis Græcis* of Vossius. But a part of a History of Judæa, found in Eusebius, and a few fragments of a History of Rome preserved in Servius, are the only remnants of his great and multifarious erudition.

POLYHYMNIA (Πολύμνια, contr. for Πολυΰμνια, *i.e., She of the many dreams*), one of the nine Muses. She was the goddess sometimes of the higher lyric poetry, sometimes of eloquence.

> "Nec Polyhymnia
> Lesboum refugit tendere barbiton." (Hor., *Od.* i. 1, 33.)

POLYNESIA.

Character- stic dis- inction.

POLYNESIA is a name given by several early writers on geography, but first, we believe, by De Barros, to the numerous islands scattered over the Pacific Ocean, or, as it was usually called, the Great South Sea. Modern writers have also given the name of *Micronesia* to the small chains or clusters of islands scattered over that part of the Pacific lying to the E. and S. of the Sandwich Islands, and to the N. of the equator, but this region may still be reckoned part of Polynesia, the name which is now applied by modern geographers to the *sixth* great division of the earth's surface. This division will probably appear on examination less arbitrary than some others; for whether we consider it in a political, physical, or moral point of view, the separation from America on the one hand, and from Australasia and the Asiatic islands on the other, is marked by very strong and distinct features. A considerable portion of the last, for instance, have ages ago been invaded and taken possession of by foreigners, and several parts of Australasia have more recently been colonized by Europeans. No colonies have yet been planted in Polynesia, with the exception of that on one of the Ladrone Islands by Spain, and the recent military occupation under the protectorate of France at Tahiti. Since the commencement of the present century, however, many of these islands have been visited by European missionaries, for the purpose of spreading amongst the natives the light of the gospel; and in most cases their efforts have been so far successful that they have established permanent settlements in these islands, and have instructed the natives, not only in the doctrines of the Christian religion, but in many useful mechanical arts and other improvements of civilized society. The inhabitants, excepting those of Tahiti with France, have no political connection with any of the other divisions of the earth, and but little exists between any two of its groups or separate islands, each being governed by its own chiefs, and confining its friendships or hostilities to some neighbouring group or island.

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All geographical divisions are to a certain degree arbitrary; but if the islands south of the equator, and eastward from New Holland as far as the New Hebrides and New Zealand, be considered as included in Australasia, the boundary of Polynesia, physically considered, is almost as distinct as its political seclusion. If a line be drawn in a south-easterly direction along the eastern extremity of the Philippine Islands, Mindanao, Papua or New Guinea, New Ireland, and Solomon's Archipelago, and from thence continued southerly along the eastern shores of the New Hebrides and New Zealand, this line will mark with sufficient precision the separation of the Asiatic islands (mostly to the northward of the equator), and Australasia (to the southward of the equator) from Polynesia. The geological structure of the islands which constitute the first-mentioned divisions is also, generally speaking, essentially different, consisting chiefly of lofty mountains of primary or secondary formation, partaking of the same structure as those on the continent of Asia, with which some of them, indeed, may probably have once been connected, their rugged sides presenting as it were a broken barrier to the great Pacific; whereas Polynesia exhibits over a large part of its surface a series of low, flat islands, scarcely rising above the level of the sea, which, with the exception of the lofty groups of volcanic formation, are the labours of minute sea animals, and are usually distinguished by the name of *lagoon* or *coral* islands.

Morally considered.

In a moral point of view, the distinctive character of the Polynesians is as strongly marked as the physical structure of the islands which they inhabit. In the Eastern Archipelago, or the Asiatic islands, and in Australasia, two distinct races of men have been traced,—the *black* and the *brown*. In the archipelago, and more particularly in the Philippine Islands, a few individual families of the Negro race were discovered by the early European visitors; in New Guinea and the Papuan Islands the whole population appears to consist of this race. They differ in some respects from the Negroes of the western coast of Africa, resembling rather those which are found on the eastern coast, particularly in the hair, which is strongly twisted into small tufts, and very different from that of the Negro of Guinea.

Natives of Polynesia.

The only Negroes that have been discovered on any of the islands of Polynesia are the Fijians, who are of the same race as the inhabitants of that part of Australasia which some modern writers have called *Melanesia*, all the other inhabitants being of the *brown* race, and by some supposed to be derived from the same common stock to which the Tartars, the Chinese, the Japanese, and the Malays, owe their origin. In this opinion Sir William Jones, Dr Buchanan, Mr Marsden, and Sir Stamford Raffles to some extent concur. To whatever source the whole of these races may be traced, the Malays and the Polynesians present so many points of resemblance as to lead to the conclusion that they have been derived from the same parent stock. The several portions of this race which inhabit the different groups of the Pacific exhibit considerable variety in figure and colour; but are generally rather above the middle stature,[1] with frames well knit and robust. Their limbs are muscular and firm; their hands and feet small; their heads not unduly large nor disproportioned; the face sometimes exhibiting in a slight degree the triangular form of the Tartar races, though as frequently oval, occasionally with broad and well-shaped foreheads; the eyes black, not large, but placed horizontally, with somewhat straight and well-defined eyebrows. The nose is frequently small and broad, but occasionally aquiline and well formed, with nostrils open. The mouth is usually large, and the lower lip projecting; the teeth regular, perfectly white, and well set; and the hair is often coarse, black, and straight or curling. The chin is seldom projecting; but in some tribes the jaw is large, and broad at its junction below the ear, which produces a peculiar fulness, as seen in New Zealand and the Sandwich Islands.

Language.

Dispersed as the Polynesians are, and rarely and purely accidental as any communication between distant islands must be, there is strong evidence that the different dialects spoken, from the shores of India and Africa to those of America, are the derivatives of one common language, which, according to Marsden, still forms the primitive portion of the Malay language, mixed as it now is with Sanscrit and Arabic.

Although the dialects of Polynesia and Australasia bear some resemblance to each other, the resemblance is not so close as that which prevails between those of the former and the Asiatic Archipelago and Madagascar, which seem to have belonged to one language, designated by Marsden the Polynesian. The Asiatic source of the language is supposed to be indicated by the presence of Sanscrit words in all. Considering the state of civilization in which the people have been found, their language is remarkably comprehensive, clear, and exact, especially in its grammatical structure; and so philosophical as to convey the impression that it must have descended from a people possessing a higher degree of civilization than those by whom it is now spoken. The vowel sounds predominate; and the peculiarity in the Polynesian language, which expresses almost every syllable by a single vowel, or a consonant and vowel, and invariably terminates every word with a vowel, renders it, when spoken, remarkably euphonic, flowing, and easy. The softness of the language is also increased by the rejection, throughout all the dialects, with the exception of that spoken by the Samoans and Fijians, of all sibilants and sounds produced by double consonants.

Religion.

Not less remarkable is the general accordance of the Polynesians in manners, superstitions, and religious observances. The conversion of the Malays of the archipelago to Mohammedanism has nearly obliterated their ancient faith, but enough still remains on some of the Asiatic islands, and still more on the Asiatic continent, to trace the source whence the Polynesians have derived many of their religious opinions and practices.

General view of the islands.

These preliminary observations on the physical form, features, language, and religion of the Polynesians, are made with a view to indicate their common origin, and may be taken as a general description of the natives of the various groups of islands which are scattered over the surface of the vast Pacific Ocean. But though the language and mythological legends of the brown-complexioned and straight-haired races inhabiting Eastern Polynesia may be traced to the Asiatic archipelago, information has lately been collected among the Melanesians, or woolly-haired race inhabiting the Fijis and the islands of Australasia, from which it appears that their language bears a resemblance to some of the languages spoken in the interior of Southern Africa. It is worthy of notice also, that if the religion of the Polynesians was derived from Asia, it does not seem to have been limited to the islands of the vast area over which it has been spread; and without entering into a comparison of the mythology of the aboriginal inhabitants of South America, it is a singular fact, that massive relics met with in Polynesia, some evidently of high antiquity, and almost Cyclopean in their dimensions and structure, the ruins of their ancient temples and fortresses, bear a remarkable resemblance in form and size to the extensive pyramidal structures composed of successive terraces, and other buildings, found amongst the Peruvians by the discoverers of America.

The chief characteristic of the religion of the Polynesians seems to be a sort of hero-worship, their principal gods having been renowned men who still exercise an influence over the affairs of this world, appearing in the form of some living creature, through the medium of which they exert their power. With this is associated throughout the islands a firm belief in spirits or demons, and in sorcery.

The groups of Polynesia are exceedingly different in their extent, both as to number and size, as well as in their composition. Sometimes single islands are met with, surrounded by extensive reefs. These islands and reefs are dispersed, as already observed, over the whole of the Pacific Ocean, but chiefly between the thirtieth degree of northern and the thirtieth degree of southern latitude. The following classification will be found to embrace the greater part of those islands which are comprehended under the geographical division "Polynesia":—

Classifica tion of th islands.

In the Northern Hemisphere.—1. The Marian or Ladrone Islands; 2. The Carolinas, including the Pellew Islands; 3. The Marshall's Islands, and the Kingsmill group; 4. The Sandwich Islands; 5. The numerous reefs and coral islands scattered over the Northern Pacific, and designated Micronesia.

In the Southern Hemisphere.—1. The Fijis; 2. The Friendly Islands, including the group of the Tonga Islands; 3. The Navigators' Islands; 4. The Society Islands; 5. The Georgian Islands, including Tahiti and the Austral Islands; 6. The Marquesas; 7. Easter Island; 8. Pitcairn's Island; 9. The Mangareva Group; 10. The Paumotus, or Dangerous Archipelago.

IN THE NORTHERN HEMISPHERE.

Ladrones.

The *Ladrone Islands* were first discovered by Magelhaens on the 6th of March 1521. This name, by which they are generally known, was given to them by the Spaniards on account of the thievish disposition of the natives; and afterwards, when missionaries were first sent thither in 1668, under the patronage of Mary-Anne of Austria, queen of Philip, they took the name of Las Marianas, in honour of that lady. (See LADRONE ISLANDS.)

The expedition of Loyosa touched at the Ladrone Islands in 1526, and were received in the most friendly manner by the natives. They found no quadrupeds on the island, but plenty of excellent fruits, fish, and rice. The only birds were turtle-doves, of which the islanders appeared to be so fond that they kept them in cages, and taught them to speak. In 1565 the Ladrone Islands were again visited by Lopez de Legaspe, and, notwithstanding his anxiety to prevent quarrels, skirmishes took place, and one of the seamen who had strolled into the woods being found murdered, the Spaniards landed in force, set fire to their houses and canoes, wounded several of the natives, and hung upon the spot three wounded prisoners.

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[1] The measurement of eleven natives of ten different races in Polynesia were taken during the progress of the United States exploring expedition under Commodore Wilkes in 1840: only one was so low as 5 feet 2 inches; one was 6 feet 10 inches; but the average was 5 feet 10 inches.

Visited by Cavendish; by Olivier Van Noort; by Spilbergen and the Nassau fleet.

In 1588 our countryman Cavendish came in sight of the Ladrones, and sailed along the coast of Guahan, from which a number of canoes came off with fruits and vegetables, which were exchanged for pieces of iron; but the natives became so troublesome that, in order to get rid of them, Cavendish ordered muskets to be fired at them. In 1600 Olivier Van Noort made the Ladrone Islands, and stopped near Guahan for two days, from which island above 200 canoes came off to the ships with fish, fruits, and rice to exchange for iron: fowls are mentioned, for the first time, in this voyage. In 1616 Spilbergen made the Ladrone Islands, and stopped two days to traffic with the natives for provisions of fruit, fowls, and fish, in exchange for bits of iron. In 1625 the fleet under Prince Maurice of Nassau refreshed at Guahan, and were supplied by 150 canoes, with immense quantities of cocoa-nuts, yams, bananas, rice, and fowls, which were of great service, as the scurvy had made such havoc among the crews that in some of the ships they had scarcely strength enough to manage the sails.

Of the Spanish Jesuits.

In the year 1668 the Spaniards established a mission on the island Guahan, consisting of P. Servitores and five other fathers, with several lay assistants, most of them natives of the Philippine Islands, and well acquainted with the Tagul language, the same as that spoken by the natives of the Ladrone Islands. For some time the chiefs of the islands behaved with great kindness to the Jesuits, and gave them ground for building a church. From this seat of the mission the fathers spread themselves amongst the other islands, where they were received with equal kindness. In short, P. Servitores says, that in the first year they had baptized more than 13,000 islanders, and instructed 20,000, in the eleven islands which they had visited. The imprudent zeal, however, of the missionaries ruined their cause by shocking the prejudices of the natives. These simple people took it into their heads that, as an infant had died shortly after being baptized, its death had been occasioned by that ceremony; and such was the terror of mothers on seeing a missionary approach, that they seized their children and ran off with them into the woods. This opinion gathered ground from the eagerness of the Jesuits to get hold of infants for the purpose of baptizing them, and more than one of these holy fathers fell martyrs to their imprudent zeal. Several murders ensued; and as the Spaniards had taken care to strengthen the mission with a body of troops well armed, with the obvious intention of taking possession of the Ladrones as an important outpost to the Philippine Islands, after a great number of the natives had been put to death, the rest submitted to the yoke of the Spaniards; though most of the missionaries suffered in the contest, and last of all Servitores, who was killed by the man to whom he had been the greatest benefactor, because the missionary insisted on baptizing his child. Thus, at the age of forty-five, this pious and good man, for such he appears to have been, fell by the hand of an assassin, after having, as we are told, "established the faith in thirteen islands, founded eight churches, established three seminaries for the instruction of youth, and baptized nearly 50,000 of the islanders." From this time constant revolts and massacres ensued, and the most inhuman cruelties were inflicted on the unhappy islanders; so that in 1681 the island of Guahan, which, on the first landing of the Spaniards, counted 40,000 inhabitants (some accounts make them more), had become so completely depopulated that it was found necessary to bring inhabitants from the northern islands to cultivate the soil.

Visited by he buca- ieers;

In the year 1685 the ship of John Eaton, the bucaneer, touched at Guahan, the crew of which quarrelled with the natives, and killed some of them. Having satisfied the Spanish governor that it was done in their own defence, "he gave us toleration," says Cowley in his narrative, "to kill them all if we could." . . . . "We took four of these infidels prisoners," continues the narrator, "and brought them on board, binding their hands behind them; but they had not been long there when three of them leaped overboard into the sea, swimming away from the ship with their hands tied behind them."

y Dam- ier;

In 1686 Dampier touched at Guahan, and states the number of natives not to exceed 100. He gives a particular description of their "flying proas," with their outriggers, which, he says, "sail the best of any boats in the world; adding that he tried the swiftness of one by his log, and that she ran 12 knots out before the half-minute glass was half out." "I believe," says Dampier, "she would run 24 miles an hour." Woodes Rogers, who visited the Ladrones in 1710, states it as his opinion that one of these proas would sail at the rate of 20 miles an hour.

y Anson.

In the month of August 1742, Commodore Anson anchored before the island of Tinian. It was deserted; but cattle to the number of at least 10,000, besides hogs and fowls, were running about wild. Cocoa-nuts in innummerable quantities, bread-fruit, oranges, limes, water-melons, and other tropical fruits, were in the greatest abundance. Though now deserted, Tinian, on the arrival of the Spaniards, is said to have contained 30,000 inhabitants. Ruins of buildings, consisting of pyramidal pillars of considerable dimensions, were met with in all parts of the island.

Visited by Byron;

Commodore Byron anchored in the year 1765 before Tinian, and found the island overgrown with large trees and underwood, amongst which were most of the tropical fruits.

by Kotzebue.

Lieutenant Kotzebue visited Guahan in 1817. No canoes nor proas, nor happy islanders, greeted his approach; the whole race of natives had long been extirpated. "We looked," he says, "in vain for a canoe or a man on the shore; and it almost seemed as if we were off an uninhabited island. The sight of this lovely country deeply affected me. Formerly these fertile valleys were the abode of a nation who passed their days in tranquil happiness; now only the beautiful palm groves remained to overshadow their graves; a deathlike silence everywhere prevailed." Soon, however, a person appeared from the Spanish governor, and piloted the ship into the harbour: and after this Kotzebue proceeded to the town of Agana, situated upon a beautiful plain some hundred paces from the shore, in the midst of fine palm groves, some of the houses being built of coral rock, others of bamboo. It had a church and a convent, and two fortresses,—one to protect the town from the seawards, and the other to keep the Indians in awe. The town contained about 200 houses and 1500 inhabitants, who derived their origin from Mexico and the Philippines. The population of the island is about 5000 souls. "There is but one man and his wife," says Kotzebue, "on the whole island of the original stock; with the death of these two people the race of the old Ladrones will be totally extinguished." "The present race," says Chamisso, "no longer know the sea, are no mariners, no swimmers; they have ceased to build boats. They now scarcely hollow out, without skill, the trunks of trees to fish within the breakers." All the other islands to the north of Guahan are entirely uninhabited, and overrun with wild cattle, hogs, and goats, which afford a supply to the American vessels trading to the Sandwich Islands and the N.W. coast of America. Indeed it was said that some of these people had been allowed to settle themselves in Agrigan, on condition of acknowledging their allegiance to Spain, and that they were peopling the island with natives kidnapped from the Sandwich Islands.

Carolinas.

The Carolinas, or Caroline Islands.—In 1686 a Spanish ship, being near the meridian of the Ladrones, fell in with an island, which her commander, Don Francisco Lazeano, named *La Carolina*, in honour of the King of Spain, Carlos II. This island has given the name to a very extensive chain spreading over a space of not less than 6 degrees of latitude and 25 degrees of longitude, the western extremity being the group of the Palaos or Pellew Islands, in Lat. 7. N., Long. 135. E.; and the easternmost island, that of Hogolen, in Lat. 9. N., Long. 155. E. The whole group, as far as is known, which however is very imperfectly, consists of at least 150 separate islands, besides various coral reefs with islets upon them. Yet, numerous as they are, being somewhat out of the direct and usual route of the Spaniards in their voyages from South America to the Philippines, they had the good fortune to escape any intimate connection with them,—a connection which has proved equally baneful to others, whether established by the cross or the sword, by their professions of friendship or avowals of hostility.

Some of these islands, and especially those towards the western extremity of the group, had been seen by various navigators long before that of Carolina was noticed and named by Lazeano. The Portuguese, Da Rocha, fell in with islands in 9. or 10. N. Lat. in 1526, which he named Sequeira, after his pilot; and in 1628 Saavedra, a Spaniard, in his passage to the Philippines, discovered islands in Lat. 11., which he named Los Reyes. In 1579, our countryman Drake saw some islands to which he gave the name of the Islands of Thieves, and which, from his description, have been supposed to be the Pellew Islands. In 1595 one of the islands, in about 6. N., was seen by Mendana; but two proas full of people, driven by the violence of the wind from a group of islands in the east as far as Samal, roused the attention of the College of Jesuits at Manilla, who made several unsuccessful attempts to establish missions on those islands, which the wrecked natives described to be thirty-two in number. In the year 1710 the two fathers, Duberron and Cortel, embarked in the San Trinidad with a crew of eighty-six men, to establish themselves on the Pellew Islands. They landed on Sonsorol, with the quartermaster and ensign of the troops, in all sixteen persons; but the ship was driven off by the current, and what became of the missionaries was never ascertained.

In the *Lettres Edifiantes et Curieuses* is a letter and chart from P. Juan Antonio Cantova, a missionary at Guahan, addressed to the King of Spain's confessor in 1722, in which is given a more particular account of the Carolinas than any which had been published.

English and American vessels, chiefly whalers, have for several years past resorted in great numbers to the Caroline Islands for water and refreshments, ten or twelve ships arriving, and two or three hundred sailors being on shore amongst the natives, at one island during a single season. Several white men, generally runaway sailors, also reside on the islands thus visited, and keep what are called accommodation-houses for the use of the officers and crews of vessels resorting to the shores. The effect of the large influx of foreigners of this class has been disastrous to the natives, who have learned to make and use intoxicating drink to such an extent that the drunkenness, debauchery, and disease attendant upon such practices are rapidly destroying the population. Within the last few years a small number of self-denying American missionaries with their wives, accompanied by some Christian natives of the Sandwich Islands, have established themselves on Ponape or Ascension Island, and Ualau or Strong's Island, two of the largest of the Caroline Islands. They have met with much discouragement from the influence of the heathen priests, the open hostility of the white men, and the recklessness and apathy of the people, as they see their race, under the destructive influence of vice and disease, rapidly melting away. In 1854 the smallpox appeared with frightful virulence among the people, and being ascribed to the prayers of the missionaries, exposed them to peril, while it deterred the natives for a time from submitting to vaccination or other means of preservation, which the medical missionary and his companions were anxious to apply. So fearful were the ravages of this visitation, that in the course of a few months more than half the entire number of one of the tribes on Ascension Island died. The safety of those who submitted to vaccination ultimately produced a re-action in favour of the missionaries, who still remain to continue their praiseworthy efforts.

Marshall's Islands.

To the N.E. of the Carolines is a large cluster of low coralline islands, discovered by Marshall and Gilbert in 1788, the northern portion being usually called Marshall's, and those to the south Gilbert's Islands. This cluster extends from 160. to 172. E. Long., and from 4. 35. to 12. N. Lat. These islands range, in two lines or chains running north and south, parallel to each other, and 60 or 100 miles apart. The western chain is called the Radick, and the eastern the Ralick chain, each comprising fifteen or sixteen islands, of which the chief part are said to be under the government of one chief. Milé or Mulgrave Island consists of twenty-four or thirty islets connected by a reef of coral, and inclosing a lagoon 12 or 15 miles across. The islets are each from half a mile to 6 miles in length, and about half a mile wide. Nearly all the islands are of similar formation. In some the soil, though scanty, supports vegetation, and bread-fruit and cocoa-nut trees, with a few bananas, are found there. The inhabitants are a finer race than the natives of the adjacent islands, having sharper features, long and curling hair, and more athletic frames. They accomplish long voyages in canoes made of bread-fruit planks. The men are partially clothed, and the women wear fine, beautifully-made mats, reaching from the waist to the feet. They are fond of ornaments. The lobe of their ears is pierced, and the aperture extended, by means of a pandanus leaf rolled up, until a man can pass his arm through it. These islanders have not had much intercourse with foreigners. During one of the early visits of shipping to their shores, a theft having been committed, a general attack was made upon the people, and many killed. Amongst these was the brother of the king, who, himself being wounded, was determined upon revenge. No white men reside upon the islands; but they have been visited by American missionaries, with a view to the ultimate conversion of the natives to Christianity.

The Kingsmill group.

These islands, sixteen in number, lie chiefly to the northward of the equator, though some are in the Southern Hemisphere. Hurd's Island is in 3. S. Lat., and the group extends to Makin, in 3. 20. N. They reach from 172. 57. to 176. E. Long. All are low coral islands, the highest land in the group being about 20 feet above the sea. Drummond's Island, one of the largest of the group, is said to be about 40 miles long, and less than half a mile wide. Several are 20 miles long, while few are more than half a mile across. There is usually a reef at some distance from the island, uniting the extremities of the island and inclosing a lagoon. Water is obtained by digging through the coral sand, but is brackish to the taste. The shallow soil is composed of coral sand and vegetable mould. Vegetation is scanty; but the bread-fruit, cocoa-nut, and a species of arum or taro, are cultivated with great care. The islands are populous. The natives, a fine race of people, bear a stronger resemblance to the Malays than many farther west. Their colour is darker than that of the Tahitians, and their faces exhibit great variety of form and expression. They have black glossy hair. Their features, according to the testimony of Commodore Wilkes, are small, but high and well marked; their eyes are large, black, and bright; nose straight or slightly aquiline, and rather wide at the base; mouth large, with moustache and slender beard, full lips, and small teeth. Both sexes are but slightly clothed,—the men wearing a girdle and a mat over the shoulder, the women a girdle of split leaves reaching to the knees. The women are guarded with great jealousy, separate houses being erected for their abode; and any man besides the husband or some near relative entering the house set apart for the woman, would be put to death or reduced to slavery. Wars appear to be frequent; and the natives use spears, with prongs at the point, armed with rows of sharks' teeth. They also manufacture a sort of defensive armour made of the twisted or braided fibre of the cocoa-nut husk, matted together about half an inch in thickness, so as to cover the limbs. Their helmets are made of the skin of the porcupine fish. The women go out to war as well as the men. Whales abound in the neighbourhood, and are occasionally stranded on the reefs or sandbanks among the islands. Excepting at one of the islands, there has been but little intercourse with shipping, but where this has taken place it has not improved the condition of the people. They manufacture a considerable quantity of cocoa-nut oil. In 1855 an American medical missionary, Dr Pierson, spent about six weeks amongst these islands. He reports them healthy, and estimates the population of the group at from 30,000 to 35,000.

Besides the clusters already noticed, there are numerous single islands, mostly of coral formation, spread over that portion of the Pacific designated Micronesia, which extends from 3. S. to 21. N. Lat., from 130. to 180. E. Long., and is estimated to contain a population of 200,000.

Sandwich Islands.

This fine group of islands in the northern Pacific had the good fortune to escape the visits of the old navigators, and the discovery of them was reserved for Captain Cook, who first touched at them in the year 1778. This distinguished navigator was received by all classes of the people with the liveliest demonstrations of astonishment and delight. Offerings and prayers in homage were presented to him by their priest in one of the temples near the bay in which his vessels anchored, and on the shore of which he subsequently fell by the dagger of a native in the year 1779. His bones were afterwards preserved by the priests, and continued to receive offerings and homage from the people until 1819, when the whole system of idolatry was abolished. A rude monument (the stump of a cocoa-nut) inscribed with his name, was the only memorial by which his countrymen have marked the spot where he fell. The name by which this group of islands is known was given by Captain Cook in honour of the Earl of Sandwich, first lord of the Admiralty at the time of their discovery.

The group consists of ten islands. The following table (from the *Polynesian*,[1] July 6, 1844) gives the extent and population of these islands. The population was supposed by their discoverers to amount, in 1779, to 400,000:—

Islands.	Length.	Breadth.	Square Miles.	Population as estimated in 1825.	Censns of 1832.	Census of 1836.
Hawaii	88	73	4000	85,000	45,792	39,364
Maui	48	30	620	20,000	35,062	24,199
Lanai	17	19	100	2,500	1,600	1.200
Molokai	40	7	190	3,500	6,000	6,000
Kahoolawe.	11	8	60	50	80	80
Oahu	46	25	530	20,000	29,755	27,809
Kauai	22	24	500	10,000	10,977	8,934
Niihau	20	7	90	1,000	1,047	993
Total...	292	193	6090	142,050	130,213	108,579

These islands are situated between Lat. 18. 54. and 22. 2. N., and between Long. 155. and 161. W. Hawaii, the largest, rises majestically in grand unbroken lines from the ocean, crowned with three massive mountain peaks, on two of which the snow lies for the greater part of the year. They are as follows:—

Mouna Roa (Long or High Mountain)...height 13,760 feet.
Mouna Kea (White Mountain) .... „ 13,953 „
Mouna Huararai (1687 toises) .... „ 11,067 „

The first two of these measurements are given by Commodore Wilkes, of the U.S. exploring expedition, and the latter by Kotzebue.

The whole group is of volcanic origin, and the entire substance of the islands is basalt or lava. Extensive craters crown the summits of the loftiest mountains, and amongst these the largest is Kirauea, on the east side of Hawaii, and about 4000 feet above the sea. This immense volcano, one of the largest yet discovered, was unknown to the civilized world until it was visited in 1823 by a party of missionaries, three Americans and one Englishman, of whose explorations an account was afterwards published. (*Tour through Hawaii*, by Rev. Wm. Ellis, author of *Polynesian Researches.*) At an elevation of 4000 feet above the level of the sea these travellers found, in the midst of a plain many miles in circumference, and 300 feet below the summits of the walls of volcanic rock around, a vast oval crater 9 miles in circumference, with perpendicular sides 1000 feet deep, covered at the bottom with a lake of liquid lava, at one end red and boiling. Around the edge, or from the midst of this fiery lake, fifty-one conical craters sent forth jets of lava or smoke and flame. From the ledge projecting round the crater, 300 or 400 feet above the burning mass, it appeared as if the lava had recently risen to this height in the vast furnace, and had then flowed out through a subterranean channel towards the sea, where some miles of the coast had been filled up with liquid lava not many weeks before. Immense banks of finely-crystallized sulphur, as well as smaller craters, were discovered in the vicinity. Two years afterwards this wonder of the Pacific was visited by Captain Lord Byron and the officers of H.M.S. Blonde, and in the year 1840 by the commander and a number of officers of the United States exploring expedition. The volcanoes had continued in action during the intervening time; but the scientific measurements of the crater taken on these occasions differed only slightly from those first published by the missionaries. Eruptions occur at intervals in other parts of the island; and in 1843 two new craters opened on the summit of Mouna Roa, 13,000 feet above the sea, from which, during six or eight weeks, the burning lava poured forth, forming three rivers 5 or 6 miles in width, and extending between 20 and 30 miles towards the sea. These eruptions being accompanied by earthquakes, and sometimes fearful thunderstorms, present at such seasons spectacles of the most sublime and awful grandeur. Nor have the spectacles of human action and feeling connected with these appalling convulsions of nature been less affecting; as when, after offerings and prayers had failed to appease the imagined anger of the gods, the sovereign, attended by the priests and followed by his people, has moved in solemn procession to the edge of the flowing lava, and there, as the costliest offering they could present, the priests have cut off part of the hair of the sovereign, by them considered sacred, and cast it into the fiery stream, whose progress was afterwards stayed. The last and the most appalling eruption which has taken place within the memory of the oldest inhabitants, commenced in August 1855, when a crater opened near the summit of Mouna Roa, and for the next ten months continued to pour forth burning lava, which formed a stream 70 miles in length, from 1 to 5 miles wide, and from 10 to several hundred feet in depth.[1]

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[1] A newspaper belonging to the Sandwich Island government.

Although entirely volcanic, the shores of these islands are protected by coral reefs, and each island possesses several harbours, some of them spacious and secure, as Hilo, or Byron's Bay, on the east, and Kealake'kua, on the west side of Hawaii; Lahaina in Maui; and Honolulu in Oahu. This last is generally considered the best in the islands, and is the resort of the greatest number of vessels. All the islands are mountainous, and great part of their surface is lava in various stages of decomposition, often sterile; but where the lava is ancient and disintegrated, covered with forests or inferior verdure; while the plains and valleys are often exceedingly fertile. 500,000 acres are supposed to be suitable for tillage, and half of this for the production of sugar. All the islands, with the exception of some parts of Hawaii, are well watered. The chief indigenous productions used as food are cocoa-nuts, bananas, bread-fruit, sugar-cane, yams, arrow-root, and several varieties of esculent arum (taro), which is extensively and carefully cultivated, and forms the chief support of the natives. To these may be added the *Convolvulus battatus* (sweet potato), which is grown in considerable quantities. The island also produces the paper mulberry and the kava plant. The forests abound with large and valuable timber, chiefly hard and durable. Sandal-wood was formerly exported in large quantities, but is now exhausted. Many valuable fruits and vegetables, as well as grain, have been introduced, and appear to thrive well. Amongst the most important of these are grapes, oranges, coffee, pine-apples, and melons. Pumpkins, Irish potatoes, cabbages, maize, and wheat are amongst the most useful vegetables; and grain.

The climate, considering that the islands are within the tropics, is remarkably healthy, being generally dry, and the temperature varying with the elevation. The following are the results of a meteorological table for one year, kept on the western shore of Oahu:—Greatest heat, 88°; least heat, 61°; range, 27°; general range, 70° to 80°; mean temp., 75°; general course of wind, N.E.

The only animals found by Captain Cook in the islands were hogs, dogs, and rats. Captain Vancouver, some years afterwards, left there a breed of cattle, which resorted to the mountains in the interior, where they soon became numerous. The natives used to shoot them, or take them by digging pits near pools of water. It was in one of these pits that Mr Douglas, an intelligent and indefatigable botanist from the Horticultural Society in England, suffered a frightful death. He was found there gored to death by a bull, which also was found in the same pit. These cattle were some years ago more numerous than at present; a number of Spaniards having come over from California, with horses trained for the service, to hunt them, chiefly for the sake of their hides. It is said that as many as 5000 hides were exported in one year, which induced the government to prohibit the shooting of these animals, otherwise they would soon have been exterminated. (Wilkes' *Exploring Expedition*, vol. iv., p. 203.) Tame cattle, horses, mules, goats, have since been introduced, as well as poultry.

The inhabitants of these islands are, considered physically, amongst the finest races in the Pacific, bearing the strongest resemblance to the New Zealanders in stature, and in their well-developed muscular limbs. The tatooing on their bodies is less artistic than that of the New Zealanders, and much more limited than among some of the other islanders. They are also more hardy and industrious than those living nearer the equator. This in all probability arises from their salubrious climate, and the comparative sterility of their soil, rendering them dependent upon the cultivation of the ground for the yam, the arum, and the sweet potato, their chief articles of food. The language of the two races is also so nearly allied, that although occupying the most remote regions north and south at which any of their race have been found, they have little difficulty in understanding each other.

Though, like all undisciplined races, the Sandwich islanders have proved deficient in firm and steady perseverance, they manifest considerable intellectual capability. Their moral character, when first visited by Europeans, was not superior to that of other islanders; and excepting when improved and preserved by the influences of Christianity, it has suffered much from the vices of intemperance and licentiousness introduced by foreigners. Polygamy prevailed among the chiefs and rulers, and women were subject to all the humiliations of the tabu system, which subjected them to many privations, and kept them socially in a condition of inferiority to the other sex. Infanticide was practised to some extent, the children destroyed being chiefly females. Though less superstitious than the Tahitians, the idolatry of the Sandwich islanders was evidently ancient. It was equally barbarous and sanguinary, as in addition to the chief objects of worship included in the mythology of the other islands, the supernatural beings supposed to reside in the volcanoes, and direct the action of subterranean fires, rendered the gods of the Sandwich islands objects of peculiar terror. Human sacrifices were slain on several occasions, and vast offerings presented to the spirits supposed to preside over the volcanoes, especially during the periods of actual eruptions.

The requisitions of their idolatry were severe, and its rites cruel and bloody. Grotesque and repulsive wooden figures, animals, and the bones of chiefs, were the objects of worship. Human sacrifices were offered whenever a temple was to be dedicated, or a chief was sick, or a war was to be undertaken; and these occasions were frequent. The apprehensions of the people with regard to a future state were undefined, but fearful. The lower orders expected to be slowly devoured by evil spirits, or to dwell with the gods in burning mountains. The several trades, such as that of the fisherman, the tiller of the ground, and the builder of canoes and houses, had each their presiding deities. Household gods were also kept, which the natives worshipped in their habitations. One merciful provision, however, had existed from time immemorial, and that was sacred inclosures, places of refuge into which those who fled in time of war, or from any violent pursuer, might enter and be safe. To violate the sanctity of the Marai was one of the greatest crimes of which a man could be guilty. Campbell was present at the execution of a man who had committed this offence, in getting drunk and running into the Marai during *tabu*. He was taken to the Marai, where his eyes were put out; in this state he remained two days, when he was strangled, and his body exposed before the image of the Atua, or idol.

The Sandwich Islands, although the last important discovery in the Pacific, have, in consequence of their geographical position, been more frequently visited by Europeans, and have advanced in civilization more rapidly, than any of the other islands, presenting, at the present time, a degree of improvement unsurpassed, if equalled, during a corresponding period in any other part of the world. The first movement in this direction was made by the chief who governed the large island of Hawaii, after the death of the king who ruled at the time of Captain Cook's visit. This prince,

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[1] Letter from Mr Coan to General Miller, in *Journal of Geological Society*, 1856.

Tamehamaha, the founder of a new dynasty, and sometimes compared to Peter the Great, was a chief of quick perception and great force of character. The Sandwich islanders are necessarily a nautical people, and their king was one of the first to perceive the immense superiority of European vessels over the native canoes. When Captain Vancouver visited these islands in 1792, the king being desirous of having a vessel of European construction, this able navigator laid down the keel of one, which was speedily finished. Ten or twelve years after this, when Mr Turnbull visited the islands, the king had a naval force of twenty vessels or upwards, of from twenty-five to fifty tons, which traded amongst the islands. To these he subsequently added others, purchased at enormous prices from foreigners visiting the islands. Bent not only on the improvement of his own island, but the subjugation of others, the king encouraged a warlike spirit in the people, introduced European arms among his soldiers, and by means of his infant navy, and the superior weapons of his troops, conquered, though not without great destruction of life, one island after another, until he became undisputed sovereign of the whole group. He also encouraged trade with foreigners, and derived from its profits a large increase of his revenue, as well as the means of consolidating his power. This energetic and successful ruler died in 1819, leaving his kingdom to his son, a mild and good-natured prince, kindly disposed towards the people, but destitute of the energy of his father, which was in a great measure supplied by Karaimoku, one of his councillors, who became prime minister of the young king, and was called by the people "the iron cable of the country." One of the first acts of the young king was to abolish the tabu throughout the islands. He was induced to adopt this policy from various causes; namely, a desire to improve the condition of his wives, who were subject, along with all other females, to the operation of the tabu; *secondly*, several foreigners and intelligent chiefs advised the change; and the report of what had been done by Pomare, King of Tahiti, had great weight with him. Some disturbances took place in consequence of the abolition of idolatry; but the insurgents were defeated, and peace was restored. which has since been but slightly disturbed by the natives themselves.

In the year 1820 a number of well-qualified missionaries arrived from America, and after some difficulty arising from the misrepresentation of foreigners, were allowed to land, and commence their labours at Honolulu, in the island of Oahu. A short time afterwards the present of a small schooner from the British government to the king afforded an opportunity for Mr Ellis, an English missionary, and a number of Christian natives from the Society Islands, to visit Oahu. These native Christians disabused the minds of the king and chiefs of the erroneous opinions they had been induced to entertain as to the objects of the foreign teachers; while Mr Ellis, who had been a number of years in the southern islands, finding the language nearly the same, was able to assist the American missionaries in reducing the Hawaiian language to writing, in preparing books, teaching the natives to read and write, and in preaching the gospel to them in their own language.

In the year 1824 the King and Queen of the Sandwich Islands embarked, amidst the sighs and tears of their subjects, on a voyage to Great Britain, where they died the same year. Their bodies, with their surviving attendants, were brought back to the Sandwich Islands, in the Blonde frigate, under the command of Lord Byron. Kauikeoli, the brother of the king, was unanimously acknowledged as his successor, under whose protection the missionaries continued their labours, often under great discouragements, in establishing schools, planting churches, and training native teachers and missionaries. Amongst those who paid attention to the instruction of the missionaries, numbers made an open profession of Christian faith; and a stricter morality prevailed. They became more humane, more industrious and honest. The Christian females adopted a dress after the European fashion, and became examples of domestic virtue.

The introduction of letters, the reception of the Christian faith, and the guarantee thus afforded for the security of commerce, constituted an era which may be regarded as the turning-point in the history of this people. From that time they have continued steadily to advance in intelligence, resources, civilization, and religion. Their progress has been at times painfully interrupted by means of the misrepresentations of the representatives of foreign governments, and the conduct of foreign officers. On one occasion an English officer went so far as to take possession of the island, and establish a commission for its government; and French officers abrogated the laws, dictated treaties, and by force of arms established the Roman Catholic religion in the country. The act of the English officer was disallowed by his superior as soon as known; but these acts of violence led to a representation on the part of the native sovereign to the governments of England, France, Belgium, and America, and by these powers the independence of the Sandwich Islands was guaranteed in the year 1844.

The Hawaiian government has since been regularly organized; its several departments are efficiently administered, and its laws obeyed throughout the islands. Most of the principal offices of government are filled by foreigners, chiefly Americans, who have become Hawaiian subjects.

The present condition of the islands is shown by the following financial statement for the two years ending March 31, 1858:—

Cash in treasury, April 1, 1856	L.5,853
Receipts for two years ending March 31, 1858	133,134
Total	L.138,987
Expenditures same period	138,914
Balance in treasury, March 31, 1858	L.73
The liabilities of the treasury, March 31, 1858	L.12,641
The assets of the treasury, March 31, 1858	1,521
Balance	L.11,120

Since their independence has been secure, the progress of the people has been uninterrupted; and the resources of the island have been greatly augmented by the discovery of gold in California, which, lying within a short distance, has increased the trade, opened important markets for produce, and raised the value of labour throughout the islands.

The material prosperity of the people is remarkable. Houses are built in European forms and of durable materials; good roads connect the different parts of several of the islands; a large portion of the inhabitants are well clothed, and are possessors of money, or herds, or plantations; and numbers of foreigners, chiefly American and English, have settled in the islands either for purposes of commerce or as permanent residents. Of these there are about 500 at Honolulu in Oahu, and perhaps an equal number in other islands. Improved and productive agriculture, introduced by foreigners, has been adopted by the natives; and besides the ordinary indigenous productions, wheat and other grain is raised, and converted into flour. Horned cattle are numerous. Extensive plantations of coffee and sugar yield a good return for the capital invested, and reward the skill and labour employed. A sort of national agricultural society exists; and the government has encouraged agriculture, especially the culture of sugar-cane, by the award of premiums or the remission of taxes to the most successful native cultivators.

The cultivation of cane for the manufacture of sugar was commenced in Oahu in 1825, when about 100 acres were planted. This attempt was not successful. Ten years later, sugar-planting was commenced on Tauai, and subsequently on the other islands of the group. There are five different varieties of cane indigenous to the islands, three of which yield a good return. Besides a number of small plantations, which have not been found remunerative, there are five of considerable size on the islands, one of which, on Hawaii, conducted by Chinese, yields 100 tons per annum; while the total produce of sugar in the islands at the present time is about 800 tons, of which one-third is consumed in the islands.

Besides sugar, corn is raised, and flour produced; while large numbers of cattle are reared for the purpose of furnishing fresh meat, or salt beef for exportation. A large fleet of coasting vessels bring the greater part of the produce of the islands to Honolulu in Oahu, the chief port in the islands; and 2000 barrels of domestic salt beef, and 3000 barrels of flour, equal to any imported, and large quantities of firewood, potatoes, pumpkins, vegetables, and fruits of all kinds, are annually furnished at this port to merchant and whaling ships; while native as well as foreign seamen may usually be obtained in this port at short notice. Less than forty years ago there was only one house built after the European model. The walls and thatch of the others were chiefly of native grass, and simple barter was the only species of commerce. Now the population of this town averages about 9000.

There are four ship-chandlery stores, about twenty importing houses, and from fifty to sixty retail stores; twelve hotels, nine or ten physicians, and five printing-offices. There are six churches, some of them very substantial specimens of architecture, and capable of accommodating each from 300 to 3000 persons. The schools are numerous both for the native and foreign children, and it is generally thought, by those most capable of judging, that the advantages afforded in Honolulu for a thorough education are equal to those of New England, excepting only her universities and colleges. (Hunt's *Merchant's Mag.*, Feb. 1858.)

To the other channels of productive enterprise and skill has recently been added that of whaling. The whaling fleet of the Sandwich Islands now numbers fifteen vessels. The proximity of the islands to the whaling grounds, and other facilities, promise to render this a profitable investment of capital, while it will increase the market for the native products which its prosecution requires.

The commerce of these islands has been far more rapid and astonishing than even the material improvement in the circumstances of the people. Ever since the discovery of the sperm whale in the northern parts of the Pacific, the captains of numerous vessels engaged in the whale fishery have resorted annually to these islands to refit their ships, recruit their crews, and procure refreshments. The geographical position of the islands has also rendered them the natural point of junction for the commerce between South America, India, and China. The discovery of gold in California has greatly increased this commerce; and the advantages which the position, the resources, and the security afforded by the consolidation of the government in the hands of one sovereign, have rendered these islands a centre of commerce between regions far more remote than the borders of the Pacific. The increase and present magnitude of that commerce will appear from the following tables, which contain a detailed statement of the several classes of imports at Honolulu in 1857, and were prepared by the collector-general of customs in the Sandwich Islands:—

Value of Goods Imported from

United States, Atlantic side	L.55,381
„ Pacific „	55,986
Great Britain	41,322
Vancouver's Island	899
Australia	1,992
Bremen	12,958
Hamburg	1,173
Society Islands	3,217
Sea, &c.	4,300
China (Hong Kong)	4,454
Japan	223
Total	L.181,905

Imports Free of Duty by

Returned cargoes	L.3,659
Whalers	2,292
Missions	897
Charitable societies	332
Agriculturists	768
Rifle company	557
H.M.'s chamberlain	244
Fire department	111
Diplomatic agents	73
Total	L.8,933

Goods and Spirits Bonded, from

United States, Atlantic side	L.22,354
„ Pacific „	5,471
Great Britain, &c.	3,089
China (Hong Kong)	49
Sea	4,196
Society Islands	553
Bremen	1,139
Hamburg	251
Total	L.37,102

Aggregate value of imports at Honolulu in 1857, L.227,943. The values imported at the other ports were,—*free*, at Lahaina, L.2108; at Hilo, L.652; at Kawaihae, L.323; at Kealakeakua, L.116: and *dutiable*, at Lahaina, L.2136; at Hilo, L.163; at Koloa, L.11: aggregate at these ports, L.750. Making the total value of imports at the Sandwich Islands, L.235,448. (Hunt's *Merchant's Mag.*)

In the midst of this external and material progress, the continued decrease of the native population is a source of depressing anxiety to the government and the best friends of the people; for notwithstanding the improved habits of many, the better food, better clothing, improved dwellings of multitudes of the people, their numbers are diminishing. The number of deaths every year is still in excess of the births to an extent far beyond what the epidemics which have at times visited the islands can be supposed to have produced; and a large number of the married couples are childless. In the year 1857 the deaths in the islands were 2017, the births only 1615; but this excess of deaths was moderate compared with many past years. Various causes are assigned for this wasting away of the people. Some consider it caused in part by the less active occupations of the women, and the different modes of life which the progress of civilization has produced, especially as the decrease has been greatest in those parts where foreigners are most numerous, and the changes have been greatest; others ascribe it to the effects of maladies of foreign origin, and to habits of licentiousness and intemperance. But by whatever cause, or combination of causes, it has been produced, it casts a mournful shadow over the future of the Hawaiian race.

The only relief to the gloom which this fact produces arises from the progress of education and religion throughout the islands. The commencement of missionary operations in 1820 has been already noticed; these efforts have been continued, progressively augmented, and spread over the whole group. The American Board of Foreign Missions, who have carried forward this work, have devoted to it a number of labourers and an amount of means unsurpassed in any other missionary field of equally limited extent; and the results have been corresponding. Every vestige of idolatry has long since disappeared. Education has been diffused so extensively, that a child of suitable age who cannot read is rarely seen; while many can write a good hand, and are acquainted with arithmetic. Besides the common native schools, 300 in number, containing nearly 9000 scholars, three high schools, for imparting more extensive instruction, have been established, and have sent into the community 500 or 600 better educated young men. There have been between 10 and 20 schools for teaching English, as well as a royal school for educating the sons of the chiefs; and now a college is established, to enable the youth of the islands to receive a solid education sufficient to qualify them, without leaving the country, to carry forward the processes of civilization, as well as to discharge all the duties which the nation may require. These educational efforts are sustained by the native government. The first missionaries carried out a printing-press. Others have been added; and the efforts of the press have kept pace with the advance of education. There are now a number of presses; and besides school-books and other works connected with education and religion, there are several newspapers regularly published in English, and one or more in Hawaiian; and one, the *Polynesian*, in English, is the paper of the government. The total number of pages printed since the commencement by the presses connected with the missionaries exceeds 196 millions. These educational efforts have been considered subsidiary to the great work of the missionary, the preaching of the gospel and the conversion of the people, and in this they have been eminently successful. Congregations of professed Christians have been gathered in most of the principal districts, and in many parts substantial churches have been built for the worship of God; while numerous communities of men and women have been united in Christian fellowship, and are living exemplars of the excellence and power of the gospel of Christ. Besides the difficulties naturally arising from the wickedness of the human heart, impediments to the religious progress of the people have arisen from the influence of Popery and the examples of Mormonism; but religious improvement among the people has continued to advance, and the numbers in church fellowship throughout the islands amount to about 22,000, and the Christian portion of the people raise annually for religious objects about 23,000 dollars. Notwithstanding all the defections from the integrity and purity required and maintained in the Christian communities, this proportion of nearly one-fifth of the entire population being members of the church exhibits a state of society truly encouraging.

To these islands the American society has, since 1820, sent out 145 labourers, of whom 42 were ministers, 7 physicians, 20 lay assistants, and 76 females. Upwards of 20 ministers, and a proportionate number of schoolmasters and assistants, including 40 native teachers, are now in the islands, supported in part from America, but chiefly by the government or people.

SOUTHERN HEMISPHERE.

The Fiji Islands.

The Fiji Islands.—Regarding the New Hebrides as the eastern limit of Australia, the Fijis constitute the western boundary of Polynesia. By French writers these islands are included in the regions to the west, to which the name of *Melanesia* has been given; but as this term designates rather the colour of the people than the peculiarities of their country, it does not necessarily define geographical boundaries; and, as ethnologically considered, the Fijis seem to form the connecting-link between the black races of Melanesia and the lighter-coloured brown races of Polynesia, and exhibit some fusion of Polynesian race and language, they may not inappropriately be classed with the latter.

This extensive group of islands, lying between 15. 30. and 20. 30. S. Lat., and between 177. E. and 178. W. Long., and comprising 225 islands and islets, about eighty of which are inhabited, was first seen by Tasman in 1643, and named by him *Prince William's Islands.* Captain Bligh, after the mutiny in the Bounty, passed amongst the south-western portion of the group in 1789. Captain Wilson, in the ship Duff, after leaving the first missionaries at Tahiti and Tongatabu, got entangled amongst these islands in the eastern part of the group in 1797. Early in the present century a sort of piratical or bucaneering trade in sandalwood was commenced in the Fijis and western islands. The sandalwood was taken to China by vessels from New South Wales. In 1804 a number of convicts, escaped from New South Wales, reached these islands, and settled chiefly on two of them, by the chiefs of which they were treated with great consideration, in consequence of the aid which they rendered with their firearms in times of war. They were men of desperate character, and depraved and barbarous habits; and while the islands derived a degree of supremacy from the aid thus rendered in war by these foreigners, their reckless waste of human life increased rather than restrained the barbarity of the natives.

M. d'Urville visited the islands in 1827; and in 1840 they were regularly surveyed by the United States exploring expedition under Commodore Wilkes. These islands are of varied size, two of them being from two to six miles in circumference, apparently coral formations covered with deep vegetable soil. The others are of volcanic formation, the highest mountains on the Viti Leva (Great Fiji) rising perhaps 5000 feet above the sea. Their forms are exceedingly varied, and often remarkably beautiful; the soil generally fertile, and in the parts where rain is most frequent the verdure is rich and constant. Vanua Leva, one of the largest islands, is 100 miles long and 25 miles wide; and Viti Leva is 90 miles from east to west, and 50 miles from north to south. The islands are entirely or partially protected by reefs, and most of them have lagoons of considerable extent. The numerous reefs and islets, together with the force of the currents, render navigation intricate, at times perilous; and, together with the supposed invincible ferocity of the natives, have caused them to be less visited than other islands of the same great ocean.

The temperature of the Fijis, though warm, is not insalubrious. The vegetable productions used as food are more numerous than in many of the other islands, as, besides the bread-fruit, cocoa-nut, banana, sugar-cane, taro or arum, yams, sweet potatoes, arrowroot, and dracœna, there are several others which the natives use for food. The population of the islands is estimated at 150,000. As in other parts of this region, the population of this group appears to have diminished one-third within the last 50 years, and in "some districts as much as one-half." (*Fiji and the Fijians*, by Thomas Williams, vol. i., pp. 102, 103.) Judging from their descendants, they must have been a fine race of men. They are usually taller than Europeans; men about 6 feet in height are frequently seen. They are often well-formed and muscular, but not corpulent, having broad chests and strong sinewy limbs. Their hair is abundant, long, black, and frizzled or bushy, with whiskers and a thick large beard. The outline of the face is a good oval, the nose well shaped, with full nostrils, yet distinct from the Negro type. The colour varies, but the pure Fijian seems to be between the black races of the West and the brown or olive-coloured races of the East. "The chiefs, as in several other groups, are incontestibly much finer-looking than the common people, their features having much less of the Negro cast, and their foreheads—partly, perhaps, on account of the form and height of their head-dresses—appearing loftier and more expansive. I did not perceive that, in general, the colour of their skins was lighter; although at Bua I noticed that the older men were in many instances of a deeper black than the younger ones." (Erskine's *Cruise among the Islands of the Western Pacific*, p. 240.)

The Fijians appear to have been regarded, from the period of our earliest acquaintance with them, as in some respects more advanced than the neighbouring tribes. In the volume containing Captain Wilson's voyage in the Duff it is stated :—"The Friendly islanders regarded the people of Fiji as superior to themselves, both in military prowess and in mechanical ingenuity,—their weapons and clothing being wrought in a more masterly style, and some manufactures, especially that of earthen vessels, being carried on at Fiji which are not attempted at Tongataboo." (*Missionary Voyage of the Ship Duff*, p. lxxi.) The Fijians seem to be the only inhabitants of Polynesia who practise the manufacture of pottery to any extent, and evince in the form and ornamentation of their vessels artistic taste and skill. Great ingenuity is also manifested in their mats and clothing, in their ear-rings and other ornaments, as well as in their articles of dress and arms. Indeed, their dress altogether might not inappropriately be described as a species of ornament, neither their climate nor their general habits requiring that it should be used for purposes of comfort or convenience. That of the men consists chiefly of a kind of figured sash, sometimes extending in length to 100 yards, though 6 or 10 yards is the usual measure. This is wound round the body so as to fall over the knees like a curtain, and is then fastened behind, or left to trail upon the ground. The women are not allowed to use the same material; but they also emulate the train by allowing a sash of inferior quality to sweep the ground behind. A white turban, consisting of a kind of gauze-like scarf of extremely fine material, is worn by all the Fijians who have any claim to this badge of respectability; and this head-dress is rendered peculiarly ornamental by the taste with which it is adjusted,—sometimes being tied with a knot in front, or at the top of the head, while portions of the scarf are allowed to float on either side or down the back. Upon this part of the person especially is the taste of the Fijians displayed. Their hair is naturally strong and abundant; but the different modes in which it is arranged by artificial means, and the patience with which the chiefs especially submit to the operations of the hair-dresser, are truly astonishing, the result being, to produce a roundness and softness of surface almost geometrical in the exactness of its outline.

The following description is given by Captain Erskine of a distinguished chief of one of these islands :—"The chief himself, the most powerful perhaps of any in the Pacific, and certainly the most energetic in character, was seen seated in the attitude of respect to receive us. He rose, however, as we entered, seeing that it was expected, unfolding, as he did so, an immense train of white native cloth 8 or 10 yards long from his waist, and invited me to occupy the one chair he possessed, the others taking their seats on rolls of cloth, or, like the natives, sitting cross-legged on the floor. It was impossible not to admire the appearance of the chief: of large, almost gigantic size, his limbs were beautifully formed and proportioned; his countenance, with far less of the Negro cast than among the lower orders, agreeable and intelligent; while his immense head of hair, covered and concealed with gauze, smoke dried, and slightly tinged with brown, gave him altogether the appearance of an eastern sultan. No garments confined his magnificent chest and neck, or concealed the natural colour of the skin, a clear but decided black; and in spite of this paucity of attire—the evident wealth which surrounded him showing that it was a matter of choice, not of necessity—he looked 'every inch a king.'" (Erskine's *Voyage*, p. 186.)

In the structure of their dwellings the Fijians also evince considerable skill. Their houses are compact and durable; and their double canoes are among the finest and fleetest in the Pacific. The Fijians are exceedingly superstitious, the priests exercising great power over the lives and property of the people. They have no idols,—*i.e.*, they worship no images or other material representations of their gods. Their term for divinity, *kolan*, is also applied to anything great or wonderful, good or bad; but they reverence certain stones as shrines of their gods, regard some weapons with superstitious feelings; while certain birds, fish, plants, and even men, are supposed to have gods residing in or connected with them. Their chief god is an impersonation of their idea of ceaseless existence. Others of the higher order are supposed to be also eternal, and to exercise influence over the elements of nature, the islands, or their inhabitants. The gods of the lower class are the spirits of deified men. Each island has its own god; each locality its own superstitions. Nearly every chief has a god in whom he places especial confidence; and some are of opinion that their god follows them wherever they go. Different classes, as the carpenters, fishermen, &c., have their respective gods. Nearly every house or village has its own *bure*,[1] or temple, some more than one. These are constructed with great care, highly ornamented, and generally raised on an artificial mound, sometimes 20 feet high. Several spears set in the ground, and some blanched human skulls, are fixed in the sacred place; offerings of weapons decorate the interior; while a long piece of white cloth, used as a girdle or sash, fixed to the top, and carried along the rafter and corner-post to the ground, forms the path down which the god is supposed to descend to enter the priest. The priests are at times also doctors, and in these cases a number of the articles presented, or the fees, are deposited in the temple. This building is also used as a council-chamber or town-hall, as well as a place of entertainment for strangers and sleeping place for the chief personages of the village. The homage and offerings appear to be provided by appeals to the fears of the people. Offerings are presented when the favour or aid of the god is required, or it is wished to ascertain his will; and the priest, pretending to be filled by the god, exhibits phrenzied and convulsive action, and in incoherent utterances delivers the response of the oracle. Upon his uttering the word "I depart," or flinging himself violently down and beating the ground, a shell is then blown or a musket fired to announce that the god has departed. A good understanding mostly exists between the chief and the priest, and the revelations from the latter generally accord with the wishes of the former. On one occasion, when a priest ventured to utter an inspiration contrary to the wishes of the chief, the latter silenced the priest by exclaiming, "Who are you? Who is your god? If you make a stir, I will eat you." (*Fiji and the Fijians*, vol. i., p. 227.) And this the priest knew well was no idle threat.

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[1] *Bure* is the word for prayer or worship in the dialects of Eastern Polynesia.

The cannibalism of the Fijians is naturally incorporated in their religion. Their gods are described as delighting in human flesh, and to minister to this horrible propensity neither age nor sex are spared. At one time, with each basket of fruits brought to their idol a human body, male or female, was required. But this was peremptorily forbidden by the chief on his observing some informality in the treatment of the victim; thus showing virtually the power of the chief above that of the god. Divination and witchcraft are also practised, and the effects of the latter regarded with general dread. The tabu, or system of prohibition common throughout Polynesia, prevailed amongst the Fijis, whose religious belief included a future state, which in its chief characteristics very much resembled the present life.

But the most repulsive and appalling custom among the Fijis is their cannibalism. With them it was not an occasional exhibition of the extreme abasement to which human nature can sink, but a regular custom, and by the mass regarded as dignified and commendable. Human bodies are eaten in many of the frequently occurring events of life: on building a temple, commencing the structure of a canoe, launching the canoe; and men are sometimes killed to furnish blood with which to wash the decks of a newly-made canoe, and the bodies of such men are eaten. On the arrival of a new canoe at an island, fourteen or fifteen men have been killed and baked to make a feast. The same has taken place on lowering the mast for the first time. On one occasion the number of bodies procured was more than could be consumed. In this case the limbs were cooked, but the trunks thrown away. Two days were occupied in cutting off and cooking the limbs. In the year 1851 fifty bodies were cooked at one time on Namena. Prisoners taken in war, and those who escape from shipwreck, are usually eaten,—the former being first offered to the war god, and then prepared for food. Sometimes the human body is baked whole, in which case, on being removed from the oven, it is placed in a sitting posture, covered with black powder, and in this state it is carried about as if alive.

Revenge is a frequent but not the only cause of this revolting practice. The only motive sometimes seems to be the gratification afforded by eating human flesh. It is never eaten uncooked, though the victim be in full health and vigour. Young women are sometimes placed alive amongst heaps of vegetables, and other food presented to the chiefs, but would be killed and baked before being eaten. The victims are confined to neither age nor sex; gray-headed persons and children of both sexes furnish the repast. Some of the chiefs never eat human flesh, but they are exceptions to the mass of the people; women seldom eat of these bodies. When a chief has wished to have the skull of an enemy for a soup-dish or drinking-cup, orders have been given not to strike the victim on the head. Murder for this horrible purpose is sometimes rendered more horrible by the infliction of tortures,—such as cutting off limbs of the victim while still living, cooking and eating them before him, and even making him eat part of his own flesh. The number of bodies eaten by some of the chiefs appears also almost incredible. Human nature has never presented depravity so revolting as that by which this custom, not arising from any want of wholesome food, exhibits.

The Fiji race, distinguished among other races as they undoubtedly are by physical and intellectual vigour, by industry, skill, and daring, their inhuman barbarities and cannibal orgies were such as to deter commerce from their shores, and even to repel all attempts of humanity and religion to rescue them from apparent self-destruction, and to render such attempts, according to all human appearances, hopeless, if made. Insurmountable, however, as the difficulties appeared, and imminent as was the peril of the attempt, it has been made; and these natives, far as they seemed removed beyond the reach of the humanizing influences of true religion, have formed no exception to the evidences so abundantly furnished in the present age of the power of the gospel.

In the year 1835 two Wesleyan missionaries from the Tonga Islands went to the Fijis. They were received and protected by the king of Lakemba, and encouraged by a number of Tongese residing there. They made themselves acquainted with the language, prepared books, taught the Fijians and Tongans, and preached to them the gospel, assisted by native Christians from Tonga.[1] A number of the Tongans placed themselves under instruction, and after a short time professed themselves Christians. In 1838 one of these devoted men proceeded to Rewa, and there, under the protection of the king, prosecuted his arduous work. Additional labourers arrived during the same year, and the printing-press was set to work. In the next year missionary labours were commenced in Vanua Leva, or Great Land, where one of the earliest events after their arrival was the strangling of sixteen women in honour of a young chief and his companions who had been lost at sea. The missionaries tried in vain to avert the cruel fate of these women. Soon afterwards eleven dead men were brought and laid down before the house, and there cut up and cooked in ovens not far distant. The endeavours of the missionaries to dissuade from this practice, and even the drawing down the blinds of their windows that they might not witness the horrid spectacle, offended those who were preparing this inhuman repast. The missionaries, however, continued their labours, and the first convert was the king's brother, whose protection and influence greatly aided their efforts, and averted the execution of the threat of the king, that he would kill the first person who should embrace the new religion.

In 1840 the converts amounted to twenty, and the missionaries constantly employed their influence to save women from being strangled and captives from death. But seven years afterwards the discouragements induced the missionaries to leave this station, and seek a more promising field. They had continued their labours amidst many trials,—sometimes interposing to save life, at others endeavouring to induce the people to receive their message. The following account shows the manner in which two of the missionaries, in 1849, interposed in the midst of horrid butchery, and even in the presence of the cannibal king, to save the lives of a number of devoted women:—"Fourteen of the poor creatures were seized, one man who was with them being killed on the spot. The news of the capture reached Mbau the day before the canoes, and great was the rejoicing. The place was all excitement, and the people flocked together to greet the approaching fleet of death. The report soon crossed over to Viwa, and reached the mission-house,—'Fourteen women are to be brought to Mbau tomorrow to be killed and cooked for the Mbutoni people.' Mrs Calvert and Mrs Lyth, missionaries' wives, were alone with the children. Their husbands were many miles away on a distant island. The thought of the horrid fate which awaited the poor captives roused the pity of those two women. But what could be done? Every moment was precious. Amidst such fiendish excitement, it would be a desperate thing for any one to venture into Mbau for the purpose of thwarting the blood-thirsty people. Those two noble women determined to go. A canoe was procured; and as they went poling over the flat, they heard with trembling the wild din of the cannibals grow louder as they approached. The death-drum sounded terrible, and muskets were fired in triumph. Then, as they came nearer, shriek after shriek pierced through every other noise, and told that the murder was begun. Fear gave way to impatience at that wild warning, and the English women's voice urged the labouring boatmen to make better speed. They reached the beach, and were met by a Christian chief, who dared to join them, saying, 'Make haste! Some are dead; but some are alive.' Surrounded by an unseen guard which none might pass through, the Christian women passed among the blood-maddened cannibals unhurt. They pressed forward to the house of the old king, Taura, the entrance to which was strictly forbidden to all women. It was no time for ceremony now. With a whale's tooth as a present in each hand, and accompanied by the Christian chief, they thrust themselves into the presence of the king, and prayed their prayer of mercy. The old man was startled at the audacity of the intruders. His hearing was dull, and they raised their voices higher, and pled for their dark sisters' lives. The king said,—'Those who are dead are dead; but those who are still alive shall live.' At that word a man ran to Ngavindi to stop the butchery, and returned to say that five still lived; the rest of the fourteen were killed. But the messengers of pity could not leave their work unfinished. They went to the house of the murderer, and found him sitting in state in full dress, but evidently very uncomfortable. He winced under the sharp rebukes of the missionaries' wives, and muttered something about his friendliness to the *lotu*. Even in cannibal Mbau, all did not consent to the deed of darkness. Thakombau's chief wife, and Ngavindi's wife, had already secured the life and liberty of two of the victims; and when Mrs Calvert and Mrs Lyth left there were others who blessed them for their work of love. What the doing of it cost those intrepid hearts none may know; but their deed stands in the record above all praise. They have their reward." (*Fiji and the Fijians*, vol. i., p. 288.)

In 1854, after many reverses, Thacombau, the powerful king of Mbau, made a public profession of Christianity, and this facilitated the spread of religion among his people; and amidst many perils and labours, the missionaries have persevered. There are eight missionaries and a number of native teachers. They number about 60,000 hearers and 7000 church members; while the influence of their labours is visibly extending among classes who are still the votaries of idolatry.

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[1] Before the arrival of the Europeans, native missionaries from the Society Islands had resided among this people.

The Tongan or Friendly Islands.—This group, comprising three principal clusters, with a number of smaller ones, is situated to the S.E. of the Fijis, from which it is distant about 300 miles, lying between 19. and 22. S. Lat., the N.W. point of Lefuka, one of the largest of the central cluster, lying in 19. 45. S. Lat., and 174. 14. 30. W. Long. Vavau, the principal island of the northern cluster, is about 35 miles in circumference. Tonga, the largest of the southern cluster, is about the same. Hapai and Lefuka, the largest of the central cluster, are much smaller. These latter are surrounded or connected with about thirty smaller islands; and the whole of these are called the Hapai cluster. Most of the Friendly Islands are low coral formations, some of them covered with rich soil. The uniform elevation of Vavau is a few hundred feet above the sea, while the highest land in Tonga is a round hill about 60 feet high. A few of the islands are lofty and volcanic; in some of the latter volcanoes are in action, while the evidences of volcanic disturbance appear in places where no actual eruptions take place. It is stated by Erskine (*Voyage of H.M.S. Havannah*, p. 120) that "earthquakes are very common, and there are several active volcanoes in the islands. Amargura or Fanua-lai, in about 18. S. Lat., is said to have been so shaken by an eruption in June 1846, that canoes can now sail in and out of the crater; and the Rev. Mr Lawry describes the islet, which until that year was covered with verdure and abounded with fruit, as changed, in August 1847, to a mass of lava and burnt sand, without one leaf or blade of grass of any kind. All things that had life had been utterly destroyed; the inhabitants having, however, warned by violent earthquakes which preceded the eruption, previously escaped to Vavau. Mr Lawry adds, that the noise of the 'fiery disgorge' was distinctly heard at Niua Foou, distant 100 miles, and that its withering effects on the trees and crops, which it damaged considerably, were experienced at Vavau, 35 miles off. An American ship, the Charles W. Morgan, had sailed through a shower of ashes for 40 miles, getting out of it in Lat. 11. 2. S., and Long. 171. 45. W.; and another, the Massachusetts, at the same time, although 60 miles farther to the eastward, had the deck covered with ashes, which the crew were obliged to clear off from time to time. Banks were also said to have been raised above the level of the sea to the eastward of Tonga-tabu."

The navigation among the Tongan islands, though less dangerous than among the Fijis, is intricate, and, excepting in favourable weather, perilous, and the attraction to ships not so great as those presented by other islands. They furnish but few articles of exportation, the chief productions for barter being vegetables, roots, and other supplies for whaling vessels. At some, water is neither abundant nor good. The productions are those common to other islands, though apparently fewer in variety than in the neighbouring group of the Fijis. Pigs are not numerous, and are generally kept confined, sometimes in the trunks of hollow trees, which are thus used as sties. Many of the islands, however, are well cultivated. Speaking of the difference between the island of Vavau as seen from the outer sea and the inside of the harbour, Captain Erskine observes (p. 121),—"On walking to the king's residence, called Mua, a distance of a mile or two, we were astonished with the richness of the country, cultivated like a garden. The broad pathway, admirably kept, is bordered by the 'ti' plant and other evergreens, regularly planted, while behind them are seen the provision-grounds of bread-fruit and bananas." And on landing at the island of Lefuka, he continues,—"entering a large inclosure, we found King George and his wife seated in a house of moderate dimensions, which it is understood he only occupies during the construction of a larger one on a European model. This house differs from those of his subjects in being inclosed nearly all round with reed-work, resembling the fences of the country, and in being divided into two separate rooms. Although both George and the queen were seated on the ground in the usual manner, there were a table and one or two chairs in the room; and on shelves around were ranged some dishes and plates of English crockery, with a few decanters, and bottles of clear glass containing scented cocoanut oil. The king himself is a very fine-looking man, about forty-five years old, above the ordinary size even of his own people, and apparently of great personal strength. He was lightly clothed in native cloth, as was his wife, a stout, handsome woman, with her only son, an intelligent boy of seven or eight years old, seated by her. The complexions of both were a clear brown, differing very little, if at all, from the hue of the Samoans; the boy, as is usually the case with children, being a good deal lighter in colour. On presenting his hand to shake, I remarked that George had one joint of the little finger amputated, an operation which, under the name of 'tutuu-nima,' it is well known is still common, and was formerly almost universal as a sign of mourning, or of deprecation of sickness or misfortune."

The population of this entire group has been variously estimated. Commodore Wilkes reckoned it at 18,000, and Mr Lawry states that in 1841 it was supposed to be 50,000. Captain Erskine observes that the population of the whole of these islands may be estimated at between 20,000 and 30,000. (*Voyage of H.M.S. Havannah*, p. 13.) The colour, features, and stature of the people resemble those of the Samoans. Many of the natives are tall and well made, and some of the chiefs are remarkably fine and noble-looking men. In describing the people, Captain Erskine (p. 155) observes,—"The Tongans, in personal appearance, resemble so closely the Samoans, that no person would hesitate at first sight to pronounce them the same people; and as their habit of tatooing their bodies, from the hips to below the knees, is precisely similar, a stranger would find it difficult to distinguish individuals of the two groups if they were placed naked before him. On further acquaintance with this people, one is struck with the marked superiority in stature and the lightness of colour on the part of the chiefs over the common people, betokening a great difference in the care bestowed on their nursing and food during childhood, and the degree of exposure they are subjected to afterwards. That this distinction is not a mere outward one is soon perceived, the authority of the chiefs, as well as the gradations of rank, being everywhere apparent. The effect on manners is also evident, although not exactly what one would expect from a system which exacts great ceremony and attention from inferiors towards superiors. The manners of the chiefs are certainly as polished as those of the Samoans, and not inferior in courtesy to any in civilized life; but the common people, when not in the immediate presence of their chiefs, are much more rude and boisterous than in Samoa, and less agreeable people to deal with generally."

The southern portion of this group was discovered by Tasman in 1743, who gave the name of Amsterdam to Tonga,—sometimes called Tonga-tabu,—*Tonga* being the native name of the island, and *tabu* intimating that it was regarded by them as sacred. These islands were visited by Captain Cook between the years 1773 and 1777. In consequence of the attention he received, the profuse hospitality, apparent amity, and the efforts to gratify their visitors, on the part both of chiefs and people, Captain Cook designated the group the Friendly Islands; though it afterwards appeared that, at the very time the chiefs were feasting and amusing their guests with night-dances and other exhibitions, they had planned their death and the destruction of their ships, and were only prevented from carrying their purpose into execution by the departure of the vessels.

The first attempt to form a settlement on these islands was made by a number of missionaries from the London Society, sent out in the ship Duff, under the command of Captain Wilson, who, after establishing the mission in Tahiti, landed ten English missionaries at Tonga in 1797. The chief of the place promised them protection; and in the hope of acquiring the language, and prosecuting their benevolent object, they took up their abode on the island. Some abandoned sailors whom they found on shore prejudiced the minds of the chiefs against them, and the people ascribed the calamities they suffered to the presence of the missionaries and the influence of their God. After enduring great privations, having three of their number killed by the natives, and feeling their own lives in peril, the remaining missionaries left the island within three years of their arrival. Intestine wars prevailed among the people at the time; and six years afterwards a British vessel, the Port-au-Prince, mounting upwards of forty guns, and carrying a corresponding number of men, was seized by the natives, and all on board, with the exception of a youth named Mariner, and one other, were massacred. In recent years vessels have occasionally resorted to these islands and to the Fijis to procure sandal-wood for the China market, or to obtain refreshments; and several have been wrecked in the difficult navigation of this region, or have been seized and destroyed by the people.

In 1822 Mr Lawry, a Wesleyan missionary, visited Tonga, and returned after remaining little more than a year on the island. Native teachers from the Tahitian Islands reached this group in 1823, and one of them laboured faithfully in Tonga, where he was joined by others, who continued the work until the arrival of Mr Thomas, a Wesleyan missionary, who reached Tonga in 1826, when they cheerfully led their adherents to the efficient teaching of the European missionary, and continued to labour on in promoting the Christian faith among the people. Other missionaries followed from England; and although the force of pagan habits and superstitious feeling among the people, the opposition of the priests, and the formidable hostility of some of the chiefs, greatly impeded their efforts, they still persevered. The nature of this hostility may be inferred from the fact, that one of the chiefs, Finau, the king of Vavau, publicly told the missionaries that the teachers might stay, and he would protect them; but that he would neither receive Christianity himself, nor allow any of his people to do so, for he would put to death the first man, woman, or child that did; a threat which they did not doubt he at that time would fulfil. The missionaries directed their efforts to the acquisition of the language, the preparation of books, and the teaching of some few of the natives to read, seeking by both preaching and teaching to induce them to adopt the Christian faith; and at length a certain measure of success followed their endeavours. Numbers of the people and the chiefs, especially the king of the Hapai Islands, who was baptized in 1830, encouraged others, who, one after another, renounced their confidence in their idols, treated them with indignity, desecrated their sacred places, and professed themselves worshippers of the true God. Amongst these was the king of Vavau himself, who in 1831 made profession of the Christian faith.

In 1831 the printing-press commenced its operations, and elementary books, as well as those inculcating Christian truth, were multiplied. Chapels were built, the Sabbath observed, and worship established at the islands of the Hapai and Vavau clusters. The circumstances and the habits of the people improved; they built themselves better houses, provided better clothing and regulations and laws for promoting order and the general good of the people were established. There were still in the island of Tonga a number of adherents to the ancient idolatry and heathen practices of the country; and in 1837 and 1840 the island was involved in the miseries of civil war. During the latter period H.M.S. Favourite, under the command of Captain Croker, arrived. He undertook to aid the Christians, landed some of his guns, and, accompanied by a number of his men, proceeded to a fortress belonging to the heathen party to propose peace; but not succeeding, he then attacked the place. The captain was killed, and nineteen of his officers and followers wounded. These, with the dead bodies of their comrades, his companions barely succeeded in carrying off.

Two years before this, some Roman Catholic priests had reached the islands, but though kindly treated, were not allowed to remain. In 1841 a French vessel of war arrived, followed by another with priests on board. The captain of the armed vessel remonstrated against the non-reception of the priests by the chiefs and people as a violation of the law of nations, asking at the same time if they had not heard what the French had done in Tahiti and the Sandwich Islands. Although this did not induce the chiefs to receive them, another party afterwards arrived at Tonga, and were received by the heathen party, who professed themselves Papists. In 1851 war broke out again between the heathens and the Christians, the Romish priests remaining with the former; and when, in 1852, the heathens surrendered their fort, the Christian king protected the persons and property of the priests from the soldiers.

Speaking of the influence of the Roman Catholic priests, and the interference of French armed vessels on their behalf, Captain Erskine observes—"The apprehension of foreign invasion has been very general among the Polynesian islands since the establishment of the French protectorate at Tahiti, and the obligation then imposed upon the people to receive Roman Catholic missionaries in opposition to the general will. No chiefs with whom I have conversed have ever expressed any objection to the enforcement on the part of their people of justice towards the subjects or the citizens of another power; but in those islands where Christianity, as taught by Protestant missionaries, has taken root, the forced obligation to admit priests of a different persuasion is always complained of as a heavy grievance; a feeling which, it must be allowed, need not proceed from fanatical or narrow-minded motives."[1]

The Protestant missionaries in these islands have continued their labours, have raised the standard of education in a number of their schools, and extended the influence of the gospel among the people, who now possess, in their own languages, the whole of the New Testament, of which 10,000 copies were recently sent to the islands, besides several portions of the Old Testament, hymn-books, catechisms, &c.

The results of missionary effort in the Fiji and Friendly Islands have certainly been in a high degree satisfactory to the labourers engaged, and encouraging to those occupied in the same work elsewhere.

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The Samoan Group, or Navigators' Islands.—These islands lie between Lat. 13. 30. S., Long. 173. and 168. 18. The most easterly of the islands were discovered by Bauman, a captain in Roggewein's expedition, in 1722; another of larger size by Bougainville in 1768; and the two larger to the westward by La Pèrouse in 1787. The whole were visited in 1791 by Captain Edwards in the Pandora, sent out by the British government in search of the Bounty. But they were little known until after the commencement of missionary operations in 1830. The French often call this *L'Archipel des Navigateurs*, a name originally given to the eastern portion only, when discovered by M. De Bougainville in 1768; the natives, however, term the whole group *Samoa*, which, decidedly more correct and appropriate, is generally superseding its comparatively modern designation, usually rendered into English as the *Navigators' Islands.* This group, which is called by the inhabitants *Sa-moa*, consists of eight islands:—Manua, Orosenga, Ofu, Tutuila, Upolu, Manono, Aborima, and Savaii. In addition to these there are several small islands off the coast of Tutuila and Upolu.

Manua is the first island west of Rose Island. It is about 18 miles in circumference, and upwards of 2500 feet above the level of the sea. Its shores are high and bold, rising in most places precipitously to the height of 300 or 400 feet. Above this the ground inland swells gracefully until it attains its greatest elevation, like a vast dome above some huge citadel. It is well wooded, and covered with rich verdure to its summit. Four miles N.W. of Manua is Orosenga, consisting of a narrow ledge of rocks, 3 miles long, rising abruptly out of the water. The only productive portion of it is a narrow strip, running lengthwise of the island, and overspread with the most luxuriant vegetation. Ofu is west of Orosenga, separated from it by a channel for boats, one quarter of a mile in width. It is of little importance, and contains but few inhabitants,—most of them having been cut off during the sanguinary wars which have more than decimated the population of these islands.

Tutuila, 15 miles west of Ofu, and visible therefrom in fine weather, is the most central, and, after Upolu, the most important island of the whole group. It is nearly 50 miles in circumference, its shores precipitous, with generally a broken and rugged appearance, occasioned by the numerous sharp spurs and ridges which vary its surface. Its scenery is highly romantic; and its unevenness is more than half-concealed by forests of cocoas and bread-fruit: the thickly-matted verdure, interlaced with creepers, covers the island as with a carpet. Its highest peak is Matafoa, upwards of 2300 feet above the sea. Tutuila contains a large population, chiefly congregated in the valleys and plains sloping down to the ocean. Lofty and impassable hills separate the island into two parts, the only intercommunication being by the seashore. The part on the N.E. is exceedingly rough and uneven; that on the S.W. lower, more level, and easy of cultivation. Tutuila was visited by the unfortunate La Pèrouse in December 1788, and derives a melancholy interest from the fact that M. De Langle, captain of the Astrolabe, and the naturalist of the expedition, with ten other persons, lost their lives there in a collision with the natives.

Upolu, 36 miles W. of Tutuila, is 70 miles in circumference. It is neither so lofty nor so much broken as the other islands of the group; but in population, beauty, and fertility, far exceeds them all. The land rises gradually for some distance from the shore, and then breaks into a succession of mountainous ridges, clothed to the top with the richest verdure. Wide tracts of table-land lie along the coast, and broad valleys between the ridges, carpeted with flowers and diversified with clumps and groves of bread-fruit, pandanus, and cocoa-nut. The steep hill-sides are fringed with the white foliage of the candle-nut, the long fronds of fern-tree and the mountain-palm. The hamlets of the natives enliven the scenery. On one side there is all the dreamy softness of an Italian landscape; on the other the sublime grandeur of Alpine scenery. Within the sea-reef of Upolu, and near its western extremity, is the small but important island of Manono, on which there is a missionary station. Directly off the west end of Manono lies the islet of Nulofa. Connected with Upolu and Manono by a line of soundings is Apolima, about a mile to the west of the latter. In former days this was the citadel of the inhabitants of Manono in time of war and danger.

Savaii, the westernmost and largest of the group, is also connected with Apolima by a line of soundings, at the distance of 3 or 6 miles. It is not so populous as Upolu, and its outline is much less beautiful. It is above 100 miles in circumference, and is protected on the north and east from the violence of the surf by reefs of coral; on the opposite sides, however, the breakers dash unchecked against the rocks. Except on the south and west the shores are low, and there is a gradual ascent to the centre of the island, where many extinct volcanic craters are seem. Above these towers a single peak, 4500 feet high, almost always enveloped in clouds, and on a clear day visible at a distance of 50 or 60 miles. Mountain streamlets, sometimes swelling into rivers, frequently intersect the larger islands, with the exception of Savaii, which has no permanent streams, though possessing an abundance of copious springs. There are likewise numerous lakes and waterfalls, the latter of which may one day be serviceable for mills or machinery. On Upolu there is a pretty lake called Lauto, occupying the basin of a crater 2450 feet above the level of the sea, with 9½ fathoms in its deepest part, and having a subterranean outlet. Like the Society Islands, the members of this group appear to be of volcanic origin, and are generally surrounded by coral reefs, with occasional openings, through which vessels may pass. The general structure is conglomerate, lying in horizontal strata. All the higher hills and mountain peaks are volcanic. The soil is principally formed of decomposed volcanic rocks and vegetable mould. The climate is mild and agreeable, and the temperature about 80 degrees. It is more moist than Tahiti, and the vegetation more thrifty. Nearly one-third of the days in the year are rainy. From April to November the season is fine, the winds being light, and affording merely a pleasant variety in the long-continued calms. During the remainder of the year high winds prevail, principally from the south and east. Destructive hurricanes sometimes occur; and earthquakes are not unfrequent. The latter are not usually violent, but produce a slight wavy motion, like that of a vessel in an ordinary sea.

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[1] During the year 1858, it is stated that, because the governor of Vavau refused to allow some priests to settle on the island without the consent of the king (which is the law of the islands), the captain of a French armed vessel proceeded to Tonga; required the king to dismiss the governor, who had only acted according to the laws of the country; to build houses and inclose lands for the Catholic priests equal to those occupied by the Wesleyan missionaries; and that the king was obliged to comply with this request.

There are a number of excellent harbours among these islands; and the navigation, being exempt from intricacies and perils of numerous low or sunken reefs, is comparatively safe. Excellent water is abundant. The whole group covers a surface of about 2000 square miles, and much of the land is fertile and available for cultivation. The commercial resources of the islands are undeveloped; although about sixty ships, chiefly English, American, and colonial, visit Apia, the harbour of Upolu, annually, principally for refreshments.

The natives of this group are handsome and well-made Malayo-Polynesians, a shade darker than the Society islanders, but in features bearing a strong resemblance to that race. Their language, although copious and refined, contains many words similar to those found in the Tongese dialect; and it is also said, in construction, closely to approximate to the Tahitian, being even yet smoother, softer, and more flexible than that tongue, though not so easily spoken. The sounds of the Samoan alphabet are represented by an alphabet of fourteen letters; and it is remarkable as the only branch of the Malayo-Polynesian family in which the sound of the *s* is heard.

The population of Samoa has been variously estimated from as many as 160,000 to as few as 38,000. The Rev. J. Williams estimated them at the former number in 1830, and Captain Erskine, in 1854, at the latter; but by the missionaries (*Samoan Reporter*, 1845) the population was reckoned at from 50,000 to 60,000. At present the Samoan nation does not probably exceed 40,000 souls.

In the year 1830 Messrs Williams and Barff, from the Society Islands, visited the Samoas in a small vessel built by Mr Williams, for the purpose of extending the blessings of Christianity to the remote islands of the Pacific. They found the islanders engaged in war; and one of the first objects which attracted their notice on the shore was the smoke and flames of the burning villages on Upolu. The king left the seat of war, and came to bid them welcome. He expressed his willingness to receive and protect the missionaries, but declared, in answer to their endeavours to persuade him to peace, that he must finish the war in which he was then engaged, and after that there should be peace. Eight native missionaries, five of whom were accompanied by their wives and children, were at that time left on these islands, and a promise made that white men should come and reside amongst them. Two years afterwards Mr Williams visited them again, and found that numbers of the people, including the inhabitants of thirty villages, with some of the chiefs, had renounced the idols of their country, and were pupils of the native missionaries. During his visit the king avowed his determination to become a Christian, and to exert his influence to extend Christianity throughout the islands.

In June 1836 six missionaries, five of them married, arrived from England, and were welcomed by all classes, who promised their protection, and expressed a willingness to receive their instructions. As an evidence of their sincerity, and to show their disposition to attend to the wishes of the missionaries, the inhabitants of Aana, who had been conquered in the war raging when the first missionaries arrived, were invited to return to the lands. Four hundred of these had been cruelly burned to death, and the rest banished. The exiles were now invited to re-occupy their country; and in less than eighteen months three thousand of them returned, rebuilt their villages, and tilled their lands. The number of the European missionaries was afterwards increased, and they acquired the language, prepared books, and taught the natives to read. In 1839 the labours of the press were commenced; and the greater part of the population had renounced heathenism. A Wesleyan missionary and some native teachers had come from Tonga; but in order to avoid the disadvantages that might arise from the slightest apparent difference in teaching Christian truth among a people who were only beginning to learn the difference between Christianity and heathenism, it was arranged by the societies at home, in accordance with the agreement entered into at the beginning by the missionaries of the two groups, that they should confine their operations to the fields they first occupied; and thus this cause of apprehended difficulty was then removed.

In 1846 a number of Roman Catholic missionaries arrived, and are labouring in the islands, where there are at present a bishop, a number of priests, seven places of worship, and above 500 adherents.

The Protestant missionaries have, besides the ordinary native schools, established schools of a higher class for the more intelligent youth, and boarding-schools for females, in which upwards of 100 are taught. They have also maintained, in great efficiency, an Institution for training native teachers, from which a number of excellent men have gone forth as pioneers to European missionaries among the most ferocious and hostile of the cannibal and other islands to the west. The teachers remain in the Institution from three to five years before they are sent forth. This institution contains 57 young men in the teachers' class; 45 in the youths' class; wives of the teachers, 47; their children, 45; making 244 in the establishment. 137 teachers have been educated and sent forth from this institution. Besides lesson-books and catechisms, books on arithmetic and geography have been printed, not in the Samoan only, but also in the languages of the islands to which native teachers have been sent; and the printing of the whole Bible, after a committee of missionaries had been occupied for nine years in its revision, was completed in 1855—less than twenty years after the arrival of the European missionaries. Part of the expense of this establishment is defrayed by the natives, who also purchase the copies of the Scriptures, and contribute liberally towards the extension of the gospel. During the year 1856 they contributed for these purposes L.1203. There are in these islands 11 missionaries (including the missionary printer), 190 native teachers, 154 schools, 4700 scholars, and 2500 native communicants. The entire native population, with the exception of a very small number, profess Christianity. There is also at Apia, on Upolu, a chapel for seamen, of which, at certain seasons, there are large numbers in the port. An English and an American consul, with about sixty foreigners, reside there, and an equal number in the other parts of this group.

To the northward and eastward of these groups are three smaller clusters, with a number of single islands and lagoon reefs. The chief of these are

Ellice's Islands, or Vaitapu Group.

Ellice's Islands, or Vaitapu Group.—A numerous cluster of straggling low coral islands, situated to the northward of the Friendly Islands, and W.N.W. from the Samoan, from which they are distant 500 miles. These are sometimes called *De Peyster's Islands.* The centre of Vaitapu, also called *Achilles Island* and *Tracy Island*, is situated in 7. 28. S. Lat., and 178. 44. E. Long. It is a lagoon island, and contains about 400 inhabitants.

The islands of this group are well wooded with the cocoa-nut, Pandanus, and Pisonia; and their inhabitants chiefly subsist upon the first two, together with a species of taro, and another larger root called *pulaka.* The people of these islands are darker in complexion than the Fakoafoans and Samoans, to whose language their own has a considerable affinity; and they are regarded by ethnologists as an interesting and important link between the races of N.W. Polynesia, and S.E. Micronesia. They practise tattooing; and both sexes wear the *maro*, as well as the *takai*, or girdle, with a heavy fringe two feet broad for the women, but narrower for the men. They have many peculiar weapons; and large canoes hollowed out of a single tree, for which they use sails of a triangular shape, with outriggers and paddles, like those common in Polynesia. The population is supposed to be not more than 1700 to 1800.

Phœnix and Union clusters.

To the north-east of these is situated the *Phœnix* cluster, consisting of seven or eight islands uninhabited. Birnie's Island, one of the largest, is situated in Lat. 3. 34. S., and 171. 3. W. To the south of these is situated the *Union* cluster, consisting of three principal islands, viz., Otafu, or Duke of York's Island; Nukanono, or Duke of Clarence Island; and Fokakafo, or Bowditch Island. These islands are of a coralline formation, and in their general aspect resemble the atolls of the Paumotus. Their inhabitants (who chiefly subsist on cocoa-nuts, pandanus-nuts, and fish), are stated to have been, previous to the arrival of foreigners, altogether unacquainted with the use of fire. They are a quiet and harmless people, considered to be the fairest race in Central Polynesia, and much resembling in form and feature the natives of Samoa, to whose language their dialect is similar. They are not numerous, probably not more than 1000.

Hervey Islands.

The Hervey Islands.—This cluster of seven islands, of which six are inhabited, is situated between Lat. 18. and 22. S, and Long. 157. and 160. W. Several of the islands, including that from which the cluster takes its name, were discovered by Captain Cook in 1773 and

1777. They are of different structure, Rarotonga, the largest, being volcanic and mountainous, surrounded by a reef of coral. Others consist of ancient coral formations raised from 20 feet to 60 feet above the sea, some of them lower, and all surrounded by live coral reefs. Most of the islands are fertile, and capable of supporting a much larger population than the present, which has been estimated at 11,000. The inhabitants belong to the Malayo-Polynesian race, and as they are able to trace their origin satisfactorily and clearly, they have had, in all probability, fewer infusions from other sources than the larger groups. Their language bears a striking resemblance to that of the Samoas, from which part of the people have been derived. It also resembles the New Zealand and Sandwich Island dialects, as well as those of the more central islands. Little was known, excepting what Cook has recorded of some of them, until 1821, when they were visited by missionaries. The first account of the largest island is that given by Mr Williams, who found it in 1823. At this time the inhabitants were heathen, their idols corresponding with those of Tahiti; their government a sort of feudalism; they were addicted to war; and were cannibals. Their history is the history of the introduction and influence of Christianity; their intelligence, civilization, industry, and piety, the effects of Christianity amongst them; and, according to the concurrent testimony of all who have visited them, these effects have been as extraordinary as they are satisfactory.

Rarotonga, the largest island, with its encircling reef, is about 35 miles in circumference, the highest mountains about 4000 feet above the sea. There are openings in the reef, but no secure harbours for shipping. The island is well watered and fertile, yielding the bread-fruit, cocoa-nut, banana, taro, and other Polynesian productions. The ferocity and barbarity of the natives, when the missionaries visited them in 1823, were such that the native missionaries and their wives dare not remain amongst them, and a single man was the only teacher that could be left. He was afterwards joined by another. Their efforts in humanizing the barbarians, teaching refined lessons of Christianity, inducing them to cast away their idols and profess themselves worshippers of the true God, were eminently successful. In 1827 the first European missionary arrived amongst them, and the second in the following year; and these were subsequently followed by a third. Their efforts were neither unopposed nor exempt from danger from the natives; but with their native associates they persevered, and the whole island became an educated, industrious, civilized, and Christian community, increasing in intelligence and comfort as their industry in raising supplies brought ships in considerable numbers to their shores for refreshments; and the returns enabled them to provide clothing, books, and many of the comforts of civilized life. A large proportion of the people are clothed in European apparel, and dwell in comfortable houses, (some of them built of stone), manufacture useful furniture, and have an abundance of native food. They have regular market-houses in which supplies for shipping are collected, and salesmen appointed to manage their trade with foreigners; about ten merchant and thirty whaling ships visit the island every year. In 1831 the printing-press was set up in the island, and has printed spelling-books, reading lessons, hymn-books, catechisms, Pilgrim's Progress, and other religious books, including the several parts of the Old Testament and commentaries on portions of the New Testament, besides elementary books on arithmetic, grammar, geography, astronomy, and natural history. Books in the language of the New Hebrides, and New Caledonia and other islands to the west, have also been printed. Upwards of 20,000 small books were stitched up in covers, and nearly 6000 books bound in leather, all accomplished by native young men taught by the missionaries. The whole of the Bible has been translated by the missionaries, and printed for the people by the British and Foreign Bible Society. Few, if any, of the young are unable to read and write; and there is an admirable institution for training native teachers in carpentry and useful arts; as well as in the learning required for the efficient discharge of their duties in their own island, or as missionaries to other islands, and the steadfastness, energy, and remarkable success which has attended their efforts, is evidence of the value of the training they have received. The entire population is Christian. They have at their respective stations spacious and substantial stone chapels, well built, and suitably fitted up by native workmen. Thirty years after the commencement of missionary effort there were 7000 communicants connected with the churches, and nearly 1000 communicants had been removed by death. The island has been visited repeatedly by fearful hurricanes and the ravages of diseases, which, with other causes, have greatly diminished the population, and retarded the progress of the people; but they have been favoured with peculiarly well qualified and devoted European teachers. Mr Williams felt great attachment to the people, and laboured some time among them; built his missionary ship at the island; and when he fell a martyr to his holy zeal as a Christian missionary, was mourned as a father by the people.

The other islands of the cluster, Mangia, Aitutake, Atiu, Mauke, and Mitiaro,—smaller islands, the largest not above 20 miles in circumference, and all of coral formation,—were some of them discovered by Cook, and their inhabitants were, till within the last forty years, cruel and ferocious cannibals. Mangia contains between 3000 and 4000 inhabitants; some of the others 1000. European missionaries reside on two of them, and native missionaries occupy the rest. Results corresponding with those on Rarotonga have followed their labours. Shipwrecked seamen are safe; supplies to vessels are furnished; the whole population is civilized, intelligent, and Christian, maintaining the institutions, and aiding liberally to extend the knowledge of Christianity to others. At the entire group, not fewer than 100 ships trade annually with the natives, and receive produce of native labour in exchange for manufactured goods, amounting to not less than L.3000. (Gill, *Gems from the Coral Islands*, vol. ii., p. 125.)

About 600 miles to the north of the Hervey cluster are Maniiki, Penrhyns, and Savage islands, all lagoon coral islands: the first containing about 1200 people; the second, Tongareoa or Penrhyns, 9 miles long and 5 miles broad, with about 1300 inhabitants; Niue, the Savage Island of Captain Cook, within two days' sail of the Samoas, nearly 40 miles in circuit, and containing a population of 3000 or 4000. Great dread of being wrecked among these islands was formerly felt by mariners sailing near; but they have been visited by missionaries, the people have become Christians, and have treated shipwrecked seamen with great kindness.

Society Islands.

Society Islands.—The first account of these islands is given in the voyage of Jacob Roggewein, who touched at Raiatea in the year 1722; at least it is conjectured by Burney, on probable grounds, that the Verquickking or Recreation Island of that navigator is the same. On sending a boat on shore, the inhabitants assembled on the beach, and advanced into the water armed with lances to oppose their landing. The Hollanders fired upon them, and having dispersed them, landed on the beach, and the inhabitants returned in a friendly manner, and brought them cocoa-nuts and other articles of food. The Hollanders then advanced up a valley towards the mountains; but some thousands of the natives coming out of the glens and crevices, made signs to them to return. The Hollanders, however, paid no regard, but proceeded, upon which showers of stones were hurled at them, by which some were killed and others wounded. These volleys were answered by a discharge of musketry, which killed many of the islanders, who nevertheless continued the action, and finally drove the Dutchmen into their boats. Many of the latter subsequently died of the wounds they had received.

Captain Cook visited these islands in 1769, and again in 1777. They consist of six in number (besides small coral islets), the names of which are Raiatea and Tahaa (both encompassed by the same coral reef), Huahrine, Borabora, Tubai, and Maurua. They extend from about 16. to 17. S. Lat., and from 151. to 152. W. Long. The climate and the productions resemble those of Tahiti. The surfaces of all the islands are uneven and hilly, in some parts mountainous; the hills are finely wooded, and the low lands exceedingly fertile. The inhabitants, like those of the Navigators' Islands, are above the middle stature. The late Sir Joseph Banks measured one of the natives of Huaheine, and found him to be six feet three inches and a half in height; and the women are described as generally somewhat fairer than those of Tahiti. Borabora differs from the rest of the islands by having a lofty double-peaked volcanic mountain near its centre. In Raiatea there is a large Marai, in which a number of jaw-bones are kept as trophies of war. The coral reefs which everywhere surround these islands form numerous safe and commodious harbours for shipping, and refreshments of hogs, fowls, plantains, cocoa-nuts, and other fruits; yams, sweet potatoes, taro, and similar edible roots, are generally to be had in great abundance.

In these islands the missionaries, though long disappointed, and though their lives were frequently endangered by the contests and revolutions which agitated the country, at last succeeded, by their perseverance and intrepidity, in establishing stations in Huaheine, Raiatea, Taha, and Borabora. The idolatry of these islands was the same as that which obtained in Tahiti, but was more zealously maintained, as Raiatea was supposed to be the cradle of their mythology. The people have been distinguished by their force of character, energy, and love of war, and have often exerted an important influence in the affairs of the islands to the eastward. Their form of government is in two of the islands a hereditary monarchy, and in the other principal island, viz., Huahine, that of a confederated state. The three chief islands—Huahine, Raiatea, and Borabora—have always been politically independent of any other group and of each other, and frequently at war among themselves. The destruction of idolatry in Tahiti in 1815 was followed, a year or two after, by the same change in these islands, not, however, without opposition. The inhabitants of Taha, strongly attached to their ancient idolatrous worship, opposed the introduction of Christianity, and even went to war with the King of Raiatea because he had agreed to renounce idolatry. But they were defeated in the contest, and their king was taken prisoner. Instead, however, of being put to death, as formerly, with cruel tortures, he and his people were humanely treated, which made such a deep impression on their minds that they embraced Christianity. In 1817 the missionaries first established themselves in these islands, and have been remarkably successful in educating the people, who are now all professing Christians, and many have gone to other islands, or are labouring in their own as Christian teachers. Commodious chapels and good school-houses have been erected; and a great change in the moral character, habits, dress, and mode of life, has taken place among the people. In addition to the indigenous productions of these fertile islands, oranges, pine-apples, custard-apples, and coffee have been introduced; as well as the manufacture of sugar, and the growth of cotton and tobacco. They have been taught to build comfortable houses and manufacture furniture; to work in iron and wood; and are described as a sociable, cheerful, and busy-moving community. Many engage in ship-building, unaided by Europeans, forging their own bolts, and performing whatever iron-work they may require, with the facility of ordinary artizans. Several of the schooners thus built by them are from 18 to 20 tons burden, and they have often as many as eight or ten upon the stocks at a time. The Huahinians are active and enterprizing traders, and their flag—which, in common with Raiatea and Borabora, is the same as the old red and white ensign of Tahiti—is well known and respected, even as far north as the seaport towns of the Hawaiian Islands.

Huahine first received a regular code in 1822. The "Ture na Huahine"—consisting of twenty-nine laws, with numerous ordinances respecting the due administration of justice appended thereto—having been solemnly enacted by the national assembly of this island in the month of May in that year. These were printed and published for general circulation; and afterwards, in 1826, considerably revised and improved; with various necessary modifications, they are understood to be still in force. An additional series, chiefly affecting the relations of foreigners with Huahinians, and those of natives with foreigners, were, subsequent to the second revision, put forth by authority, and adopted, under the title of "The Harbour Regulations of the Port of Huaheine," by Captain J. Laws of H.M.S. Satellite, 17th of March 1829. On accepting these last-mentioned ordinances, Captain Laws, on the part of Great Britain, officially recognised what is now usually known as the old flag of Tahiti (red, with a white fess or bar thereon), to be also the national ensign of the whole of the Society Islands. Similar laws and regulations have been established at the other islands, and a British consul resides at Raiatea, the central island of the group. A number of vessels, traders, and whale ships visit these islands annually; but the advance of the people in intelligence, civilization, and outward prosperity has been retarded by a series of impediments arising from the disturbance and civil war, in which the whole of the islands have been involved; the prevalence of epidemic diseases, which have swept off many of the people; the insolent and injurious conduct of foreigners in promoting intemperance and vice amongst the people. To the evils thus produced must be added the disorganization produced by proceedings of the French at Tahiti, and their forcible seizure of Huahine, from which they were expelled by the natives who held the island, till they were assured, on the authority of Admiral Seymour in 1847, that their independence with that of the other islands of the Society, or, as they are also called, the Leeward group, was secured and guaranteed by the English and French governments. Great attention has been given to the schools and the religious teaching of the people. The population is about 8000.

Georgian group.

Georgian Group, or Tahitian Islands.—Tahiti was discovered by Captain Wallis in 1767, visited by M. Bougainville in 1768, and by Captain Cook in 1769. The group consists of five principal islands, the most westerly about 70 miles to the S.E. of the Society Isles, between 17. 2. 23. and 17. 53. of S. Lat., and 150. 40. and 148. 9. 45. W. Long. The principal island of the series is Tahiti, which consists of two peninsulas, chiefly mountainous, but with a good deal of low land upon and near the coast well fitted for cultivation. The large peninsula is described as about 90 miles in circumference, the small one about one-third of that extent, and the isthmus connecting them about three miles across. Present population under 6096. Ten miles W. of Tahiti, from reef to reef, lies Eimeo, an island about 40 miles in circumference, wild and mountainous, but with a fair proportion of level land and magnificent scenery. It contains a population of about 900 souls. Between 40 and 50 miles to the westward of Eimeo lies another island, that of Tabuaemanu, much smaller than Eimeo, but of the same general character. The surrounding reefs of this island are so narrow and intricate that it can never be a place of any trade. The population of Tabuaemanu is not, it is believed, at present more than 200. This island, though geographically nearest the Georgian group, is politically connected with Huahine, the inhabitants acknowledge the supremacy of Huahine, and pay tribute to its chiefs; the laws of the latter are also the laws of this island. Tetuaroa, a small series of very low islets, with but few inhabitants, lies 24 miles to the north of Tahiti, to the ancient inhabitants of which it formerly served as a sort of watering-place. Lastly, Matia or Maitea, the most easterly of the Georgian group, is a steep mountainous island, very thinly inhabited, about 70 miles E. of Tahiti.

Tahiti and her adjacent islands are capable of producing sugar, oil, arrow-root, coffee, cotton, and indigo; but the Tahitians, never very fond of labour, have of late years, since the seizure of their country by the French, given themselves up to such sullen apathy, that any healthy development of the resources of their group seems to be, under existing circumstances, totally out of the question. Wilkes, however, informs us that in 1840 the yearly produce of sugar was, at Tahiti 105 tons, valued at 8000 dollars; and at Eimeo 22 tons, valued at 2000 dollars. Annual produce of cocoa-nut oil at Tahiti 55 tons, valued at 3500 dollars; and at Eimeo 20 tons, valued at 1500 dollars. Not a tithe of this has, it is understood, been produced of late years. Even the statistics of the whaling trade show that the French profit but little, in a commercial point of view, by the toy so dearly bought to satisfy the grasping ambition and vanity of one who died himself unsceptred. With every disadvantage, the United States' whalers are at Tahiti far before the French, and indeed those of any other nation. The Americans, in fact, here engross nearly all that lucrative trade. During the whaling season, for example, in 1854, thirty whalers arrived in the Tahitian harbours,—viz., one English, four French, and twenty-five American. The natives are stated to have abandoned agriculture. The few other arts which had begun to thrive in 1840 are now quite neglected. The guava has completely supplanted the grass; cattle, in consequence, cannot thrive, and have become well nigh extinct. The garrison, 300 in number, are all clothed and sustained by stores sent out from France, and have neither means nor opportunity to spend much money. Some appearance of trade, no doubt, is kept by the supply of these men with what they need; but, to judge from observation, it must be a ruinously unremunerative affair, a mere outlay without any benefit whatever. (*Gazetteer of Central Polynesia*, by E. Reeve, pp. 41, 42.)

The island of Tahiti is fertile and its scenery beautiful.[1] The bread-fruit is here superior to that which grows on the other islands. The fruit affords the natives a nutritive food; the trunk supplies them with timber for their buildings and canoes. It exudes a gum which serves for pitch, and from the inner bark is manufactured a substantial cloth. They reckon no less than thirty varieties of this most useful tree, which, with the different exposures to the trade-winds and the difference of elevation above the sea, afford to the natives a bread-fruit harvest at almost all seasons of the year. The cocoa-nut, next to the bread-fruit, supplies them with meat, drink, cloth, and oil, and sometimes clothing. Of plantains they reckon fifteen different sorts. Yams and sweet potatoes, taro-root of different kinds, and various other edible roots and fruits, are abundantly produced; to which missionaries and others have added the orange, pine-apple, the grape, and various culinary vegetables of Europe.

The animals found on the island were hogs, dogs, and rats. Horses, horned cattle, and goats have been introduced. Common poultry are abundant, and the woods supply wild pigeons and parrots.

The colour of the natives is that of olive or light copper. The men are above the middle size; the chiefs are almost uniformly tall, muscular, and well limbed, measuring from 5 feet 9 inches to 6 feet 4 inches, and continue healthy and vigorous to a good old age. The women of the upper ranks are likewise tall, with limbs finely turned. Their skins are soft and delicate; their eyes black, sparkling, and full of expression; their teeth beautifully white and even; their hair jet black, and generally ornamented with flowers; and in their gait they are firm, but easy and graceful. Their language, their deities, and superstitious observances resemble those of the other races in Eastern Polynesia, and have been repeatedly described.

The early visits of the European navigators to these islands produced no advantages whatever to the inhabitants, who were only contaminated by the vices, without participating in the blessings, of civilized life. In the year 1796 the London Missionary Society sent out their first missionaries to Tahiti, their object was to communicate the knowledge of Christianity to the natives, who gladly received them, as well as several others who were afterwards sent out in the year 1800. Their prospects were for a long time uncertain or unpromising, and they laboured with very little success to draw the attention of the natives from their cruel rites and superstitions to the purer faith of the gospel. About the year 1814 they began, however, to make some converts. In the neighbouring island of Eimeo, about fifty persons voluntarily renounced idolatry, and embraced Christianity. Pomare, the king, was among their earliest converts. These first converts were continually increased by new accessions, until the great body of the inhabitants, as well as those in the neighbouring islands, embraced Christianity. They now assemble regularly for public worship, decently attired, in congregations of four or five hundred, and occasionally eight hundred or a thousand persons. Along with religion, they have been instructed in mechanical trades of Europe; they are taught to read, write, and to cast accounts, the natives with singular industry teaching each other. Great numbers have been taught to read in the Tahitian language, which the missionaries have reduced to writing, and into which the Scriptures have been translated. A great reformation followed the propagation of Christianity throughout the islands; the profligate practices of the Arreoi societies were abolished, and many of the improvements of civilized life were adopted. The dwellings of the chiefs have been enlarged and beautified; a distinct house has been assigned to each family, in place of their being, as formerly, all crowded into one. Schools for girls have been established by the wives of the missionaries, where instruction is given in sewing, in reading, and writing. In these accomplishments many of the females have made considerable proficiency; and since 1815 reading and writing has become general among the natives. Pomare, the king of Tahiti, and the first convert to Christianity, was born about the year 1774. He died in the year 1821, and was immediately succeeded by his son Pomare III., who was crowned in 1824, being then only four years of age. Shortly afterwards he was placed at the South Sea academy in the island of Eimeo, for the purpose of receiving, with the children of the missionaries, an English education. He died in 1827, and was succeeded by a daughter of Pomare II., who is still nominally the sovereign of Tahiti.

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[1] Darwin, in his *Naturalist's Voyage*, has given an interesting account of the mountain scenery and vegetation of Tahiti, p. 406.

The missionaries experienced, after the gloss of novelty had worn off their religion, a considerable defection of their proselytes, and for a time their fair prospects of usefulness were overcast. At first the natives appeared zealous in their attachment to the Christian creed, and schools and congregations multiplied in all quarters. In a short time, however, the people began to relapse into their former evil practices; and the letters of the missionaries themselves contain a full and candid account of these defections. Many of the converts, they observe, grew weary of the restraints which Christianity imposed on their passions; and the introduction of ardent spirits, the licentious example and the debauchery of the European sailors when vessels touched at the islands, the propagation of delusions among the people by visionaries, and finally a bloody war which broke out in Tahiti, completed the corruption and the defection of many converts. The missionaries spared no pains to counteract this tendency to vice. They established throughout the island temperance societies, and prevailed on the chiefs to restrain the importation of spirits. The Queen Pomare and most of the chiefs, who show an ardent desire for the instruction of the people, joined these societies, and countenanced the efforts of the missionaries, who have in some degree succeeded in stemming the torrent of profligacy which was inundating these countries, and was fast sweeping away all traces of that purer morality which had been planted among the natives. But even after all the defections that have taken place, a letter, dated April 1836, mentions that there were two thousand natives in church-fellowship; that two-thirds of the people could read; that a great number had learned to write; and that the schools and chapels were well attended. A letter from one of the missionaries mentions that he had seen Queen Pomare in the midst of a group of little girls, teaching them words of one and two syllables.

A great step in the progress of improvement has been the commencement of trade and manufactures. A knowledge of useful arts, such as rope-making, turnery, carpentry, and the art of working in iron, had been introduced. Some were employed as smiths, others in the preparation of lime, and in the construction of neat and comfortable dwellings, and also in boat and ship building, in which many of them are adepts.

They also began to carry on commerce. A number of small vessels built by the natives, of from 20 to 35 tons burden, were employed in fetching from a group of islands situated 200 or 300 miles eastward, cargoes of pearl-shell, which they dispose of to the English and American traders.

Such were some of the results of nearly fifty years of self-denying labour, when, instigated by Romish priests and the misrepresentations of an unscrupulous adventurer, who persuaded the French officers to constitute him consul for their nation, the French, under the name of a protectorate, took forcible possession of Tahiti and its dependencies. The defenceless queen appealed in vain to Europe for the restitution of her country, and her people defended themselves for two years; but being at length betrayed into the hands of the French, resistance ceased, and these islands have since been, in their policy, commerce, educational and religious institutions, under French rule and authority, as already noticed.

Austral Islands.

Besides Eimeo and the rest of the Georgian group, there are to the south of Tahiti a number of islands, designated the *Austral Islands*. The principal of these—Raivavai, Tubuai, Rurutu, Rimatara, and Rapa—are hilly and well watered. Missionaries have visited them, and Christian teachers have instructed the people, who profess themselves Christians, and have been taught to read. Ships occasionally call for refreshments, and shipwrecked mariners have experienced from the people assistance and security for themselves and their property; but since the fall of Tahiti but few accounts of them have been received.

The Marquesas.

The Marquesas.—This cluster of islands was discovered by Alvarode Mendana in 1595, and named by him Las Marquesas de Mendoça, in honour of the viceroy of Peru. Four only are described by Quiros the pilot, under the names of La Dominica, Santa Christina, San Pedro, and La Madalena. The Spaniards anchored in a port of Santa Christina, to which they gave the name of Madre de Dios. This port is protected from the trade-wind, and has two excellent streams of fresh water flowing into it. The people are described as being an elegant race; the men and women are remarkably beautiful, in symmetry of form and gracefulness of movement surpassing all others in the Pacific, their complexions and general appearance being said to excel those of the women of Lima. Their dress consisted of a cloth made of the leaves of a palm-tree, with which they were covered from the breast downwards; and so civilly disposed were they, that a beautiful native woman seated herself by the side of Donna Isabel, the wife of Mendana, and began to fan her. But the Spaniards, as usual, found means to quarrel with the natives, and to drive them with fire-arms into the woods.

The islands are mountainous, with but little low land. The produce of the islands are hogs, fowls, fish, cocoa-nuts, sugar-canes, plantains, and the bread-fruit, which is described for the first time by the writer of this voyage.

Subsequent voyagers have made us nearly as well acquainted with the Marquesas as with Tahiti. Captain Cook visited them in 1774, and Captain Wilson in 1797. From these we know that they consist of eight in number, besides some smaller islands to the westward, which being seen by an American master of the name of Ingram, he called them *Washington's Islands.* They had previously been seen by Marchand in 1789, and may fairly be grouped as part of the Marquesas. The centre of the group may be reckoned in about the Lat. of 9. 30. S., and Long. 139. 30. W.

The manners, the religious ceremonies, the Marais, and the general appearance of the natives, are similar to those of Tahiti. To their earliest English visitors the natives appeared hospitable and gentle, but they have been frequently engaged in barbarous wars, and are reported to have been cannibals. In 1797 Captain Wilson landed a missionary amongst them, who was kindly treated, and furnished with a share of their scanty food; but after remaining little more than eighteen months in the islands he returned to England. About thirty years ago they were again visited by English missionaries from Tahiti, two of whom remained some years in the islands, though their labours appeared to be unproductive of good among the natives. The French then took possession of the islands, and placed some Roman Catholic missionaries among the people, with what result is not known. Very recently some American missionaries, with native assistants, have gone from the Sandwich Islands, and are now labouring in the northern portion of the Marquesas among the small, but in many respects deeply interesting, people by whom they are inhabited.

Easter Island.

Easter Island.—This small island, not 30 miles in length, is chiefly deserving of notice from its solitary position, its great distance from any of the islands of the Pacific, its comparative proximity to the coast of South America, and its being inhabited by a race of men who differ no more from the rest of the Polynesians than the latter do from one another,—having the same language, the same features, the same religious notions, and Marais constructed as they generally are in other islands. On the platforms of the latter are erected shapeless and uncouth masses of stone carved in imitation of the human bust, with rude faces 4 or 5 feet in length, set on trunks of 10 or 12 feet in height. Kotzebue, the last visitor to this island, looked, however, in vain for any traces of these statues on the spots where they are described by Cook and La Pèrouse.

This island is supposed to have been discovered by the bucaneer Davis in 1687, although some have contended that the Dutch admiral Roggewein was the discoverer, and he it was who gave it the name of *Paaschen* or *Easter Island*, having first seen it on the day of that feast. Its latitude is 27. 5. S., and longitude 109. 14. W.

It is not remarkably fertile; but few trees are found on it, and no running stream. The natives are very industrious in raising food for their support, which consists chiefly of bananas, taro-roots, sugar-canes, sweet potatoes, and yams. The inhabitants are about 1200 in number. By some navigators they are described as a very savage people, and by others as a mild and amiable race. The fact is, that their conduct has always corresponded with the treatment they have received from foreign visitors. Thus their decided hostility to Kotzebue, when he attempted to land on the island, was explained on his arrival at the Sandwich Islands. An American, commanding a schooner called the Nancy, from New London, had observed a vast multitude of seals on the shores of the small uninhabited island of Massafuero, to the westward of Juan Fernandez; and thinking it might turn out an excellent speculation if a small establishment were formed on the island to carry on the fishing, he therefore proceeded to Easter Island, and seized and carried off twelve men and ten women. For the first three days they were confined in irons, and were not released till fairly out of sight of land, when the first use they made of their liberty was to jump overboard, choosing rather to perish in the waves than to be carried away they knew not whither, or for what purpose. The women, who were with difficulty restrained from following them, were carried to Massafuera, but what ultimately became of these poor creatures M. Kotzebue does not relate. No wonder, then, that such practices should have driven the natives to acts of hostility against all foreign intruders.

Pitcairn Island.

Pitcairn Island is a rocky, triangular island about 5 miles in length, situated in Lat. 25. 3. S., and Long. 130. 8. W. It was discovered by Captain Carteret in 1767, celebrated on account of its having been the retreat of the mutineers of H.M.S. Bounty, and the abode of their descendants, until, more than forty years afterwards, when the descendants of the mutineers were, at their own request, removed by the British government to Tahiti, the country from which their mothers had been taken by the mutineers. The entire number amounted to 87 individuals. They were kindly received, a piece of land was given to them, and new temporary houses erected for their accommodation by the natives, and eight months' provisions left with them by the captain of the British ship in which they arrived. Soon after their arrival they were attacked by an epidemic disease, which proved fatal to twelve of their number, and this, together with the unsettled state of the island at the time, was so discouraging to the rest, that they expressed a desire to return. In order to comply with their wishes, a subscription was raised, and a small vessel chartered to convey them to their island home, where they continued leading the same exemplary moral and religious life as before until recently, when the resources of the island proving insufficient for their support, their number being 194 persons, they were, at their own request, removed by the British government to Norfolk Island. This small but fertile island is attached to the government of New South Wales, and is now appropriated to the use of the Pitcairn islanders. A resident has been appointed, with a liberal salary, to act as magistrate or governor among them. The island is salubrious and fertile, and is surrounded by reefs, yet possesses no harbour; but this will prove no insurmountable impediment to intercourse between Australia and this interesting Anglo-Polynesian community, whose future welfare all must ardently desire.

Mangareva Group, also called Gambier Islands, a cluster at the S.E. extremity of the Paumotus Archipelago, and W.N.W. of Pitcairn's Island, was discovered by the Missionary Ship "Duff," in 1797, and named by Captain Wilson, her commander, after Admiral Lord Gambier. It consists of four large islands, and several smaller ones, situated in a lagoon formed by a reef of coral, and lying between Lat. 23. 1. and 23. 15. S., and Long. 134. 49. and 135. 3. 30. W. They are all (with the exception of two sandy reef islets on the northern and western aspects) extremely steep and rugged, and obviously of volcanic origin, clothed with verdure, and for the most part with trees. The Mangareva group is, moreover, a locality well supplied with good water, than which nothing can be more important to the navigation of these seas, that indispensable article not being elsewhere found in a pure state between Tahiti and the coast of Chili (a distance of 4000 miles), except, indeed, at Pitcairn Island, whence it is difficult, and well-nigh impossible, to get it on board ship. Captain Beechy, R.N., under whose direction a survey was made of this series in 1826, states that in addition to several sorts of wood (some of a very useful description) and flowers, the group is by no means deficient in a variety of edible roots, nor in those kinds which are most productive and nutritious. Besides the ti-plant (*Dracæna terminalès*), sweet potato, sugar cane, water melon, cocoa-nut, plantain, and banana, he found on his visit that the natives possessed the bread-fruit and the taro, from both of which an abundance of wholesome food is procurable.

The Dangerous Archipelago.

The Dangerous Archipelago, or Paumotu Islands.—This vast archipelago, if not geographically and politically the most important, is, on account of its geological structure, one of the most deeply interesting, as well as the most extensive groups of Polynesia. It lies to the south of the Marquesas, and stretches from the Georgian and Society Islands in a south-easterly direction, beyond Mangareva or Gambier's Island,—thus covering an area of the ocean nearly 1000 miles in length and 600 miles in breadth. This archipelago is an immense series of groups, mostly of low coralline islands, more or less detached from each other. Most of them are lagoons, and the majority of them rising but a few feet above the level of the sea at high-water. Oana or Rairoa is 46 miles long and 20 miles broad; it is inhabited by a quiet people. Ilao or Bow Island is 34 miles long and 10 miles broad. The lagoon which it surrounds is generally about 20 fathoms deep, and abounds with the pearl oyster. The ring-like shore of the lagoon is covered chiefly with cocoa-nuts: the inhabitants are about 100. The other islands are generally smaller, but some of them much more populous; and many of them are clothed with cocoa-nut trees. Navigation amongst them is exceedingly perilous, on account of the numerous reefs which are found in every direction. Their native name Paumotu, which signifies islands of shallow water, indicates the peril to large vessels. They are also called the Pearl Islands, on account of the large quantities of mother-of-pearl shell found amongst them. Most of them are inhabited, chiefly by the Malayo-Polynesian race; and some of those nearest to Tahiti have become Christians through the exertions of native missionaries from the latter island.

But, curious, attractive, and deeply interesting as these labyrinths of islands are,—seeming like so many rings of coral and sand scarcely higher than the long swelling billows of the wide ocean in which they rise, and each inclosing a smooth placid lake of comparatively shallow water; and covered as they are for the most part with waving palms, beneath which the almost amphibious native builds his hut, and in this isolated home begins and ends his days,—the agencies by which these wondrous structures have been raised, the vast extent over which they have been spread, and the records they exhibit of the changes that have taken place in the surface of our globe are among the wonders of the world we inhabit. These innumerable and gigantic structures are the work of small marine animals of several different kinds, which separate calcareous substances from the sea, and with it rear, in all their varied and often beautiful forms, these marvellous structures. According to the theory of Mr Darwin, who traversed a large portion of this region in 1835, with Captain (now Admiral) Fitz-Roy in H.M.S. Beagle, these reefs, which sometimes surround like a fringe existing islands, or stretch like a barrier in a line parallel with a coast, and at unequal distances from the shore; or surround like a circular breakwater, at a distance of 3, 5, or more miles, a mountainous island; while others rise like a ring from the depths of mid-ocean, and inclose a lake of calm and shallow water,—all these have been formed by one uniform process, and in obedience to one invariable law. Mr Darwin, it appears, supposes that where fringed reefs exist, the land to which they are attached slopes gradually down below the water, and is subsiding, but that as the land subsides the corals rise to the surface; that where there are barrier reefs or circular breakwaters at a distance from the present existing land, the whole land has gradually subsided. The coral-building insects, which are most vigorous on the outside of the reef, or the part next the ocean, rearing their encircling walls higher and higher as the foundations sink lower and lower, and then in the atolls or lagoon islands, which present a ring-like reef inclosing a smooth lake, the land has subsided entirely beneath the level of the ocean, while, as it sank, the myriads of marine architects continued to keep their outer wall up to the level of its waves. It has been found that the reefs never rise above the level of the sea, and that the building animals do not live at a greater depth than from 20 to 30 fathoms; so that, as the coral structures have gradually subsided to that depth, their inhabitants have died, and their cells have become their graves, and a new generation has carried on the structure up again to the surface of the waves, to give place, as the foundation subsided, to succeeding generations. Such appears the outline of Mr Darwin's theory. What vast changes must be in progress when an area of subsidence so large as that covered by this archipelago is considered; but how much more astonishing when we consider that, from this archipelago single islands stretch in a north-westerly direction to the Radic chain; that these two archipelagos on opposite sides of the equator indicate a line of subsidence in mid-ocean of "more than 4000 miles in length, in which not one single island rises above a specified height!" In closing his account, Mr Darwin observes:—"The reef-constructing corals have indeed reared and preserved wonderful memorials of the subterranean oscillations of level; we see in each barrier-reef a proof that the land has there subsided, and in each atoll a monument over an island now lost." (*Voyage of a Naturalist*, p. 482.) (W. E.)

POLYPHEMUS, King of the Cyclops in Sicily, was the son of Neptune and Thoosa. (See CYCLOPS.)

POLYPLECTRON (from the Greek πολυ, *much*, and πλῆκτρον), a musical instrument invented by Dietz about thirty years ago, and played upon in the manner of a pianoforte. Its sounds are produced by the friction of numerous narrow slips of leather made to revolve upon a cylinder and over pulleys, and brought into contact with the strings by pressing down the finger-keys. The powers of this instrument were highly commended by Prony, Savart, Cherubini, Paer, and others after they had made trial of it on the 11th of July 1828. According to the touch, firm and *legato*, or light and *staccato*, the quality of the tone varied. The lower sounds and medium ones closely resembled those of the double bass, violoncello, and viola. Dietz had not succeeded in imitating the sounds of a violin. The *orchestrino* of Poulleau, and some other instruments on the same principle, preceded Dietz's polyplectron. (G. F. G.)

POLYTHEISM (πολύς, *many*, θεός, *God*), the doctrine of a plurality of gods. This word, although not used by Greek writers, differs from idolatry with respect to the *forms* of the object worshipped. Polytheism refers to a plurality of gods, without including, of necessity, the notion of *forms;* whereas idolatry refers either to one God only, under some visible form, or to any number of gods under as many visible forms. No one taking the Bible for his guide will believe that men were polytheists before the flood; but it is plain that men had embraced this doctrine in the time of Moses (1500 B.C.) The ancient Persians, so far as we are aware, became first Sabians, or worshippers of the host of heaven, and afterwards Magians, or worshippers of fire. According to the latter view, they held that Ormuzd was the principle of light and the cause of all good, and that Ahriman was the principle of darkness and the cause of all evil. The Egyptians in Moses' time were polytheists, and not a few of the provisions of the law were designed to guard the Israelites against the polytheism and idolatry of Egypt. The Greeks and Romans acknowledged one being, Zeus or Jupiter, as superior to the other deities, but nevertheless they bound him hard by the absolute control of Fate. Yet the lesser deities were worshipped as gods, and the system was essentially polytheistic. Cudworth has laboured very ingeniously to show that the ancient philosophers in general worshipped mentally but one Supreme Being under different names. But granting the truthfulness of this doctrine, it only establishes with greater solidity that the people were polytheists; and as Philo-Judæus has it, "Polytheism in the mind of the ignorant is atheism." Wherever the Christian religion has been established, polytheism has disappeared; but there still remains vast portions of territory where polytheism still prevails. (See MYTHOLOGY.)

POMBA, VILLA DA, a town of Brazil, in the province of Minas Geraes, on the River Pomba, an affluent of the Parahiba, 60 miles E.S.E. of Ouro Preto. It has a church and town-hall; and most of the inhabitants are employed in the cultivation of the sugar-cane. Some trade is carried on in sugar, rum, &c. Pop. of the district, 12,000.

POMBAL, a town of Portugal, in the province of Estremadura, stands on a hill near the Sora, 20 miles N.E. of Leiria. It contains the ruins of a castle, and of a church of the Templars, and three modern churches. Hats are manufactured here; and large markets are held weekly. Pop. 5000.

POMBAL, MARQUISE DE, DOM SEBASTIAO JOSÉ DE CARVALHO, a celebrated Portuguese statesman, was born in 1699 at Soura in Coimbra. As he advanced towards manhood he appeared in the character of an accomplished votary of fashion. His tall, handsome, and animated figure fascinated every eye; and his easy, agreeable, and intelligent address captivated every heart. No dissipation impaired his robust constitution, and no pleasure palled upon his strong and healthy appetite. Life, in fact, seemed to him to be a gay pageant, where a man was required to play his part not from a sense of duty, but merely for his own amusement. He attempted to study law at Coimbra, but his highly pampered tastes revolted at the dry and heavy nutriment of jurisprudence. He then entered the royal guards, but his mettlesome spirit could not brook the restraint of military discipline. His last resource was to elope with a wealthy widow, and to live in indolent privacy upon her fortune until circumstances occurred to draw him into active life. In 1739 Carvalho, through the influence of his uncle, a canon of the royal chapel at Lisbon, commenced the preparatory steps of his political career by being appointed ambassador extraordinary to Great Britain. The ability which he displayed recommended him in 1745 to the office of plenipotentiary at the court of Vienna. He returned from that post to find that he had improved his prospects by contracting a second marriage with the young Countess of Daun. The queen-dowager of John V. conceiving an attachment for his wife, recommended him to the notice of her son Joseph I. Accordingly, in 1750, the year of that prince's accession, he was raised to the congenial office of secretary for foreign affairs. The determined efforts which he put forth to rouse the country from its lethargy began to make a favourable impression upon the king. His promptitude, activity, and address in allaying the universal distraction caused by the earthquake of 1755 completed the impression; and in the following year he was created prime minister of the kingdom. Carvalho, thus raised to the very summit of his political ambition, ably engrossed the virtual sovereignty, and commenced to rule the Portuguese with a rod of iron. His first acts were directed to the utter and merciless extermination of all those abuses that clogged or obstructed the national prosperity. No grievance, however highly connected and time-honoured, met with any quarter. His edicts went through the land smiting and crushing their victims with blows as summary and remorseless as those of Destiny herself. The desperadoes who plundered and murdered on the midnight streets of the capital were shot down on the spot. The proprietors who refused to raise corn on their lands had their vineyards torn up by the roots. The Jesuit confessors who abused the ear of the sovereign with their wily and selfish schemes were turned out of court. The self-seeking magnates who mismanaged the affairs of the state were removed from their snug sinecures to prisons prepared expressly for them. It was to no purpose that the parties smarting under these stripes sent forth a murmur of indignation and discontent. A decree was forthwith issued daring any one to speak against the measures of the government on pain of capital punishment. It was to no purpose that an attempt was made to assassinate the king on the night of the 3d September 1758. The minister's policy only assumed greater rapidity, force, and decision. No compunctions deterred him from pouncing upon some of the principal nobility as accomplices in the treasonous crime. The Duke of Aveiro was broken on the wheel; his sons and his servants were strangled; and all the dead bodies were consigned to the flames. Suspicion then fell upon the Jesuits; and they were commanded as rebels and traitors, to quit the country in a body. On refusing, they were seized by the military, shipped to the number of 1854, and landed in the States of the Church. After this thorough-going manner were the impediments to advancement destroyed or removed out of the way. Nor while Carvalho was eradicating old abuses did he fail to introduce improvements. It was his great aim to draw out the torpid energies of Portugal into a full and healthy development. Accordingly, he set on foot a system of universal education. The Portuguese, both at home and in the colonies, were instructed in the cultivation of new kinds of crops. Englishmen and Frenchmen were employed to teach the people navigation and ship-building. Special schools were established to train the young for the pursuits of industry and commerce. At the same time, the discipline of the university was investigated; the physical and mathematical sciences were introduced into the course of study; and every facility was furnished to the students for acquiring information, both practical and theoretical. For so many public benefits it was natural that Carvalho should be bountifully rewarded. Accordingly pensions and estates were lavished upon him; the title of Marquis of Pombal was added to his name; and the government of the country was more and more completely entrusted to his charge. He was still continuing to hold undisputed possession of the royal favour when the death of Joseph I., in 1777, left him exposed to the malice of his many enemies. Pombal, however, maintained his heroical bearing to the last. His foes, indeed, closed in around him, clamouring for his head; but he entrenched himself behind the prerogative of the deceased sovereign, and dared them to punish him for simply executing the commands of his royal master. Leaving court unharmed, with all his titles and wealth, he lived in dignified retirement till his death in May 1782.

POMERANIA (Germ. *Pommern*), a province of Prussia, lying between N. Lat. 52. 58. and 54. 50., E. Long. 12. 30. and 18. 2.; bounded on the N. by the Baltic, E. and S.E. by the province of West Prussia, S. by that of Brandenburg, S.W. and W. by the grand duchies of Mecklenburg. Its length from E. to W. is upwards of 200 miles, its breadth varies from 30 to 80, and its area is 12,221 square miles. It is entirely low and flat, with a few hills in some parts. The largest river that flows through Pomerania is the Oder; but the province contains only a small portion of its course. After entering the country, it separates into two branches, the larger, towards the left, retaining the name of Oder, and the other taking that of Reglitz. The latter spreads itself out east of Stettin into the Lake of Damm; then again contracts, and, re-uniting with the Oder, expands, first into the Papenwasser, and then into the Pomeranian Haff, from which it falls into the Baltic by three mouths. East of the Oder there are a number of small rivers, flowing generally from lakes in a N.W. direction to the Baltic. The chief of these are the Rega, Persante, Wipper, Stolpe, and Leba. The largest river west of the Oder is the Peene, which flows N.E. from Mecklenburg-Schwerin. The coast of Pomerania is generally low and shallow; and the land is only protected from the overflow of the water by sand-hills or artificial dykes. Several sheets of water are formed at the mouths of the rivers, separated from the sea by narrow stripes of land. The largest of these is the Pomeranian Haff, or gulf, at the mouth of the Oder. The island of Rügen, separated by a narrow strait from the mainland, belongs to Pomerania. The principal lakes in the province are those of Vilm, Pileborg, Lübbe, Plöne, and Madine. The soil is generally good, especially along the Baltic coast and near the lakes of Plöne and Madine; in other parts it is of inferior quality. In some places there are extensive moors and bogs. Pomerania contained in 1852, 3,474,252 acres of arable land, 1,680,981 acres of pastures and meadows, 1,359,891 acres of forests, and 1,237,313 acres of waste land. Agriculture is well managed; and the produce in favourable seasons is somewhat more than the wants of the people. There were in the province in 1855, 150,241 horses, 450,637 horned cattle, 2,651,030 sheep, 182,992 swine, and 27,263 goats. Deer, hares, and other kinds of game are found in Pomerania; and fish abound in the lakes and rivers. Iron, salt, and alum are the only minerals found in the country. Manufactures are extensively carried on here; the most important establishments in 1852 were 16 paper-mills, 14 tanneries, 249 breweries, 258 distilleries, 16 iron-works, 11 glass-works, and 13 manufactories of porcelain; besides many cotton and woollen factories. There is a considerable trade in corn. Ship-building is carried on in the coast-towns. The great majority of the population belongs to the Reformed Church; but there were also in 1855, 11,577 Roman Catholics, and 11,336 Jews in the province. Education is well attended to in Pomerania, as in other parts of Prussia. The province contained in 1852, 9 gymnasia, with 124 teachers and 2018 scholars; 6 normal schools, with 124 scholars; 124 middle schools, with 432 teachers and 17,777 scholars; and 2489 elementary schools, with 2923 teachers and 497,697 scholars. There are also many benevolent establishments in the country.

The country between the Oder and the Vistula was inhabited in the earliest historical period by the German tribes of Sueves and Vandals; but these people gradually migrated southward; and about the end of the fifth and beginning of the sixth century, the Wends, a Slavonian nation, settled in the country, and gave it the name of *Po More* ("beside the sea"), from which the present name has been derived. The first prince of Pomerania was Mestibock, who lived about the year 960. His great-grandson Sambor died in 1107, and left four sons, who divided the country into two parts. Of these, the eastern, called Pomerellen, now West Prussia, on the extinction of its line of princes in 1296, fell to the Teutonic knights, though it was also claimed by the Polish monarchs, who more than a century afterwards obtained possession of it. The princes of the Pomeranian or elder line possessed the present province, and were in 1182 recognised as princes of the German empire (*Reichsfürsten*) and dukes of Pomerania. In 1295 the ducal line was divided into two, that of Stettin and that of Wolgast. Wratislaw IV., the second duke of the latter line, was elected in 1325 lord of Rügen, which he held as a vassal of the King of Denmark. The extinction of the Stettin line in 1464 led to a dispute between Wolgast and Brandenburg about the succession; but finally, in 1478, the whole of Pomerania was united under a duke of the Wolgast line. The Reformation was introduced at the diet of Treptow in 1534; John Bugenhagen, surnamed from this, his native land, *Pomeranus*, being the chief founder of the new church. The whole line of the Pomeranian dukes became extinct in 1637, and the electoral house of Brandenburg had, according to former treaties, the next claim on the country; but in the peace of Westphalia (1648), the whole of Hither Pomerania (west of the Oder), with the island of Rügen and part of Further Pomerania, were given to Sweden, and the rest to Brandenburg. By the peace of Stockholm in 1720, the country between the Oder and the Peene was ceded to the House of Brandenburg, which had assumed the Prussian crown; but a part of Pomerania was retained by Sweden till 1814, when it was given up to Prussia in exchange for the duchy of Lauenburg. Pomerania is at present divided into the circles of Stettin, Köslin, and Stralsund; and contained in 1855 a population of 1,288,964.

POMEROY, a town of the United States of North America, state of Ohio, on a narrow strip of land between the Ohio river and a steep rugged range of hills, 100 miles S.E. of Columbus. With the neighbouring villages of Coalport, Minersville, Carltonville, and Middleport, which are almost parts of the same town, it extends nearly 3 miles along the river. Since its foundation in 1841 the town has rapidly increased in size and prosperity, from the abundance and excellence of the coal found in the vicinity, of which 5,000,000 bushels were mined and exported in 1851. There are here salt springs of a very superior quality, and several companies have been formed for the purpose of working them; so that the salt manufactures of Pomeroy will soon be very extensive. Pop. (1853) estimated at 4000.

POMFRET, John, an English poet, son of the vicar of Luton in Bedfordshire, was born in 1667, and educated at Queen's College Cambridge; after which he took orders, and was presented to the living of Malden in Bedfordshire. About 1703 he went to London for institution to a larger and more considerable living; but he was stopped for some time by Compton, then bishop of London, on account of four lines of his poem entitled the *Choice* (1699):—

> "And as I near approach'd the verge of life,
> Some kind relation (for I'd have no wife)
> Should take upon him all my worldly care,
> While I did for a better state prepare."

But he was soon convinced that this representation was the mere effect of malice, as Pomfret at that time was actually married. The opposition which his slanderers had made to him, however, produced its effect; for, being thereby obliged to stay in London longer than he intended, he caught the small-pox, and died in 1703, at the age of thirty-five.

He published in 1699 a volume of his poems, with a very modest and sensible preface. Two pieces of his were published after his death by his friend Philalethes: one entitled *Reason*, and written in 1700, when the disputes about the Trinity ran high; and the other *Dies Novissima*, or the Last Epiphany, a Pindaric ode. His versification is not unmusical, but his writings want that force which is necessary to constitute a poet. "The *Choice*," says Dr Johnson, "exhibits a system of life adapted to common notions, and equal to common expectations; such a state as affords plenty and tranquillity, without exclusion of intellectual pleasures. Perhaps no composition in our language has been oftener perused than Pomfret's *Choice*. In his other poems there is an easy volubility; the pleasure of smooth metre is afforded to the ear; and the mind is not oppressed with ponderous or entangled with intricate sentiment. He pleases many; and he who pleases many must have some species of merit."

POMŒRIUM, is derived from *post* and *mœrium* (*murus*), and thus signifies a line running by the walls of a town. The *pomœrium* consisted of a symbolical not of an actual wall, and the course of it was marked by stone pillars. The custom of making a *pomœrium* was peculiar to the Latins and the Etruscans. It was done as follows:—"After this," says Plutarch, "the founder, yoking a bull and a cow together, ploughed a deep furrow with a brazen ploughshare round the bounds. The attendants took care that all the clods fell inwards,—that is, towards the city." This sacred line might be built beyond, but it was necessary to leave a certain space on each side of it unoccupied, so as not to unhallow it by profane use.

POMONA, or Mainland, an island of Scotland, the largest of the Orkneys, lies about the centre of the group. It is about 20 miles in length, and its breadth varies from 3 to 15; area, 150 square miles. In shape it is very irregular, being penetrated on all sides by arms of the sea, so that no part of the land is more than 4 or 5 miles from the sea. The western and north-western coasts are steep and lofty; the waves of the Atlantic roll in and dash upon the rocks with such violence that several remarkable caves have been hollowed out by them. The surface gradually slopes towards the south-east, and is diversified with hills and valleys, though bare of trees, and consisting chiefly of moors and mosses. There are, however, sheep pastures and some fertile tracts of ground. The geological structure of the greater part of the island is old red sandstone, containing many fossil fishes. There are also some dykes of whinstone, and a range of granite hills, forming a promontory on the west coast. Oats, beans, and bere are the crops principally raised on the island. Grouse, plover, and other kinds of game abound here, as well as fish. The island has several good harbours, and the only towns in Orkney, Kirkwall and Stromness. It is divided into 13 parishes. Pop. (1851) 16,757.

POMPEII, an ancient city of Italy, situated in that part of the country to which the ancients gave the name of Campania. It lies at the bottom of the Gulf of Cumæ, known in modern times as the Bay of Naples, 5 miles from the volcanic mountain of Vesuvius, and 13 miles S.E. of the city of Naples. Of the early history of Pompeii little is known. It is said to have been founded by Hercules, and that its name is derived from Pompa, in allusion to the pomp with which that hero celebrated his victories whilst awaiting his fleet at the mouth of the river Sarnus (*Sarno*) after his reputed conquest of Spain. This refuge in mythology, to which men have betaken themselves in accounting for the origin of Pompeii, is a sufficient proof that the obscurity in which it is hidden is too profound to be penetrated. Strabo, however, asserts that these towns were first founded by the Oscans, afterwards by the Pelasgians and Tyrrhenians, and subsequently by the Samnites; and this statement is by no means destitute of plausibility. The early history of the city is nearly as uncertain as the date of its foundation and the etymology of its name. It is first mentioned in B.C. 310. And the next account we have of it is in the Social or Marsic War, which broke out 91 years before the birth of Christ, as one of the towns of Campania that had revolted. It escaped the punishment with which some other places were visited; and the only subsequent event of any moment which is related of it is a quarrel between its inhabitants and those of Nuceria (now *Nocera*), in which the latter were worsted. This transaction occurred A.D. 59. Four years afterwards Pompeii was almost destroyed by an earthquake, the terrible effects of which are recorded by Seneca. A great part of the town was reduced to ruins; and Herculaneum was likewise considerably injured. Similar alarms, the usual presages of an approaching eruption, were repeated, until the memorable 23d of August A.D. 79, when the first recorded volcanic paroxysm of Vesuvius occurred. We are fortunately in possession of a faithful and striking narrative of the event, contained in two letters of Pliny the younger to Tacitus. He was an eyewitness of the catastrophe; and, besides a description of it, he gives an account of the death of his uncle, who fell a victim to his inquiring spirit and humanity.

It was not lava, but showers of stones, cinders, and mud, which overwhelmed Pompeii; pouring down for more than a week, and much of the matter having been deposited in a liquid state. Nor was it by one eruption alone that the cities were covered to their present depth. Successive layers are clearly to be traced, and the lowest bears marks of having been moved, whilst the others are untouched; a plain proof that some time elapsed between their deposition, and that the inhabitants had made excavations in search of their more valuable property. The bed of ashes and stones which covered Pompeii varied in depth from 12 to 14 feet. Under this it remained for 1676 years; for although indications of its ruins were observed in 1689, the excavations did not commence till 1755. The disappointment experienced on the failure of the attempt to excavate Herculaneum to any extent has thus been compensated; for whilst the thick layers of lava which covered the latter city rendered the undertaking too difficult to be persevered in, the light friable mass which entombed Pompeii was easily removed. The upper storeys of the buildings, which were probably composed of wood, were either burned by the red-hot matter which fell upon them, or forced inwards by the weight of the enormous superincumbent mass, or the violence with which it descended. With this exception, we see a beautiful and once flourishing city just as it existed nearly eighteen centuries ago. The buildings stand as they were originally designed, unviolated by time or fashion; and in some instances memorials of a more impressive character bear sad testimony to the suddenness and completeness of the calamity which overwhelmed the city.

Pompeii was originally situated upon the sea-shore, as is proved by shells and sea-sand being found on the side adjoining the Bay of Naples; and it is even said that rings have been discovered close to the ruins, intended, as is supposed, for the mooring of vessels. By the gradual elevation of the coast, it is now at some distance inland; and the river Sarnus (*Sarno*), which, it is not improbable, was once capable of receiving the vessels of the ancients, has shrunk to a mere rivulet, and is diverted from its original course. The city stood on an insulated spot formed by the lava which, at some remote period, the action of subterranean fire seems to have thrown up in various directions around the foot of Vesuvius. Thus situated, it combined all the advantages of mercantile convenience with the security of a military station, and the romantic beauty of a spot celebrated in all ages for its surpassing loveliness, and which was a favourite resort of strangers for health or recreation. The city was surrounded by a wall, the whole, or nearly the whole, of which has been traced; and six gates and twelve towers have been counted. Its greatest length is little more than three-quarters of a mile, its breadth is less than half a mile, and its circumference is nearly two miles. Its general figure is irregularly oval, and it occupied an area of about 161 acres. There have been excavated above eighty houses, an immense number of small shops, the public baths, two theatres, two basilicæ, eight temples, the prison, the amphitheatre, and other public buildings, besides fountains and tombs. The streets are paved with large irregular pieces of lava, neatly dovetailed into one another. This pavement had been deeply rutted by the chariot-wheels which formerly rattled over it In general, the streets are so narrow that they may be crossed at one stride. Where they were of greater breadth, a stepping-stone was placed in the middle, it is supposed for the convenience of foot-passengers. On each side there is a footpath, along which run curb-stones to prevent the encroachment of the chariot. From the position of the town, and the discoveries made by the excavators, it seems clear that only three principal roads could have led to it. The first, which was on the western side, led to Naples; the second joined the Popilian Way at Nola; and the third crossed the Sarnus, and afterwards divided into two branches, of which the principal led to Nocera, and the other to Stabiæ. The city is generally approached by the first road, because it was the ancient route from Rome to Herculaneum, and the chief entrance of Pompeii. The first object of interest met with is the Street of Tombs, now completely excavated, which rises by an easy ascent to the city gate, called the Gate of Herculaneum. The road is flanked by tombs of much beauty and interest, as well as by other buildings, amongst which is a hostelry. We quote the following description of Pompeii, as entered by this gate, from an interesting work on the subject:—"On entering, the visitor finds himself in a street running a little east of south, which leads to the Forum. To the right stands a house formerly owned by a musician, to the left a *thermopolium*, or shop for hot drinks; beyond is the house of the vestals; beyond this the custom-house; and a little further on, where another street runs into this one from the north, at a very acute angle, stands a public fountain. In the last-named street is a surgeon's house, at least one so named from the quantity of surgical instruments found in it, all made of bronze. On the right or western side of the street by which we entered the houses are built on the declivity of a rock, sloping down to where the sea formerly came, and are several storeys in height. The fountain is about 150 yards from the city gate. About the same distance farther on the street divides into two, the right-hand turning seems a bye-street, the left-hand turning conducts you to the Forum. The most important feature in this space is a house called the house of Sallust, or of Actæon, from a painting in it representing that hunter's death. It stands on an area about 40 yards square, and is encompassed on three sides by streets, —by that, namely, which we have been describing, by another nearly parallel to it, and by a third perpendicular to these two. East of this island of houses is an unexcavated space, beyond which is another broad street running parallel to the first, the limit of the excavations in this quarter. Between these two are indications of another street, which is cleared out, south of the transverse street. Still farther south these streets all terminate in a transverse street. Thus the whole quarter already described is divided by four longitudinal and two transverse streets into what the Romans called *islands*, or insulated masses of houses. One of these is entirely occupied by the house of Pansa, which, with its court and garden, is about 100 yards long by 40 wide. The average interval between the western and eastern street is not more than 150 yards. The island immediately east of the house of Pansa has three houses of considerable interest, called the house of the tragic poet, from dramatic paintings on the walls; the cloth-dyer's house, from paintings illustrating the processes and utensils of that trade; and the house of the mosaic fountains.

"From the transverse street which bounds these islands on the south, two streets lead to the corners of the Forum; between them are the baths, occupying nearly the whole island. Among other buildings are a milk-shop and gladiatorial school. At the N.E. corner of the Forum was the triumphal arch. At the end of the broad eastern street, and higher up in the same street, another triumphal arch is still to be made out; so that this was plainly the way of state into the city. The Forum was distant from the gate of Herculaneum about 400 yards. Near the south-eastern corner two streets enter it, one running to the south, the other to the east. We will follow the former for about 80 yards, when it turns eastward for 200 yards, and conducts us to the quarter of the theatres. The other street, which runs eastward from the Forum, is of more importance, and is called the Street of the Silversmiths. . . . The quarter of the theatres comprises a large temple of Hercules, a temple of Isis, a temple of Æsculapius, two theatres, and two spacious porticoes inclosing open areas. On the north and east it is bounded by streets; to the south and west it seems to have been inclosed partly by the town, partly by its own walls. Here the continuous excavation ends, and we must cross nine yards to the amphitheatre, distant from the theatre about 550 yards, in the S.E. corner of the city, close to the walls, and in an angle formed by them. On the other side are traces of walls, supposed to have belonged to cattle-markets. Near at hand a considerable building, called by the Italians the palace of Giulia Felice, has been excavated and filled up again. A considerable distance to the westward is the first excavation, made near the centre of the city; it is surrounded by vines, which hang in festoons from the poplars on which they are trained; it is small, and appears to have been abandoned on account of the few coins and vessels discovered. From the amphitheatre we return along the Street of Silversmiths towards the Forum; but before we arrive at the latter, turn up a street running parallel to it. Arriving at the end of it, we turn to the right, and soon reach the triumphal arch of the Forum, having now traversed the whole excavated portion, except a few insignificant streets."

This account of the general aspect of Pompeii renders it less necessary to give any description of particular places and buildings. The Forum was the focus of business, the resort of pleasure, and the scene of all political and legal contention. Entering at the gate of Herculaneum, the main street of the town leads the visitor to the N.W. corner. Here he gains admittance by a flight of steps leading downwards through an arch in a brick wall. Upon entering, the spectator finds himself in a large area surrounded by columns and the ruins of temples, triumphal arches, and other public buildings, the particular uses of which can in general be only conjectured. There are also a number of pedestals, which once supported statues; and around the west, south, and east sides there runs a Doric colonnade in the Grecian style. At the end by which the place is entered stands a building, called by some the temple of Jupiter, and by others the Senaculum, or council-chamber. It is prostyle, and of the Corinthian order, and stands upon an elevated basement, which was ascended by a flight of steps. Those near the columns, which served for ornament, and also for supporting the upper part of the building, run along the whole front of the portico. The interior had been painted; red and black are prevailing colours. Fragments of a colossal statue and a sun-dial were discovered. Near this temple are the ruins of what has been conjectured to have been the granary. Adjacent to this building is the prison, where were found the skeletons of two men, their leg-bones still within the shackles. On the opposite side of the temple of Jupiter stands an edifice which has been called the Pantheon, from its having had in the centre of its area an altar encircled with twelve pedestals, and which, it is supposed, once supported statues of the aristocracy of Italian mythology. The area is 120 feet in length by 90 feet in breadth. To this building are attached numerous cells, in all probability for the accommodation of priests. Near to this building were discovered 93 brass coins and statues of Nero and Messalina.

On the northern side of the Pantheon there runs a street named the Street of Dried Fruits, from the quantity of fruits of various kinds preserved in glass vases which have been found in it. Scales, money, and moulds for pastry and bread were discovered in the shops; and a bronze statue of Fame was also found. On the western side of the Forum are the Basilica, a temple supposed to have been dedicated to Venus, and the granary and prison already noticed. The Basilica, or court of justice, is the largest building in Pompeii. It is of an oblong form, 220 feet in length by 80 feet in breadth, and corresponds in some particulars with the ancient description of that building. The temple of Venus is the only remaining building of importance connected with the Forum. It possessed the usual apartments, in one of which was found a painting of Bacchus and Silenus in a state of perfect preservation. In most of the paintings the colours are as vivid as when they were first laid on.

Amongst other objects of interest, there is a broad street, which, from various articles of jewellery having been found there, is called the Street of the Silversmiths. On the walls of the shops several inscriptions appear, one of which has been thus translated:—"The scribe Issus beseeches Marcus Cerrinius Vatia the ædile to patronize him; he is deserving." At the end of this street was discovered a skeleton, supposed to have been that of a priest of Isis. In the hand was a bag of coarse linen, not entirely destroyed, containing 360 silver coins, 42 of copper, and 6 of gold. Near him were also found various articles belonging to the worship of Isis.

The baths of Pompeii were excavated in the year 1824. They surpass all the other buildings of Pompeii in magnificence, decoration, good taste, arrangement, and the state of preservation in which they remain. They occupy a considerable space, and are divided into three separate compartments; one was for fire-places and for the use of servants, another was for the men, and a third for the women. The walls of the *frigidarium* are ornamented with figures; and the apartment is round, and altogether remarkable for its beauty. The basin is 12 feet 10 inches in diameter, and 2 feet 9 inches deep, and is entirely lined with white marble. The *tepidarium* is divided into a number of compartments, and has also been highly ornamented. The ceiling is adorned with figures and carvings in stucco. In the bronze frame of the window were four beautiful panes of glass, from which it is evident that windows of glass were in use amongst the ancients. Glass-blowing seems to have been better understood by them than many of the learned are inclined to admit. This is proved by the quantities of bottles, vases, glasses, and other utensils made of the same material, which have been discovered in this subterranean city. The *caldarium*, the third and last description of bath made use of by the Romans, is an apartment in all respects as highly finished and decorated as the others.

Two theatres have been excavated in Pompeii, a large one and a small one, both displaying the remains of considerable magnificence. They are constructed after the usual plan of a Roman theatre, and need not therefore be described here. In the large theatre there must have been sufficient space for 5000 persons. This theatre appears to have been entirely covered with white marble, although only a few fragments remain. The other theatre nearly resembles the one here mentioned, but is much smaller, was capable of holding 1500 spectators, and appears from an inscription to have been permanently roofed.

Adjoining the theatres there is an edifice which, from the style of its architecture, has been called the Greek temple, or the temple of Hercules. It is supposed by some to be of great antiquity, and is in a very dilapidated state. In this quarter also is situated the temple of Isis. It is also one of the most perfect examples now extant of the parts and disposition of an ancient temple. In one of the rooms was found the skeleton of a priest. Near his remains lay an axe, from which it would appear that he had delayed his departure till the door was choked up with the falling ashes, and so had attempted to force his way through the walls with the hatchet. He had already penetrated through two, but before he could break through the third, death arrested his flight. A number of other skeletons were here found, and also some paintings of the priests of Isis, together with a statue of the deity herself. In this neighbourhood stands the temple of Æsculapius, where were found three terra-cotta statues of Æsculapius, Hygeia, and Priapus. Near this is one of the most interesting buildings discovered in Pompeii, not for its beauty, but for its contents, which prove it to have been the abode of a sculptor. There were found statues, some half finished, others just begun, with blocks of marble, and all the tools required by the artist, as mallets, compasses, chisels, saws, and the like. The amphitheatre, which has been excavated, does not differ from other Roman buildings of the same kind. It was calculated to contain 10,000 persons.

In a street which conducts to the Forum, and is called the Street of Fortune, an immense number of utensils have been found. Amongst these were vases, basins and handles, bells, elastic springs, hinges, buckles for harness, a lock, an inkstand, gold ear-rings, a silver spoon, an oval caldron, a saucepan, a mould for pastry, a number of lamps (about 1000 were found at the baths), and three boxes with a slit to admit money, one of which contained coins of Titus Vespasian and other Roman emperors. Here also were found seven glazed plates packed in straw, a pair of scales, and a steelyard. In other parts of the city were discovered fishing-nets, some of them quite entire, and linen with the texture well defined. In the shop of a baker there was found a loaf, still retaining its original form, and with the maker's name stamped upon it. On the counter of an apothecary's shop lay a box of pills, and by the side of it was a small cylindrical roll, evidently waiting to be cut up. This mode of administering medicine, therefore, is of very high antiquity. In various parts of Pompeii have been dug up a number of bronze helmets, greaves, and other warlike furniture; more than one candelabrum, braziers of various sorts, vases, cooking-vessels and other kitchen utensils, glass vessels, articles of dress, female ornaments, and other articles of luxury.

But the relics most calculated to interest our feelings are the remains of the human beings who perished in the great catastrophe. A comparatively small number of skeletons have as yet been brought to light; and hence it is clear that most of the inhabitants had found time to make their escape. Besides those already mentioned, there were discovered in the vaults of a house in the suburbs of Pompeii the skeletons of seventeen individuals, who appear to have sought in vain an asylum there from the tempest of ashes which poured down from the sky. There was likewise preserved in the same place a perfect cast of a woman, supposed to have been the mistress of the house, with an infant locked in her arms. Her form was imprinted upon the consolidated mass in which she was entombed, but of her body only the bones remained. To these a chain of gold was suspended, and rings with jewels were upon the bones of the fingers. The remains of a soldier were found in a niche, where in all probability he was performing the office of sentinel. His hand still grasped a lance, and the other military accoutrements worn at the time were found beside him or upon his bones.

The architecture of Pompeii is not always in the best taste; yet there is much to be admired in it, both for design and execution. At the same time, except in those quarters where the public buildings were situated, there could have been nothing striking or magnificent in the appearance of the city as a whole. The houses were of small height, and externally gloomy; the lower part being usually a blank wall plastered over, and often painted with different colours, and the upper pierced with small windows to light the apartments on the first floor. Internally there is very little costly decoration to be found, with the exception of mosaic pavements, which are numerous and extremely beautiful; and even in the public buildings marble is of rare occurrence. Its place, however, was not inadequately supplied by a stucco of great beauty, equally adapted to receive paintings or to be modelled into bas-reliefs; and these have been found in great abundance. The paintings are in general in a state of perfect preservation, and have all the freshness of recent finishing. In the Pompeian houses every species of masonry described by Vitruvius may, it is said, be met with, but the cheapest and least durable sorts have been generally preferred; and by far the greater part of the private, and many of the public edifices, are built of bricks, or of the rough masonry which is called *opus incertum*. Hence arises their rapid decay on being exposed to air. Copper, iron, lead, and other metals have been found employed for the same purposes as those for which we now use them; so that the articles discovered need not be enumerated. Almost all the doorways are nearly of the same size and form, a little more or less care in the execution of capitals and entablatures making all the difference between them. It is rare in Pompeii to see a whole house set apart for purposes of trade, a portion of it almost invariably furnishing an abode for the owner. The houses of the richer classes were usually surrounded by shops. Throughout the streets numerous signs are to be seen upon the shops, indicative of the trades which were pursued within. One of these represents two men carrying an amphora, and probably served as the sign of a wine-shop. And there is a painting of a boy mounted upon the back of another, and undergoing a process of flagellation; an ominous indication to all idlers that the schoolmaster was at home.

Fountains are very numerous both in the streets and houses of Pompeii, but it is not known from what source or sources the city was supplied with water. But, however obtained, the waters once brought to the city were distributed to its different quarters by conduits of masonry, lead, or baked earthen pipes. Fountains, which appear to have been *jets d'eau*, have been found in several houses; and there is a painting of one representing a broad vase with a jet of water rising from the centre. Of the manner in which the town was drained, and the numberless impurities carried off, little is known satisfactorily; but remains of a considerable sewer, with minor drainages converging to it, have been observed. The tombs line the approach to the city through the gate of Herculaneum. They are numerous, and almost all those which have been found are raised upon a platform of masonry above the level of the footway. They are themselves solid, elegant, and in many instances highly ornamented structures.

No perfect manuscripts, nothing but mere fragments, have been found at Pompeii. It may be mentioned that most of the houses have received their names from the paintings on the walls; but some have been designated from persons of rank being present at their excavation, and from other accidental circumstances. (See Mazois and Gau's *Les Ruines de Pompeii*, 4 vols., Paris, 1812-38; Sir William Gell's *Pompeiana*, 1st series, 2 vols., London, 1824; 2d series, 2 vols., London, 1830; *Pompeii*, 2 vols., 1831, by the Society of Useful Knowledge; *Pompeia*, Paris, 8vo, 1855; *Pompeji*, by Overbeck, Leipsic, 1856. Also Mommsen's *Inscriptiones Regni Neapolitani.*) (J. F. S.)

POMPEY, Cneius, commonly known as "Pompey the Great," was the son of Pompey Strabo, a Roman general, and was born on the 30th September 106 B.C. His first fame as a general was won in the great struggle against the Marian party. Hearing in 84 B.C. that Sylla, the leader of the opposite faction, was returning from the East, he resolved, with the most decisive activity, to advance the cause of that famous commander. Although only in his twenty-third year, he succeeded in raising a force of three legions in his family district of Picenum, marched southwards, routing or terrifying all the troops that came across his path, and at length had the honour of presenting to the chief of his party an entire army, well equipped, and flushed with several victories. His next act was to proceed to Sicily for the purpose of driving out Perperna, and recovering the island. No sooner had that been effected without any opposition, than he was found in Africa defeating Domitius, and reducing the savage country of Numidia. The title of *Magnus*, and the honour of a triumph, which were conferred upon him on his return to Rome in 81 B.C., only served to increase his military ardour. He did not rest until, in 76 B.C., he was sent into Spain to finish the war by subduing Sertorius, the only surviving general of the Marian party. At first, indeed, his youthful impetuosity was checked and repulsed by the veteran tactics of his able foe. Yet no sooner had Sertorius been assassinated by Perperna in 72 B.C., than he annihilated the hostile forces in one great battle, reduced the entire peninsula shortly afterwards, and returned to Italy in 71 B.C. to claim a second triumph. Pompey now entered upon the meridian splendour of his career. His personal qualities began to show themselves, and to give a fresh and exquisite interest to the remembrance of his great exploits. In private he was seen to be simple in his tastes, temperate in his habits, fond of domestic quiet, and faithful to his marriage vows. In public he appeared a thorough-trained soldier, a dignified general, a man of honour and integrity, gracious in granting a favour, and prompt in giving a telling reply. The people pampered and idolized him on every occasion. There was no commission which could be refused to him, and which he could not execute with honour and success. Appointed in 67 B.C. to the great task of exterminating the hordes of pirates who revelled in plunder and license along the entire length of the Mediterranean, he received the undivided empire of the sea and the coast, and commenced the enterprise with all the bold decision and comprehensive power of a mighty potentate. His numerous squadrons, distributed along the shores, chased the corsairs out of their favourite haunts in the numerous creeks and harbours. Then he himself, ranging the middle of the main with the body of his fleet, swept them all eastward before him, and bringing them to bay off the promontory of Coracesium, completely routed them, and remained undisputed king of the seas. Nor were his growing dominion and triumph checked even at this stage. As soon as it was known at Rome that he had extirpated the pirates, it was decreed that his command should also be extended over Asia Minor —that in fact almost the entire empire should be entrusted to his sway. Accordingly in 66 B.C. he began his progress through his new domains, invested with all the majesty and awe of a virtual emperor. Wherever he marched strife and opposition gave way before him. Mithridates, that formidable and inveterate foe to the Romans, fled at his approach to the distant regions of the Cimmerian Bosphorus. Kings and princes laid their crowns down at his footstool, and received them again from his hand. One country after another— Pontus, Armenia, Cappadocia, Paphlagonia, Media, Colchis, Iberia, Albania, Syria, Cilicia, Mesopotamia, Phœnicia, Palestine, and Judea, were compelled to submit to the Roman yoke. He was even meditating to extend his conquests as far south as the Persian Gulf, when in 62 B.C. the intelligence of the death of Mithridates led him to consider that the chief object of the war was accomplished, and to return with his spoils in triumph to Rome. This triumph, in 61 B.C., was the culminating point of Pompey's career, and from that date his influence began to decline. A much greater and abler man, Caius Julius Cæsar, was now silently and successfully plotting to supplant him in the supreme place of power. At first that wily rival artfully used him as a tool. He formed the league of the first triumvirate with him and Crassus, in order that he might obtain by their assistance the province of Gaul. He then gave him the hand of his daughter Julia, in order that he might bind him still more closely to his interests. At the same time, under the protection of these alliances, all his energies were bent to train a veteran army which might execute his plans by sheer physical force, to achieve a military renown which might inspire his foes with terror and his friends with confidence, and to amass a treasure of wealth which might buy him partisans in the distant city of Rome. At length, when all his projects were ripe for execution, he boldly demanded leave from the Senate to stand for the consulship without appearing personally at Rome, and on his being balked in his request, he crossed the Rubicon at the head of his army in 49 B.C., and marched towards the city. It was then that the sad decline of Pompey's power became apparent. He could procure no thoroughly-disciplined trustworthy levies, with whom he could oppose his formidable enemy. Those who flocked to his standard were raw recruits, helpless senators, and luxurious and foolhardy nobles. His army was bound together by no spirit of mutual confidence or unity of purpose. He felt himself compelled to leave Cæsar in undisputed possession of Italy, and to cross over in his fleet from Brundisium to Dyrrhacium. There, too, he failed to gain any real elements of strength. Although a year elapsed before he was confronted by the enemy, the spirit of insubordination and license was as prevalent in his camp as ever. Taunts and criminations continued to be cast against his generalship. He received no respite from blame, until he set aside his own plans of following closely upon the hostile troops and cutting off their supplies, and on the 9th of August 48 B.C. drew up his line of battle on the plain of Pharsalus. The consequence was, that his ranks were soon broken to pieces before the hardy battalions of the foe; his cause was totally ruined; and Cæsar remained the undisputed master of the world. Pompey was completely stunned by this sudden blow of fortune, and made no attempt whatever to retrieve his fate. Departing from the fatal field with a few attendants, and walking silently and sadly on, he reached the mouth of the river Peneus, and took refuge for the night in a fisherman's hovel. On the following day a Roman vessel took him on board, and repaired to Lesbos to take in his wife Cornelia and his boy Sextus. He then, without any definite purpose, coasted westwards along the shores of Asia Minor, receiving acquisitions of ships and attendants as he proceeded. On arriving at Cyprus, it was determined that he should seek an asylum with Ptolemy, King of Egypt, whose father he had been the means of restoring to the throne. His friends accompanied him to the coast of Pelusium, and with sad forebodings saw him entrust himself to an Egyptian boat which had come out to take him to land. Their fears were doomed to be realized. Just as he was on the point of stepping on shore, they saw the dastardly hirelings stab him from behind, and beheld him calmly muffle up his face in his toga, and fall with a dignity that was worthy of Pompey the Great.

Pompey, *Sextus*, surnamed "Magnus," after his father, was the younger son of Pompey the Great, and Mucia, and was born in 75 B.C. He first appeared on the field of action immediately after his elder brother Cneius had been defeated by Cæsar at Munda in 45 B.C. He then determined to take up the sword that had fallen from his brother's hand, and to devote his life to the avenging of his father's death, and to the recovery of his patrimony in Italy. Accordingly no time was lost in escaping to the border territory of the Lacetani, and in rallying around him in the mountain fastnesses a gang of banditti and desperadoes. In the course of a short period his band had swelled into an army, and his stealthy depredations had been exchanged for open and aggressive warfare. He marched southward, overwhelming all opposition, until he gained a firm footing in Bætica, and assumed the state and authority of a petty sovereign. Caius Carrinas and Asinius Pollio, the successive governors of the invaded province, tried in vain to crush him. Equally in vain was the attempt of the government at Rome to wheedle him into a surrender of his arms. Manning a fleet, he steered for the neighbourhood of Massilia, and lay off the coast, awaiting the issue of the political turmoil which had followed the death of Cæsar. When the result was announced in 43 B.C., and he perceived that a second triumvirate was formed, and that his own name was among the number of the proscribed, his future plan of action was determined. There was no resource for him but to resort to piracy, and become as daring a sea-king as he had formerly been a brigand chief. His mariners therefore commenced to board traffickers, and to make descents upon cities, with telling effect. Corsica, Sardinia, and Sicily fell into his power; Rome was reduced to the point of starvation by his interception of their corn-ships; and the triumvirs were at their wits' end how to deal with him. The negotiation which was held off the promontory of Misenum in 39 B.C. eventually proved fruitless. The attempts to subdue him by force were also signally foiled in the sea-fights at Cumæ and Messana. It was not until Octavian strained every effort to extirpate this pest of the sea that the aspect of the contest began to change. Then, indeed, the doom of Sextus Pompey was virtually sealed. A Roman squadron, under Agrippa, annihilated his fleet off Naulochus in 36 B.C. Forced to flee for safety, he repaired to the coast of Asia Minor only to involve himself in greater perils. A plot which he had formed for seizing the eastern provinces was detected; Titus, the legate of Antony, overtook him in his flight towards Armenia; and after being carried to Miletus, he was put to death in 35 B.C.

POMPEIUS, Trogus. See Trogus.

POMPONIUS MELA. See Mela.

POMPTINE or PONTINE MARSHES (*Pomptinæ Paludes*) was the name given to the extensive fens in the south of Latium, on account of their vicinity to the town of Suessa Pometia. They covered a space which was 7 or 8 miles in breadth, and which extended in a south-easterly direction to the length of about 30 miles. On the W. a desolate tract of sandy downs, diversified with clumps of trees and lagoons, separated them from the sea. On the other side they were hemmed in by the dry slopes of the Volscian Hills. Through the level district thus inclosed the Amasenus (*Amaseno*), the Ufens (*Uffente*), and other streams from the neighbouring high lands, took their course, creeping sluggishly along, spreading their ooze and slime over the entire dead flat, changing the ground into one large quaking bog, and sending up disease, pestilence, and death into the overhanging air. This immense stagnant pool continued for many centuries to swamp and swallow up all attempts to reclaim the soil from its dominion. In 312 B.C. the censor Appius Claudius Cæcus, while carrying his famous Via Appia directly through the middle of it, diverted the water into various channels; but in no long time the streams had risen above these, and filled them all up with mud. Many years afterwards, Augustus cleared and repaired the choked-up drains; but the silent sapping of the floods soon destroyed them once more. Equally vain were the successive efforts of several emperors and many popes to convert this scene of noisome desolation into a dry and habitable region. Highwaymen, footpads, and desperadoes were the only persons who ventured to dwell in it. The waters also continued steadily to increase, until the Appian Way, with its arches and bridges, was completely submerged. It was not until the pontificate of Pius VI. that the attempts at draining were in any degree successful. Canals were then dug which effectively carried off the floods, and which have been able, with occasional repairs, to keep the greater part of the plain dry down to the present day. Rich pastures and fertile corn-fields now extend over a large portion of that space which was once covered with soaking and barren mud.

PONANY, a seaport town of British India, in the district of Malabar, presidency of Madras, on the south side of a river of the same name, at its mouth in the Arabian Sea, 34 miles S. by E. of Calicut. It is a straggling place, built on level sandy ground; and it contains no fewer than 40 mosques, being inhabited chiefly by Mohammedans. Some of the houses are well built of stone, two storeys high, but the most of them are mere huts. The inhabitants live by fishing and trade. The latter is chiefly carrried on by the *patemars* or sea-going boats of the natives, in which they sail to Madras, Bombay, and even as far as Arabia or Bengal. The chief exports are pepper, rice, cocoa-nuts, iron, and timber; the imports, wheat, sugar-canes, molasses, spices, salt, &c. Pop. about 10,000.

PONCE, PEDRO, a Spanish Benedictine monk who lived in the middle of the sixteenth century, was celebrated as the inventor of the art of teaching the dumb to speak. His principal pupils were two brothers and a sister of the constable of Castile, and a son of the *gran justicia* of Aragon. They learned not only to write correctly, but even to express themselves by an articulate living voice. One of them, Don Pedro de Velasco, although he died at the age of twenty, had become a proficient in Greek, and a fluent writer and speaker of Latin. Another, assuming the garb of a Benedictine monk, was able to preach, and to go through all the other oral exercises of his calling.

POND, JOHN, an astronomer, was born about 1767, succeeded Maskelyne as astronomer-royal in 1811, and died in 1836. (For an account of his contributions to the advancement of science, see DISSERTATION SIXTH.)

PONDICHERRY (Fr. *Pondichérie*), a town of India, and the capital of the French possessions there, on the E. coast of the Carnatic, 85 miles S. by W. of Madras; N. Lat. 11.56., E. Long. 79.54. It is built at the S.E. extremity of a long flat hill, quite close to the beach, and to the mouth of a small river. From the sea it presents a grand and conspicuous appearance; nor is the visitor disappointed on a nearer approach, as it has straight and regular streets, a handsome square planted with trees, and fine boulevards. It is divided into the White and the Black Town by a canal, which is crossed by elegant bridges. The former part, which lies to the east, consists of lofty flat-roofed houses, with gardens in front. The Black Town is regularly laid out, but it consists for the most part of mere huts. The most notable buildings are the splendid government palace, the church of foreign missions, and the bazaars, which were erected in 1836. In the Black Town the most conspicuous edifice is an enormous and grotesque pagoda. Pondicherry has no harbour; and as there is a shallow bar, where the surge is very violent, peculiarly constructed boats with flat bottoms are necessary for landing. The river can only admit the very smallest craft. Abreast the town is a pretty good roadstead; and there is a lighthouse (finished in 1836) 89 feet high, and visible in clear weather 16 or 17 miles. Pondicherry has some cotton factories; and rice, indigo, and sugar are raised in the adjacent country. Fishing is also actively pursued, and there is an extensive trade.

The territory of Pondicherry, which has an area of 106 square miles, and is inclosed within the British district of South Arcot, consists of the three districts of Pondicherry, containing, besides the capital, eleven villages; Vallanor, containing forty-five villages; and Bahour, containing thirty-six villages. The executive and legislative establishment consists of a governor, a council of administration, and a council-general; the judicial establishment includes a royal court, a tribunal of the first instance, and a tribunal of peace and police. The governors of the other French possessions in India are subject to that of Pondicherry. The first French settlement here took place in 1674, they having purchased the town two years before from the Rajah of Bejapoor. In 1693 the place was taken by the Dutch; but restored, with its fortifications much improved, by the peace of Ryswick in 1697. Pondicherry was attacked by a British fleet and army in 1748, but without success, and the siege had to be raised. In 1758 Count Lally arrived here, and commenced vigorous measures against the British. Fort St David, Arcot, and the town of Madras fell successively before the French arms; but Fort St George, the citadel of Madras, held out till it was relieved, and Lally was obliged to retreat to Pondicherry. Subsequently the fortune of the war turned decisively against the French: Pondicherry was besieged, forced to surrender, and razed to the ground; while the other French posts in the Carnatic met with a similar fate. Along with their other possessions in the Carnatic, Pondicherry was restored to the French in 1763; and though subsequently more than once captured by the British, it was finally secured to France in 1814. Pop. of the town from 25,000 to 30,000; of the district (1856), 119,755.

PONIATOWSKI, PRINCE JOSEPH, the nephew of Stanislaus, the last king of Poland, was born at Warsaw in 1763, and was trained to the profession of arms in the Austrian service. His life from early manhood was consecrated to the cause of national liberty. In 1792 he led the Polish troops against the Russians; in 1794 he fought for freedom under the banners of Kosciusko; and on the defeat of his cause he went into exile, refusing to come to terms with the oppressors of his country. The arrival of Napoleon in Warsaw brought him once more into the field of patriotic action. Identifying the cause of his country with that of the great conqueror and deposer of kings, he devoted himself henceforth to the service of the French emperor. The command of the fifth corps of the "grand army" was entrusted to him in the fatal invasion of Russia; he gained fresh laurels on several fields during the campaign of 1813;

and he was discharging the important commission of protecting the retreat of the French army, when he was drowned in the river Elster in October of the same year.

PONS, a town of France, in the department of Charente-Inférieure, stands on the left bank of the Seugne, 14 miles S.S.E. of Saintes. It has the remains of an old castle, now used as a prison, with a square tower 108 feet high, an ecclesiastical school, and an orphan hospital. Dyeing, tanning, and the manufacture of woollen stuffs are carried on here; and there is some trade in wines and brandies. Pop. 4765.

PONS, *St*, a town of France, capital of an arrondissement in the department of Hérault, on the Jaur, an affluent of the Orb, 60 miles W. of Montpellier. It is well built, chiefly of variegated marble, quarried in the vicinity. The church, of this material, is historically of some interest. St Pons has also an ecclesiastical school, a communal college, a tribunal of the first instance, manufactories of woollen cloth, dye-works, tanneries, saw and flour mills, &c. There is some trade in corn and cattle. Iron mines, as well as marble quarries, are worked in the vicinity. Pop. (1856) 6512.

PONT-À-MOUSSON, a town of France, in the department of Meurthe, on the Moselle, here crossed by a bridge, from which the town takes its name, 16 miles N. of Nancy. On a hill to the east stand the ruins of the old castle of Mousson. The ramparts with which the town was surrounded are now public walks planted with trees. The principal square, which is lined with arcades, contains an old house, called the "House of the Seven Deadly Sins," from the curious sculptures on its front. The chief public edifices are the Gothic church of the thirteenth century, the town-hall, cavalry barracks, and the seminary occupying the buildings of the ancient abbey of St Mary. Pont-à-Mousson has also an hospital, tanneries, breweries, potteries, sugar-houses, and some trade in corn, wine, brandy, &c. Pop. 7843.

PONT-AUDEMER, a town of France, capital of an arrondissement in the department of Eure, on the left bank of the Rille, which here becomes navigable, 38 miles N.W. of Evrua. It is a prettily-situated, clean, and well-built town, surrounded with walls and ditches. Here tanning is the staple employment of the people; there are no fewer than forty tanyards, besides curriers and establishments for dressing leather. Even one of the churches, that of Notre Dame des Prés, has been converted into a tan-house. This building, and the churches of St Germain in the suburbs, and of St Ouen and St Sepulchre, are architecturally interesting. Pont-Audemer has also public baths and a small theatre. There is some trade in hides, leather, corn, cider, flax, and other articles. Pop. (1856) 5832.

PONTARLIER, a frontier town of France, in the department of Doubs, stands on the river Doubs, at the foot of one of the chains of the Jura, and at the entrance of a mountain pass leading into Switzerland, 35 miles S.E. of Besançon. It has much of the appearance of a Swiss town, with its neatly-built houses arranged in broad straight streets. Its town-hall, college, market-house, and cavalry barracks, are its chief buildings. There are here large iron foundries and furnaces, a copper foundry, a brewery, saw-mills, and tan-yards; besides manufactories of scythes and other implements. Some trade is carried on in horses, cattle, marble, timber, clock-work, essence of wormwood, paper, &c. Pop. (1856) 4783.

PONT ST ESPRIT, a town of France, in the department of Gard, on the right bank of the Rhone, 32 miles N.E. of Nismes. It derives its present name (for it was formerly called *St Saturnin*) from the great bridge which crosses the broad and rapid river, and which is the longest stone bridge in the world, being 2717 feet, or three times as long as London Bridge. It crosses the river obliquely, and has 23 arches, varying in size, the largest being 108 feet wide. It was finished in 1309, after 45 years of labour; and the cost was partly defrayed by offerings made at a small chapel of the Holy Ghost at one of its ends. The town is ill built, with narrow irregular streets; it is defended by ramparts, and by a citadel built by Louis XIII. against the Protestants. There is here a good harbour, and some trade in wine, oil, fruits, provisions, &c. Pop. 5538.

PONTECORVO, a town of the Papal States, in an isolated district of the same name belonging to the province of Frosinone, but surrounded by the Neapolitan province of Terra di Lavoro, on the left bank of the Garigliano, 20 miles S.E. of Frosinone. It is the seat of a bishop, and has a mediæval castle, a cathedral, a fine bridge, and an hospital. In the vicinity there are some remains of the ancient Interamna. Pop. 5300.

PONTEFRACT, or POMFRET, a parliamentary and municipal borough and market-town of England, in the West Riding of Yorkshire, on an eminence near the Aire, 24 miles S.S.W. of York, and 177 N.N.W. of London. The original appellation of the town was *Kirkby* under the Saxons; but it obtained its present name (from the Latin *pons fractus*) on account of the breaking of a bridge over the Aire. A castle, the remains of which still exist, was built here in 1080 by Ilbert de Lacy, who received from William the Conqueror a grant of the adjacent lands. In the beginning of the fourteenth century it passed by marriage to Thomas, Earl of Lancaster, uncle to Edward II., who was executed here by his nephew in 1322. Several important historical events took place in the castle of Pontefract; as the murder of Richard II. in 1399, the execution of Archbishop Scrope for rebellion against Henry IV. in 1405, and the murder of Lord Rivers and others by order of Richard III. in 1483. During the civil war the castle was garrisoned for Charles I. by Colonel Lowther; besieged in vain by Lambert in 1644; surrendered to Fairfax in 1645; retaken in 1648 by Colonel Morrice, who first issued money in the name of Charles II. here; and finally captured and destroyed by Lambert in 1649. It seems to have consisted of several towers; the remains are very few, and the site is now occupied by gardens. The town is well built, chiefly of brick, and has several broad well-paved and well-cleaned streets. The parish church is old, but has been very much altered. The old church of All Saints, formerly the parish church, is cruciform, and has a fine tower. It has recently been restored and fitted up for public worship. Besides these, there are places of worship in Pontefract for Roman Catholics, Independents, Quakers, Wesleyan and Primitive Methodists. Of several ecclesiastical establishments, colleges, and hospitals, that formerly existed here, no traces now remain. There is here a town-hall and a commodious court-house, in which the Easter quarter sessions are held. There is a free grammar school with an interest in several exhibitions to Oxford, a charity school, national and British schools, a subscription library, mechanics' library, news-room, and savings-bank. The charitable institutions include a dispensary, poor-house, and several almshouses. The surrounding country is celebrated for its gardens and nurseries, from which vegetables are supplied to York, Leeds, Doncaster, and other places. Liquorice is extensively raised on the deep rich soil of this district. There are also coal-mines and flour-mills in the neighbourhood, and filtering stones are quarried on the castle-hill. Though not remarkable for its manufactures, Pontefract produces hats, iron and brass castings, earthenware, bricks, tiles, beer, &c. There is some trade in liquorice, malt, corn, &c.; and eight annual cattle-markets are held at Pontefract. The borough is governed by a mayor, three other aldermen, and twelve councillors; and it returns two members to the House of Commons. Pop. (1851) of the municipal borough, 5106; of the parliamentary, 11,515.

PONTE LAGOSCURO, a town of the Papal States, in the province of Ferrara, on the Po, 4 miles N. of Ferrara. It has a free harbour, and an active transit trade. Pop. 6000.

PONTEVEDRA. See Galicia.

PONTEVICO, a town of Austrian Italy, in the province of Brescia, on the Oglio, 20 miles S.S.W. of Brescia. It is an old walled town, and has a ruined castle, formerly very strong. Many of the houses are well built. There is much manufacturing industry; and an active trade is carried on in corn and wine. Pop. 5870.

PONTIANAK, a town in the Island of Borneo, at the mouth of a river of the same name on the W. coast, 391 miles E.S.E. of Singapore, almost under the equator, in E. Long. 109. 20. It is the seat of the governor of the Dutch possessions of the W. coast of Borneo, and of a tributary sultan. Though built on marshy ground the climate is healthy; and the town is chiefly remarkable for its commerce. There are many Chinese here, who export diamonds, gold-dust, birds' nests, and other articles. Pop. of the town, 3000; of the district, 19,115, chiefly Malays. Pontianak was settled in 1823.

PONTIFEX, Pontiff, or *High Priest* (probably from *pons*, a bridge, and *facere*, to sacrifice), a person among the Romans who had the direction and superintendence of divine worship. The Roman pontiffs, which formed the most illustrious among the great colleges of priests were supposed to be founded by Numa. A pontifex might hold any other office, whether military, civil, or priestly, provided they did not interfere with one another. The college of pontiffs, which was always ruled over by the emperors, continued to exist until the overthrow of paganism, when the title was assumed by the Christian bishop of Rome, and subsequently by the Pope.

PONTIVY, a town of France, capital of an arrondissement in the department of Morbihan, on the left bank of the Blavet, 30 miles N. by W. of Vannes. It is ancient, and has still some remains of the old walls and gates. A new quarter was added by Napoleon I., who gave the town the name of *Napoleonville.* On the restoration of the Bourbons the old name was resumed; but recently it has again been called Napoleonville, and is given under that name in the census of 1856. The chief building in the town is the picturesque but ruinous old castle of the dukes of Rohan. The new portion lies outside the walls, and has broad regular streets; but being unfinished, it has a desolate appearance. Pontivy has a prison and very handsome cavalry barracks. It contains numerous tanneries, and has an active trade in corn, linen, thread, horses, cattle, hides, leather, &c. Pop. (1856) 6859.

PONTOISE, a town of France, capital of an arrondissement in the department of Seine-et-Oise, on the side of a steep hill on the right bank of the Oise, 18 miles N.W. of Paris. The river is here crossed by a bridge, whence the town derives its name (*Pont Oise*, Oise bridge). Remains of the castle and walls that formerly defended the town still exist. The streets are in general steep and narrow. There is an interesting church in various styles of architecture; a Gothic court-house, a public library, and a splendid hospital. Pontoise has also a college and several schools. Clocks and watches, chemical substances, cotton yarn, leather, &c., are manufactured here; and there are many corn-mills turned by the Oise and its affluent the Vionne. Pop. (1856) 5366.

PONTOON, a kind of flat-bottomed boat, the body of which is composed of wood lined without and within with tin. Pontoons serve for the construction of bridges over rivers to facilitate military operations. Our pontoons are 21 feet in length, 5 feet in breadth, and in depth within 2 feet 1·5 inches.

PONTOPPIDAN, Eric, a learned Dutch writer, was born at Aarhuus in Jutland in 1698, and studied divinity at the university of Copenhagen. His passion for the study of geography and history was encouraged by a considerable amount of patronage. On finishing his education he was appointed travelling tutor to several young noblemen; in 1735 the office of one of the king's chaplains was conferred upon him; in 1738 he was promoted to a theological chair at Copenhagen; and in 1747 the bishopric of Bergen in Norway was entrusted to his charge. Accordingly, at his death in 1764, he left behind him various works on the typography and annals of his native country. Among these were *Theatrum Daniæ Veteris et Modernæ*, 4to, 1830; and *Gesta et Vestigia Danorum extra Daniam*, in 2 vols. 8vo, 1740. He was also the author of a work on the natural history of Norway, which was translated into English in 1755.

PONTREMOLI, a town of the duchy of Parma, stands at the confluence of the Magra and Verde, on the southern slope of the Apennines, 36 miles S.W. of Parma. It consists of an upper and lower town: the upper is ancient, defended by a castle and massive picturesque fortifications; the lower town has a more modern aspect, and contains a cathedral and many good houses. There is here an episcopal seminary, a literary society, and several schools. The weaving of silk and linen stuffs is the principal branch of industry. Pontremoli was formerly an important place, commanding one of the chief passes of the Apennines between Tuscany and Lombardy. It belonged at one time to the Genoese, at another to Milan, and previously to 1847, when it was ceded to Parma, it formed a part of Tuscany. Pop. 10,600.

PONTUS, an ancient kingdom in the N.E. of Asia Minor, which derived its name from its being on the Pontus Euxinus, extending from the River Colchis in the east to the River Halys in the west. In early times its various parts were designated after the tribes which inhabited them. The most important of those tribes are,—the Leucosyri, Tibareni, Chalybes, Mosynœci, Heptacometæ, Drilæ, Bechires, Byzeres, Colchi, Macrones, Mares, Taochi, and Phasiani. From the middle of the seventh century B.C., many of those tribes inhabiting the coast rose to great power and opulence, spreading Greek culture and civilization around them; while many of those of the interior were extremely savage and wild. According to tradition it was conquered by Ninus, founder of the Assyrian empire; and it was certainly under the Persian dominion after the time of Cyrus the Great. In the reign of Artaxerxes II., Ariobarzanes conquered several of the Pontian tribes, and laid the foundation of an independent kingdom. Mithridates II. succeeded him B.C. 337, who, by availing himself of the disputes of the successors of Alexander, considerably enlarged his dominions. He was followed by Mithridates III., by Ariobarzanes III., by Mithridates IV., by Pharnaces I., and by Mithridates V. Under Mithridates VI., from B.C. 120 to B.C. 63 (see Mithridates), the kingdom of Pontus rose to its highest dignity. In his war with the Romans his kingdom was dismembered by Pompey, B.C. 65, who annexed the western part of the nation, and gave the remainder to the native chiefs. A portion between the Iris and the Halys was given to the Galatian Deiotarus, which was henceforth called Pontus Galaticus. The Colchians and other tribes received a king in the person of Aristarchus. Pharnaces II., son of Mithridates, received the Crimea and some neighbouring districts, under the name of Bosphorus; and the central part of the Pontian kingdom, subsequently given to Polemon, was henceforth termed Pontus-Polemoniacus. The widow of Polemon, on her marriage with Archelaus, King of Cappadocia, transferred to him the eastern part of the kingdom, subsequently called Pontus Cappadocius. On occasion of Polemon II., son and successor to Polemon I., resigning his kingdom into the hands of Nero, Pontus was made a

Roman province A.D. 63. In the changes which transpired under Constantine, the province was divided into two parts,—viz., Helenopontus after the emperor's mother Helena, and Pontus Polemaicus.

Pontus embraced the modern pashaliks of Trebizond and Siwas. The country was surrounded by mountains, and the plains were highly fertile. It grew excellent fruit,—cherries, apples, pears, various sorts of grain, timber, olives, and aconite. Game was found in abundance; and the bees were much valued. The mineral wealth of the country consisted chiefly of iron and salt. The chief mountains of Pontus are the Pharyadres, and on the east Scœdises, two ranges of Antitaurus, sending off various branches. Proceeding from W. to E. we have the promontories Heracleium, Jasonium, and Zephyrium, which form the bays of Amisus and Cotyora. The mountains of the south give rise to the Halys, Lycastus, Chadisius, Iris, Scylax, Lycus, Thermodon, Beris, Thoaris, Œnius, Phigamus, Sidenus, Genethes, Melanthius, Pharmathenus, Hyssus, Ophis, Ascurus, Adienus, Zagatis, Prytanis, Pyxites, Archabis, Apsarus, Acampis, Bathys, Acinasis, Isis, Mogrus, and the Phasis. To the west, north of the river Scylax, is the lake called by the ancients the *Stiphane Palus*.

PONTYPOOL (said to be a corruption of *Pont-ap-Hywel*, Howell's Bridge), a market-town of England, in the county of Monmouth, stands in the midst of mountains, on a steep hill on the right bank of the Afon Llwyd, an affluent of the Usk, 19 miles S.W. of Monmouth, and 149 W. by N. of London. It is straggling and irregularly built, but contains many good houses and shops. The parish church, which stands on a hill about a mile from the town, is a fine building in the early English style, with a square embattled tower. The Wesleyans, Independents, Roman Catholics, and other sects, have also places of worship here. There are, besides, national and infant schools, a reading-room, and a savings-bank. The prosperity of the town is derived chiefly from the manufacture of iron and tin wares which is carried on here, and from the coal-pits and iron mines that are worked in the vicinity. From the rapid extension of these sources of employment, the population of the town and parish has also rapidly increased. Weekly markets and annual fairs are held at Pontypool; and there is some trade in iron and coal. Pop. (1851) 3708.

PONZ, Antonio, an industrious and useful writer on art, was born at Bexix, near Segorbe in Valencia, in 1725. He was educated for the church; but a strong bias turned his mind from his professional studies to the fine arts and kindred subjects. While finishing his theological course at Valencia, he took lessons in painting from Richarte. After he had gained the degree of Doctor of Divinity, he placed himself as a pupil at the provisional academy at Madrid, and studied there from 1746 to 1751. His predilection for the antique then led him to Italy; and the next nine years were spent in imitating the great masters at Rome. On his return to his native country he was still continuing to improve himself in art, and was copying Raphael, Paul Veronese, and Guido, in the Escorial, when a new sphere of labour was opened up to him. Commissioned by government to visit the colleges of the ejected Jesuits, and to collect whatever valuable works of art might be found there, Ponz began to write an account of his observations and travels. It soon appeared that he was even better fitted for this task than for painting. His style, it is true, was sluggish, dull, and prolix. His mind also observed no method, loitered over every object that chanced to fall in its way, and was allured by every accidental circumstance into the most irrelevant digressions. Yet he was an inquisitive, indefatigable, and candid investigator. Especially were his zeal and his fidelity commendable in describing works of art, and in rescuing the names of many artists from oblivion. The book accordingly met with a very favourable reception. The first seventeen volumes, which appeared during the author's lifetime, were the means of securing for him much patronage and honour till his death in 1792. The entire work, published after his death in a complete form, under the title of *Viage de España*, 18 vols., 1772–94, took the first place as a guide-book to Spain. It is only within recent years that it has been superseded by the English hand-book of the late Richard Ford.

PONZA (anciently *Pontia*), the largest and only inhabited island of a small group in the Mediterranean, lying off the coast of Naples, included in the province of Terra di Lavoro, and 29 miles S.W. of Terracina. It is crescent-shaped, 5 miles long and 1 or 2 broad, and has a natural harbour on the concave side, which looks towards the mainland. Near the harbour stand a castle, governor's house, storehouses, and a few houses and huts. The surface is entirely rocky, and generally barren; but there are some good pastures for cattle. The inhabitants are chiefly employed in fishery and salt-works. Pop. 1500. The other islands of the group are Palmarola and Zannone. Ponza and Palmarola were used as places of banishment by the Romans.

POOLE, a municipal and parliamentary borough, seaport, and market-town of England, forming a county by itself, in Dorsetshire, on a peninsula on the N. side of Poole harbour, 20 miles E. of Dorchester, and 97 W.S.W. of London. It is an old town, built for the most part of red brick, and somewhat resembling Sheerness and Portsmouth. The streets are irregular, and many parts of the town have a mean appearance; but the more modern portions are well and substantially built. The parish church of St James (rebuilt in 1812), the custom-house, town-hall, guild-hall, jail, and an old edifice called the King's Hall or wool-house, are the principal public buildings in the town. The Independents, Baptists, Wesleyan and Primitive Methodists, Unitarians, Roman Catholics, and Quakers, have places of worship in Poole; and there are also National and British schools, a free grammar school, a public library, a savings-bank, and several well-endowed almshouses. The peninsula on which Poole stands is lined towards the sea with broad and convenient quays and warehouses. Shipbuilding is extensively carried on especially the construction of sailing-yachts; sail-cloth, ropes, and other articles used in ships are also made here. The number of sailing-vessels registered at Poole, December 31, 1857, was 113, tonnage 15,445; of steam-vessels 1, tonnage 22. In the year 1857 there entered the port 751 sailing-vessels, tonnage 61,514; and there cleared 517 sailing-vessels, tonnage 31,183, and 1 steamer, tonnage 18. Poole harbour is an extensive estuary, communicating with the sea by a very narrow entrance. It is 6 miles in length, and 4 or 5 in breadth, and has a very irregular outline. The water is shallow throughout, and there are many mud-banks laid bare at low water. A fine view is obtained from the town and its vicinity of the harbour, the beautiful island of Brownsea, the extensive heaths which spread around, the bold chalk range on the south, in a deep cleft of which stand the ruins of Corfe Castle. North of the town is a smaller arm of the sea, called Holes Bay, connected with the harbour by a narrow channel, which is crossed by a swing bridge. It is remarkable that the tides in Poole harbour ebb and flow twice in twelve hours. This is caused by the position of the entrance facing the E., and by the ebb tide from the Isle of Wight forcing the water up into the bay. On a bank near the harbour's mouth many oysters are obtained, and taken to the shores of Kent and Essex to be fattened. The fishing of plaice and herring is also carried on at Poole; and there is a considerable trade in the export of corn and clay. It is supposed that there was a harbour at Poole as early as the time of the

Romans, as there are traces of a Roman road between it and Winchester. The town received its first charter in the time of Richard I., but it was Elizabeth who raised it from being a mere fishing village to the rank of a town and county. In the civil war, Poole, then a fortified place, was held by the republican party; and in the reign of Charles II. its fortifications were destroyed. The borough is governed by a mayor, five other aldermen, and eighteen councillors; and it returns two members to Parliament. Pop. (1851) 9255.

POOLE, MATTHEW, the learned author of the well-known *Synopsis Criticorum Biblicorum*, was born at York in 1624, where he inherited a good family estate. He was educated at Emmanuel College, Cambridge, and was afterwards transferred in 1648 to succeed Anthony Tuckeney in St Michael le Querne, London. He held this rectory for some time, but was compelled to leave it, being unable to comply with the terms of ministerial conformity imposed by the Act of Uniformity just passed. Before this time he had been actively and successfully engaged in a project for the education of those intending for the ministry, of which, in 1658, he printed an account, entitled *A Model for the Maintaining of Students of Choice Abilities in the University, and principally in order to the Ministry.* In 1662, being ejected from his living for Nonconformity, he had leisure to complete the great work by which his name has become so extensively known. The design was to bring into one view all that had been written to illustrate the Scriptures throughout all ages. This he completed in ten years; and the *Synopsis Criticorum Biblicorum* appeared in 5 vols. in 1669–76. He was likewise engaged in most of the controversies of his time. He attacked Biddle on Socinianism, published a defence of the Nonconforming clergy in 1662, wrote against the intrusion of laymen into the ministerial office, and numerous pieces in opposition to Popery. His last work was *Annotations on the Holy Bible*, which he had carried as far as the 58th chapter of Isaiah. It was subsequently completed by several of his Nonconforming brethren, and appeared in 2 vols. folio, 1685. This very able critic retired to Holland in quest of toleration, and died at Amsterdam in 1679.

POONA, a town of British India, capital of a collectorate of the same name in the presidency of Bombay, stands at the confluence of the rivers Moota and the Moola, which form the Moota Moola, in a treeless plain bounded on the W. by the Ghauts, 74 miles S.E. of Bombay, and 58 N. of Sattara. Until recently it was an ill-built place, having more of the appearance of a village than of a town; but since 1841 it has been much improved: two good stone bridges, instead of the ruinous old Mahratta one, have been thrown across the Moota Moola; many good and some splendid houses have been built; and the streets adjacent to the cantonments on the east have been macadamized. The chief building in the town is the former palace of the Peishwa, now used as a prison, hospital, and lunatic asylum. It is extensive, and consists of a fine quadrangle lined with ranges of carved wooden pillars. The British cantonments, which occupy an elevated position to the west of the town, are among the best and largest in India. Here there are broad streets, and a large but not very elegant church. The chief street in the town is broad, and presents a cheerful appearance, as many of the houses are adorned with painted and carved representations of mythological subjects. Poona contains numerous pagodas and extensive bazaars. The town has long suffered from the want of an adequate supply of water, and various efforts have been made to procure it. It was resolved to obtain a sufficient supply from the Moota Moola by means of a dam; and this was completed, after several failures, in 1850, chiefly at the expense of Sir Jansetjee Jejeebhoy. But after all, these works were found to be unsuitable to the end in view; they had to be abandoned, and other measures resorted to for supplying the town with water. There was at Poona a government English school, which has recently been united with the Sanscrit College, established in 1821. This institution had in 1853, 497 pupils. The town has also three girls' schools, all established since 1851, and attended in 1853 by 237 pupils in all. The manufactures of Poona have fallen off very much since the introduction of European goods; and there is only now a manufacture of paper to a very small extent. There is a profitable trade carried on in grain and the raw produce of the country; but with this exception, the merchants of Poona are said to be declining in wealth; and the trade in jewellery and precious stones which, under its Indian rulers, was carried on here, has entirely disappeared. In the neighbourhood of the town there are many ruinous hill-forts and an excavated temple, similar, but greatly inferior, to those of Elephanta and Ellora. Poona stands on the south-eastern branch of the Great Indian Peninsular Railway, and is connected by roads with Bombay, Sholapore, Ahmednuggur, Nassick, and Sattara. Communication by water can be carried on during the rainy season by means of the Moota Moola, Bheema, and Krishna rivers, from within 75 miles of the west coast of India to the Bay of Bengal.

Poona was, in the flourishing period of the Mahratta power, a great place of rendezvous for the different independent chiefs, with their numerous followers, in order to consult on the general interests of the confederacy, and, when at war, to settle the plan of operations. These meetings were held about the middle of October, at the end of the rainy season, and were sometimes attended by 400,000 or 500,000 people, who were encamped in the surrounding plain, and were well supplied with every necessary, such as wood, grain, and fodder, which were brought down the rivers. At the height of the Mahratta power Poona is said to have contained 150,000 inhabitants; and at its fall in 1818, 11,000. The population in 1838 was estimated at 75,170.

The collectorate of Poona, which has an area of 5298 square miles, is bounded on the N. by the collectorate of Ahmednuggur, E. by those of Ahmednuggur and Sholapore, S. by the territory of Sattara, and W. by the collectorate of Tannah. It belongs entirely to the Deccan; and is bounded on the W. by the Western Ghauts, from which many branches proceed, generally in a S.E. direction, sloping gradually down to the plain. The chief rivers are the Bheema and its affluents, the largest of which is the Neera. The soil and climate of the country are extremely arid, and the east winds especially very dry; but the climate in general is not unhealthy, nor unsuitable for Europeans. The country is almost entirely destitute of trees, but it produces the ordinary grains of the Deccan, potatoes, &c.; and cotton also is cultivated to a small extent. Pop. (1855) 666,006.

The first notice of Poona occurs in the early part of the seventeenth century, when it was included in the jaghire or estate of Shahjee, father of the famous Sevajee, the founder of the Mahratta power, who built the palace there for his own residence. In 1740 the office and the power of the peishwa or minister was rendered really supreme, and that of the rajah merely nominal, by Balajee, who fixed his residence at Poona, and died there in 1761. The dignity was transmitted to his son Madhoo Rao, who died in 1772, and was succeeded by his brother Narrain Rao, who was murdered by his uncle Ragoba; and shortly afterwards a posthumous child of the deceased was placed on the throne. He died in 1795; and the elder of the two sons of Ragoba, named Bajee Rao, succeeded. This peishwa was supported by Scindia, and took his part against Holkar, who totally defeated both the allies at Poona in 1802. In order to avoid total ruin, Bajee Rao applied for an alliance with the British. A treaty was in consequence concluded which re-established his authority; and this good understanding continued for nearly fifteen years. But in 1817 the peishwa, anxious to emancipate himself from the British yoke, entered into the hostile combination which was then formed amongst the native powers for the assertion of their independence. As the contest ended in the triumph of the British armies, the peishwa was compelled to fly; and in May 1818 he at last consented to resign his office, and to retire on a pension to Benares. A portion of his country was given to the rajah of Sattara, the representative of the line of Sevajee, which had been supplanted by the peishwas; but that line afterwards becoming extinct, the whole territory fell to the British.

POORBUNDER, a town of India, on the S.W. coast of the peninsula of Kattywar, in the province of Guzerat, presidency of Bombay, 210 miles S.W. of Ahmedabad, and 275 N.W. of Bombay. It has a harbour, which, being obstructed by a bar at the entrance, does not admit vessels of a large size. The harbour is, however, the best on this coast, and frequented by many vessels, which carry on an active trade with the various seaports in Sinde, Beloochistan, Arabia, the east coast of Africa, and the Concan and Malabar coasts. The principal articles of export are wheat, oil, millet, cotton, and thread; the imports, iron, steel, tin, lead, sugar, pepper, spices, and other articles. There are about sixty vessels of various sizes belonging to the port. The half of the duties levied at the port of Poorbunder, amounting annually to L.3000 or L.3500, is paid to the British government by the rana, or chief of the Jaitwa tribe of Rajpoots, who holds the town and surrounding districts from the Guicowar, himself a dependent ally of the British.

POOR-LAWS.

Until very recently, the great interest felt in the body of laws comprehended under the above title was derived from the consciousness of the danger with which the manner of their administration in England threatened the property of the rich, and the morality of the whole people. As the law continues fundamentally the same as it was before the adoption of an improved administration, that source of interest in these institutions remains; but the present sense of security renders possible a calmer and more dispassionate examination of their merits and demerits than could previously to the year 1834 have been made by the most candid persons acquainted with the rapid progress of the evils of the system.

Origin and objects of poor-laws.

It was generally, and is now frequently, assumed by English writers, that a legal system of compulsory relief to the poor was peculiar to the polity of England. No assumption could be less justified by the facts, as will presently be shown. Wherever inquiry has been made, it has been found that the same objects as were sought by the institution in England have been sought by means which more strictly resemble those adopted in England, in proportion as the condition of the community resembles that of England in the complexity of its social relations and the progress of its legal polity.

So general an adoption of analogous institutions amongst independent communities was, of course, not fortuitous, nor the mere result of imitation; and these institutions are everywhere of too distinct and recent an origin to be traceable to any of the primitive laws or customs of those several peoples who have descended from one common race.

On the contrary, it was the development of the like evils in the progress of the civilization of each country which suggested the adoption of the like remedy. The evils which were sufficient to induce nations to try a remedy so obviously fraught with great dangers both to the givers and to the receivers, and requiring sacrifices so immediate and so incapable of disguise, appear to have been at least as pressing elsewhere as in England. The description of these evils shows that they were and must be of universal prevalence, and that they have their origin in the constitution of mankind, and not in any such incidents as the dissolution of monasteries or in any other local or temporary incident.

There never was a time or place in which there were not to be found men anxious to avoid labour, and yet to live in ease and enjoyment. There never was a time in which other men were not, from their sympathy, from their superstition, and from their fears, ready with their bounty to assist the necessitous, and liable to be imposed upon and intimidated, according as the beggar was crafty or bold. No community is so poor as not to suffer in some degree from the existence of a body of idle and worthless persons, subsisting profligately on the benevolence, the folly, or the fears of its members.

And as the condition of the people is found to improve, as progress is made in the arts and commodities of life, there is, of course, found a greater disparity in the condition of the people, and destitution more violently contrasted with opulence. Such a state of things, whilst it increases the means at the disposal of the benevolent and fortunate, increases the sympathy with the unfortunate, or those who appear to be so, and at the same time presents wealth in such masses as to serve as a temptation to those who may prefer to live by fraud or violence. Mendicancy and depredation, which are nearly impossible where a population is scattered, and its moveable wealth in small quantity, become easy in the contrary state of things.

It is accordingly found, in the progress of the civilization of every country, that a period arrives when beggary in its many forms, and with its whole train of consequences, appears in an alarming extent, usually even professed by large fraternities having some character of organization; sometimes connected by religious profession, like palmers, pilgrims, and various orders of mendicant friars, faquirs dervishes; sometimes connected by supposed identity of race, as the people known throughout the continent of Europe, and largely in Asia, as Zingari, Gypseys, Bohemians: these, with the unfortunate and dissolute of all classes, find a means of living by practising various arts of amusement, and more frequently by operating on the superstitious credulity, and often on the fears, of the more wealthy and industrious part of the community. All accounts of such a state of things, wherever it may have prevailed, agree in showing that predatory habits almost invariably accompany, where occasion offers, the habit of mendicancy.

Great as were the evils obviously connected with the existence of such a mass of idlers, impostors, and depredators, there were not wanting motives to the other classes to perpetuate and increase the evil. Individual benevolence, even where accompanied by intelligence and prudence, although its objects may be immediately selected from the really unfortunate, would not withhold its indirect aid to this bad effect, its respectable example seducing many to imitate the act, without using the due precautions.

But a much greater share of the effect must always be attributed to the incautious benevolence of the great mass of those who have the power to give. It requires great knowledge and sagacity to distinguish the cases in which alms can be given without directly encouraging idleness, or some worse vice; and to direct these qualities effectively to the case of each applicant would, in the state of things described, require an amount of industry and an expenditure

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of time seldom or never possible. The ignorance and indolence, therefore, of the benevolent, afford the largest encouragements to the idle. Other influences are not wanting, especially ostentation and the love of popularity, which, where many live in idleness, never fail to create dependents and retainers to the full extent of the power or the will to maintain them. Superstition, too, has in all times enforced alms-giving as a virtue, and, operating upon the consciences of great criminals, has throughout the world created and endowed the largest and most magnificent of the so-called charities.

In the above description will be recognised a state of things partially exemplified, either in one set of its details or in another, in every country in Europe, more especially in those in which, like Spain, Naples, many other Italian states, and other countries, no public or well-controlled and systematic provision for the poor has been established.[1]

These observations will be well instanced in England during the progress of the institutions of which a description is about to be given.

CHAPTER I.

GENERAL OBJECTIONS TO PUBLIC RELIEF AND TO PRIVATE ALMS-GIVING.

The fact was adverted to in the beginning of this article, that the state of the poor-laws since 1834 enables us to take a more dispassionate view of the abstract merits and defects of a system of public relief than was formerly possible, while the question was embarrassed by the consciousness of the evils which we were suffering, and of those towards which we were visibly making a rapid progress. On the other hand, the evils of general mendicancy, and the other painful and dangerous circumstances which are everywhere found to prevail where a public law of relief has not been established, are so little known in England, from whence our poor-laws have long excluded them, that little of the good really derived from our poor-laws was acknowledged, whilst the whole of their positive mischief was so apparent as to form almost alone the matter of every discussion of the merits of the system.

Alms-giving.

Before great accumulations of moveable wealth have taken place in any community, depredation to any large extent is scarcely possible, and mendicancy as a trade cannot be followed in such a community, especially where its population is widely scattered. Alms-giving, in the usual sense of the term, does not exist; but its place is often supplied by hospitality to the stranger and traveller, and by the readiness to share with friends or relatives the means of enjoyment which individuals may possess. But in countries where comparatively great accumulations of wealth have taken place, and where poor-laws have not been introduced, or where, as in Ireland before 1838, they have not taken root, alms-giving and begging are either avowedly permitted or connived at. And, for reasons hereafter to be shown, the alternative of a regulated system of *public relief*, or the practical permission, whether avowed or not, to solicit *private alms*, appears inevitable.

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Poor-laws.

It would be an evasion of the question to compare a well-devised system of poor-laws with a system in which alms-giving was to be substituted. It is necessary, in order to do full justice to the comparison, to assume a system of poor-laws fraught with all the evils known to be derivable from such a system, and administered with a degree of laxity not less than that of which we have had a practical experience. A system of public relief may be had in principle, and yet judiciously administered; or it may be good in its principle and ill administered. For the present purpose, a system shall be assumed, bad in its principle and bad in its administration.

Operation of a bad poor-law.

In this view, the law may give a claim to all persons not having means of independent subsistence, to be relieved, without subjecting the claimant to any harsh or disagreeable condition. Such a claim, though never in fact countenanced by the law, was practically allowed for above a quarter of a century in many parts of England. A law of this kind would obviously render all those who by their exertions could at the utmost earn but a bare subsistence, averse to industry, which in such a case would be a sacrifice of ease without any increased advantage. If present industry were rendered useless, so would thrift and forethought become a folly, an abandonment of present enjoyment without an object. Every present indulgence which the law allowed would wisely be enjoyed; good moral habits and bodily skill would have little merit if the law should place those with them and those without them in the enjoyment of the like benefits. What appears desirable for a man's advantage, it is a virtue in him to do also for his progeny. The pauper's children would be themselves paupers, and the law would present to them every inducement to beget other paupers, and no inducement to refrain. Such we have seen the English pauper, slothful, thoughtless but of his parish pay, sometimes living to see three generations of his progeny paupers, like to or worse than himself.[2]

But the idle pauper cannot be supported except from those funds which must otherwise employ and reward the industrious. Every pauper, for his support, consumes that which would maintain or nearly maintain an industrious labourer; with this difference, that the consumption of the pauper is never repaid, whilst the value of the labourer's consumption is always reproduced with a profit, which again affords the means of employing other industry. The pauper, therefore, is constantly drawing those above him into his own rank. The misfortune of those reluctantly becoming paupers produces a sympathy which extends to the voluntary pauper, and the unfortunate and the idle become less and less distinguishable.

If the law increases its bounty with the number of the paupers' offspring, all these evils are aggravated and accelerated. If the law, like the former English bastardy law, renders the reward for having a bastard child greater than the allowance to a legitimate child, another source of immorality is opened, female virtue is at a disadvantage, and unchastity, becoming a source of profit, becomes respectable.[3]

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[1] For a very ample detail of the state of mendicancy and vagrancy of private and public charitable institutions in the chief countries of Europe and in the United States, the reader is referred to the Appendix (F) of Foreign Communications made to the Poor-Law Commissioners, 1835, and especially to the interesting abstract of and comment upon these communications by Nassau W. Senior, Esq., entitled "A Statement of the Provision for the Poor, and of the Condition of the Labouring Classes, in a considerable portion of America and Europe," 8vo, Fellowes, 1835.

[2] See extracts from evidence received by the commissioners of enquiry:—"We have cases of three generations of paupers," p. 204. See at p. 218 an amusing instance of three generations of the same stock contemporaneously relieved, at the rate of L.100 per year, by a parish; see also pp. 220, 226, 358.

[3] See extracts from the information received by the commissioners of enquiry into the poor-laws. A clergyman in Cumberland speaks thus of the practice of that county:—"A very different description of women have of late years become the mothers of bastard children. Formerly it was confined to the daughters of cottagers and girls employed in farm-husbandry; but of late *very respectable farmers' daughters* have been in that situation, and have applied to have their offspring taken care of by the parish." (Captain Pringle's Report, p. 404.) The next extract is from the evidence of an overseer in the same county. "We at this time, in our parish, are sup-

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If the law takes the yet more insidious course of providing relief to those who live partly by regular industry, the evils described are enormously increased. In this way the whole industrious population may be destroyed, almost without rendering the recipients conscious of their degradation. In this way the forethought of the industrious man becomes of as little value to him as it is to the pauper, and the whole of the restraints on population are destroyed in the great bulk of the people.

But relief to his workmen is in fact for the moment relief to the master; the public undertaking a portion of the maintenance of the servant saves to that extent the wages of the employer. The corruption of the system thus reaches the master as well as the labourer, and each is equally induced, by his immediate interest, to secure and continue to himself the portion of the benefit, unless we presume them to be more provident than the law itself.

That such bad principles might be involved in a poor-law, is undoubted; for although the English law never, either in letter or spirit, contained all these elements together, yet it at one period or another in succession contained them all, and a loose and in some measure a corrupt administration gave for a long time prevalence to all their influences together.

Evils of a bad administration of the poor-law.

This brings into view the evils of a bad administration of the law. Suppose its execution intrusted to officers who must, in a majority of cases, be necessarily ignorant of its complicate objects, being ignorant of the common rudiments of education;[1] and let such officers be in no way distinguished by their interests being made to accord with the interests of the community in a good administration; the obvious consequence must be such as were seen in England, that the best portions of the law must be badly administered, whilst the bad parts, by such instruments, can scarcely be expected to have these evils softened by a good administration. But a certain consequence would be, that those whose interests were identical with the welfare of the community, would be reluctant to serve the office, which would thus be left to others who could best employ its provisions to their own advantage. Thus in England the overseer was generally found, even when zealous in the discharge of his duty, blindly giving effect to the most pernicious part of the system. When merely weak, without being corrupt, we find him a tool in the hands of those whose object it was to procure labour at a low price, at the expense of the other rate-payers, and at the peril of the gradual though certain deterioration of the labourer and his posterity. Such an overseer was also subject, as a matter of course, to the cajolery or intimidation of the pauper, to the seduction of popularity, readily to be got by the expenditure in miscalled charity of other people's contributions. But the natural operation of the system was to find or to make its officers corrupt, as it was natural that that class of men should be readiest to execute the office whose circumstances best allowed them to avail themselves, for their own advantage, of the law. In England we found that the more pauperized the district, the more certainly was the overseer an employer of pauper labour, or a supplier to the paupers, on his private account, of the objects of their daily consumption, or the owner of the habitations in which they lived, and for which the parish guaranteed a certain and exorbitant rent.

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Even these evils might be aggravated by parcelling the country out into districts too small to allow of the procuring of the necessary means even of an economical administration. In England few parishes or townships were large enough to afford a workhouse or to contract for the supply of the articles of consumption for the poor. Many were so small that the cost of purchasing small books of account was considered as an extravagance.

We have another important example of the way in which the administration could be carried to the extreme of badness; namely, by the provision of a control which could by its nature operate only to enforce an improvident administration, and which should have no authority to check it. England, again, affords us an example of such a device in the authority of the justices of the peace. The justice was enabled to enforce the giving of relief where the overseer from any motive had refused it; but the justice of the peace had no authority to interfere when the overseer was profligately allowing relief.

Effects of such a poor-law

The effects of such a system, then, would inevitably be the same as we have witnessed in England. Such have been perhaps too indiscriminately attributed to poor-laws generally. These effects were, in a former article in this publication,[2] very distinctly and ably described and elucidated. They were described, first, as a disturbance of the natural course of population, which they increased without reference to the means of support; and, indeed, in the inverse direction, inasmuch as every addition to the number of the non-productive or the partially productive paupers diminished the means of living of the other portions of the community. Secondly, as increasing the very pauperism which it was their object to relieve. Thirdly, as productive of improvidence in the poor, who saw no worse consequence of a dissolute and idle life than an eventual reliance, in common with millions of their fellow-subjects, upon the parish for their support in sickness or old age, or in the visitation of those calamities against which it is the task of prudence to provide. A fourth effect, much dwelt upon, was the misapprehension caused by these institutions as to the real cause of poverty and distress, and the operation of this misapprehension in producing a discontented spirit in those who entertain the notion that they have a right to relief, but no equally definite notion of their duty to provide for themselves. The fifth evil was the encouragement which the system, as administered, was found to give to every species of immorality: idleness in the day, depredation, poaching, and smuggling by night, facilitating the resort to the beer-shop again by day: particularly the law of bastardy was observed to be rapidly destroying the virtue of the females, and by producing ill-assorted marriages, sapping the whole of those domestic virtues, both of parents and children, which depend mainly on a happy home. It was also remarked that the law of settlement had a large effect in lowering the character of all who claimed a maintenance from the parish; it being notorious that the most steady, industrious, and moral workmen, upon whom the employer can place his surest reliance are those who do not legally belong to the parish in which they are living.

Such is the description of an extensive system of poor-laws framed on a bad principle, and badly administered; and such are their observed effects.

But it does not thence follow that a poor-law, well de-

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porting two bastard children whose *mothers have landed property of their own*, and would not marry the fathers of their children." (Ibid.) "The daughters of some *farmers, and even landowners*, have bastard children. These farmers and landowners, and children with them, regularly kept back their poor-rate to meet the parish allowance for their daughter's bastard." (Ibid.) "Captain Pringle states that in the neighbourhood of Carlisle it was not unusual for the daughters of small farmers, or statesmen as they are here called (men farming their own property), to have bastard children, and to come to the parish for allowance." (Ibid., p. 403.)

[1] See as to the illiterateness, general ignorance, and inefficiency of overseers, the volume of extracts before cited, at the passage referred to in the index under the title "Overseers."

[2] By Dr Sumner, late bishop of Chester.

vised and well administered, should find no place in the polity of a nation.

There appear to be at least two resources besides that of adopting bad principles in such a law, or adopting a bad constitution of officers for its administration. The first resource is to exclude such an institution altogether.

Alternative of alms-giving.

Some few countries taking their place by common estimation amongst civilized nations, have made no public provision for the poor. Ireland was practically, before the session of 1837–38, without such a provision. England was in the same condition until the reign of Elizabeth. In all such countries rigorous enactments exist against mendicancy, but everywhere such enactments are defeated by the common co-operation of the whole people. It will be seen that in England the most ferocious penal enactments were repeated, with every variation that ingenuity could devise, for the purpose of suppressing mendicancy and vagrancy; and yet at every stage of legislation it is avowed that the evil was still increasing.

It appears a preposterous expectation that any people will generally sympathize or co-operate with the law which, whilst it leaves the unfortunate to perish, pretends to render mendicancy a crime. So common is the sentiment against such an attempt, that many systems of jurisprudence avowedly admit necessity, or the extreme danger of perishing for want, as a legal excuse for some offences, and as a palliation of any offence directly incited by the pressure of such necessity. There appears, therefore, no means of preventing mendicancy but by a recognised provision of public relief.

Mendicancy is often expressly permitted by law; sometimes it is allowed to particular classes of persons,—as discharged soldiers and sailors and their families, poor students, discharged prisoners, and such like. Sometimes a limit is assigned to begging, a given route on the way homewards, or a given district in which a party may have been born or may have become otherwise domiciled. Even in England both these kinds of license and restriction have, till within these few years, formed part of our statute-law. The effect of such restrictions has nearly everywhere been the same as in our own country,—viz., to give authority to mendicancy without in any way operating to diminish it.

Mendicancy compared with pauperism.

Let us now examine the effects of mendicancy, whether permitted by the law or not, comparing it throughout with the operation of a bad system of poor-laws. In the *first* place, it, like pauperism, destroys industry, but the mendicant is wholly and entirely idle, with no one responsible to see him set to work, and, being for the most part unknown to those who relieve him, is under no necessity even to affect, like the pauper, a readiness to work. The mendicant's progeny is like himself in this respect, except that, being early bred to the parent's habits, industry becomes nearly impossible to them; whilst the occupation of both is such, that even on the supposition that an inclination to adopt a life of industry should be excited, few occupations could be found to which they would be fitted, and still fewer employers who would engage them. In respect of the influences upon *industry*, therefore, the individual mendicant is under worse influences than the individual pauper relieved by the *worst* system of poor-laws. So with respect to the general *morality* of the mendicant. The pauper is under some restraints, owing to his being settled amongst neighbours upon whose good opinion he is at least in some measure dependent; he must be known to the officers of his parish, and by this alone is kept in contact with and in fear of the law. The local sphere for the exercise of his vices is one of narrow limits. These restraints keep the pauper under considerable subjection, both to law and to opinion. But no such restraints operate upon the mendicant. No irregularity of conduct, no vice, can exclude him more from general society than his daily mode of life already does; even if, amongst his fellows, any vice should be recognised as sufficiently repulsive to exclude him from their companionship, their unsettled life renders it impossible that the reputation of his odious qualities could very closely attend him. Add to this absence of restraint the positive encouragement given by their more various and adventurous life, the zest with which its frauds and its darings are performed, and the glory with which they are recounted,—these accompaniments have rendered the beggar's life popular as the subject of romance, and occasionally as the object of imitation amongst even the better educated and more fortunate members of society. A pauper was never yet, as the beggar often is, the romantic hero of a ballad or a legend. Here, again, the influences on the individual mendicant are more pernicious than those on the pauper.

The same disadvantageous comparison exists when we consider the unlimited opportunities afforded by the mendicant's mode of life for every species of petty theft and depredation; habits which appear invariably to accompany that of vagrancy.

Extent of mendicancy.

In England we have a difficulty in conceiving the extent to which the habits of mendicancy may be carried on, and the varieties in its practice. It would be comparatively a small evil that a few mendicants should be found to be pre-eminently vicious characters; and this evil would bear no comparison with the evil of a pauperism spread as widely as that formerly in England. But some estimate may be formed of the extent to which mendicancy may be carried where there are no poor-laws, by a reference to the state of Ireland, in which it is represented that, in a population of eight millions, not less than 200,000 habitual mendicants and vagrants existed in the years previous to 1838, and where this number was annually reinforced by the accession of the wives and families of those labourers who left their homes in search of work elsewhere, and which are represented, in the evidence collected by the Commissioners of Poor-Laws Inquiry in Ireland, to have exceeded a million of persons.

The evil of mendicancy, therefore, may even bear a comparison in the extent and number of those practising it with the evil of pauperism even under a bad poor-law.

Distributors of alms and of relief.

Now, let the operation upon the distributors in both cases be compared. No regular machinery is devised for the supply of the mendicant, but he is let loose upon the whole of society, to procure his living by every means by which the sympathies, the virtues, the follies, the weaknesses, or the vices of man may be attacked. Though much of the relief given to the mendicant is prompted by the benevolence of the giver, much also has its origin in sympathies falsely excited; in folly, and especially in the vanity and ostentation of him who dispenses the alms. Much, too, of the alms given to mendicants, in alms-giving countries, is given with the object of acquiring power over a disorderly and reckless class. In all countries, in times of commotion, we have seen this class unscrupulous instruments in the hands of those who, by their largesses, or by the exciting of expectations, had attached a large number of these classes. An example is seen in Spain, where the merit chiefly professed by the distributors of the alms of enormous charities is that of relieving the wants of armies of mendicants. No instrument in the hands of ambitious and designing persons has ever been found more effective than that of retaining large classes of ready-formed mendicants, and of bringing the poorer classes, under specious names, as near as possible to the condition of receivers of alms.

Another advantage which a system of poor-laws has over alms-giving is this: poor-laws are subject to the control of the legislature. Their evils, as discovered, may one by one be pruned away by the power which has created the whole institution; and they can also, at the will of the legislature, if such should appear to be an advisable course, be at any time totally abolished. Mendicancy, on the other hand, and alms-giving, are beyond the effective control of the law. Where once established by habit, no interference of the legislature can effectively modify them, no prohibition of the legislature can abrogate them. The sole corrective appears to be a retreat from private alms, by the adoption of a system of public relief as a means of discountenancing the mendicant's claim.

Thus far have been compared bad poor-laws with mendicancy, with the view to show that, even in this comparison, private alms-giving involves disadvantages greater than those attending a system of public relief. The comparison thus far with poor-laws has, as an abstract question, been unfair, because it seems possible, and recent experience appears to confirm the conclusion, that a poor-law may be so devised and so administered as to take away all plea for crime founded upon absolute necessity; to diminish no man's present motives to labour, and bring up his offspring to industry; to offer the least possible inducements to improvidence, so far as improvidence is involved in neglecting to make accumulations against old age and other calamities. This appears to be rendered possible by such an administration of relief that those capable of working would reject it, as less desirable than independent industry in the time of their health and vigour, and less desirable than any provisions secured by their own prudence for their old age.

CHAPTER II.

HISTORY OF ENGLISH POOR-LAWS TILL THE YEAR 1834.

The most authentic accounts, at least those which prove most incontestibly the prevalence of the habits of mendicancy and vagrancy in England, and give the best evidence of the extent to which their evils were recognised, may be found in the expressions of our early statutes.[1]

It will not be possible to give a detailed description, either of the contents of the series of our statutes or of their effects. The number of statutes passed for the suppression of vagrancy, mendicancy, and idleness, and for the relief of the poor, amount at the least to a hundred and eighty-seven; those now in force, commencing with the statute 43 Elizabeth, and including only the modifications of that law, amount to a hundred and eighteen, and contain matter of itself about equal to four average volumes of the statutes at large. None, therefore, but the most salient points in the legislation of the last four centuries and a half will be adverted to in the following summary of the progress of legislation upon these subjects.

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We first find indications of a general relaxation of the industry of our population in the reign of Richard II. Civil discord had unquestionably its effect in producing the result; but a change in the habits of the population had been produced by the increase of commerce and of communication with other countries, and a large accession had at this time been made to the disposable wealth of the community. The large system of vagabondage, sanctified by the name of pilgrimage, of which the expeditions known as the Crusades were the most salient instance, had begotten a spirit of restlessness and idleness in Europe, infecting even our insular population. It was not so much the habit of beggary as the desire of change and restlessness of life that the statute of 12th Richard II., chap. 7, passed in the year 1388, was intended to repress. This statute, though entirely directed against habits characterized in that day as vagabondage, scarcely recognises beggary as an habitual pursuit. Its main provisions are confined to the object of restraining labourers from changing their abodes. It prohibits any labourer from departing from the hundred, rape, wapentake, city, or borough where he has dwelling, without a testimonial showing reasonable cause for his going, to be issued under the authority of the justices of peace. Any labourer found wandering without such letter is to be put in the stocks till he find surety to return to the town from whence he came. So far are its enactments from affording any evidence that able-bodied persons of either sex exercised by choice to any large extent the trade of mendicancy, that the only other class besides labourers which it recognises are the impotent. As to impotent persons, it provides that they are to remain in the towns in which they be dwelling at the time of the act; or if the inhabitants are unable or unwilling to support them, they are to withdraw to other towns within the hundred, rape, or wapentake, or to the towns where they were born, and there abide during their lives.

Restraint of begging.

From the earliest periods, but from this time especially, begging was an offence; yet the chief enactments of the two succeeding centuries are rather confined to the object of restraining the movements of labourers than to the restraining of able-bodied beggars. The provisions of the 11th Henry VII., chap. 2, however, require beggars not able to work to go to the hundred where last they dwelt, or were best known, or born, without begging out of the hundred. The 19th Henry VII., chap. 12, passed eight years afterwards (in 1504), requires them to go to the town, city, or hundred where they were born, or to the place where they last abode for the space of three years, without begging out of the said city, town, hundred, or place.

The legislation affecting the classes of poor least able to provide for themselves had thus far been entirely restrictive, and contained that element of the poor-laws by which they are connected with police, almost to as great an extent as is to be found in our most recent institutions. They also indirectly contain a complete settlement law; for, by confining the labourers, but especially the impotent poor and beggars, to the places in which they dwelt at the time of the act being passed, or in which they had been born, or to the places of their last abode, they directly settled such persons on the places thus defined, and rendered the districts chargeable with the burden, at least to the extent to which the endowments of the church and the benevolence of individuals could be applied to the purpose. At length, especially after all the revenues of the church were diverted from the purpose of maintaining the poor, legislation becomes of a severe penal character, and is more immediately directed against those who practise mendicancy as a trade, viz., "able-bodied, sturdy, and valiant beggars." At the same time, the distinction becomes more apparent between the impotent poor and those whom the legislature evidently regarded as voluntary poor, and whom the law now subjects to heavy and even sanguinary penalties. The 22d Henry VII., chap. 12, passed in the year 1531, directs the justices to assign to the impotent poor a limit within which they are to beg. An impotent person begging out of his limit is to be imprisoned for two days and nights in the stocks, fed on bread and water, and then sworn to return to the place in which he was authorized to beg. An able-bodied

Settlement law.

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[1] The whole history and successive characters of English vagrancy and mendicancy, and of the legislative efforts to restrain them, may be traced from the seventh century downwards, in the extracts from Saxon, Danish, Norman, and English laws, and a great number of contemporaneous evidences given at length in the Appendix to the Report on the Law of Settlement and Removal of the Poor, House of Lords papers, 1851 (101).

beggar is to be whipped, and sworn to return to the place where he was born, or last dwelt for the space of three years, and there put himself to labour.

Compulsory relief.

Thus far restrictions upon vagrancy, whether originating in misfortune or idleness, or more serious vice, had proved unavailable. The evil had not been repressed; it had evidently increased, and at length drove the legislature to the adoption, not only of severer penalties, according to the old policy, but of a new expedient.

With imperfect machinery for giving effect to its intentions, without security that where its intention was carried into effect evils greater than those against which it was intended to provide might not arise, a system was now created which, in all its policy, is identical with that which now exists in England, and was introduced into Ireland in 1838. The means employed, and not the policy itself, alone distinguish the legislation of the two periods. In the first place, beggary and vagrancy are still to be repressed, but no one is to be driven, by absolute destitution, to an infraction of the law; all excuse is to be taken away from the beggar. In the next place, the sympathy of the community with the law is to be secured by a provision at the public expense against the evil consequences of individual destitution. In the last place, the compulsory provision thus made by the community is to be protected by compelling those capable of exertion, and seeking to avail themselves of it, to accept it subject to the condition of working for the maintenance thus secured to them; a condition obviously intended to be as hard or harder than that upon which the independent man obtains his own support, and rendering the alternative of independent industry preferable to that of dependence on the public charity.[1]

The 27th Henry VIII., chap. 25, passed in the year 1536, recites the act last mentioned, and adds, that no provision is made for the support of the impotent, nor for the setting and keeping in work of valiant beggars; and then enacts, that the land-officers of every city, shire, town, and parish, to which such poor creatures or sturdy vagabonds shall repair, in obedience to that act, shall most charitably receive the same, and shall keep the same poor people by way of voluntary and charitable alms, within the respective cities, shires, towns, hundreds, hamlets, and parishes, by their discretion, so that none of them, of very necessity, shall be compelled to beg openly, and shall compel the said sturdy vagabonds and valiant beggars to be kept to continual labour, in such wise as they may get their own living by the continual labour of their own hands, on pain that every parish making default shall forfeit twenty shillings a month. Alms-giving otherwise than to these common boxes, or common gatherings, or to fellow-parishioners, or prisoners, is prohibited on forfeiture of ten times the amount given. A sturdy beggar is to be whipped the first time, his right ear cropped the second time; and if he again offend, he is to be sent to the next jail till the quarter sessions, and there to be indicted for wandering, loitering, and idleness; and if convicted, *shall suffer execution of death as a felon*, and an enemy of the commonwealth.

As far as the policy of the succeeding legislation is concerned, its intention appears to be fully expressed by the terms of this statute. In all the succeeding period we find a very large variety of means adopted for the purpose still of giving effect to the same policy; sometimes an increase of severity, even beyond the rigour of this statute, against the beggar and vagrant; sometimes an improved machinery for succouring the impotent, especially for the assessment and levying of the funds, and for producing an effective responsibility in the officers charged with this duty; and eventually a more comprehensive system devised for effectuating the whole of the objects clearly contemplated by the statute of Henry, without the adoption of any other than those objects, but intended merely to prevent the evils resulting from the defective means and instruments previously employed for their attainment.

Accordingly we find in the statutes of the reign of Edward V., "the foolish pity and mercy of them which should have seen to the execution of the goodly laws before enacted, and the perverse nature and long-accustomed idleness of persons long given to loitering," inveighed against in the usual declamatory manner of preambles of that period; but we find indications of the growth of a conviction that the excessive penalties of the previous legislation had defeated the operation of the law. The enactments against vagrancy are therefore rendered somewhat milder; an able-bodied poor person who does not apply himself to some honest labour, or offer to serve, though only for meat and drink, if nothing more is to be obtained, shall be taken for a vagabond, branded on the shoulder with the letter V, and adjudged a slave for two years to any person who shall demand him, to be fed on bread and water and refuse meat, and caused to work by beating and chaining, or otherwise. If he run away within that period, he is to be branded on the cheek with the letter S, and *adjudged a slave for life*; if he run away again, he is to suffer *death as a felon*. If no one demand such loiterer, the place where he is born is to keep him as a slave, and is to see him set to work; and if it fail in this, it is to be mulcted in a penalty, a city forfeiting five pounds, a borough forty shillings.

Removals.

By this statute the old settlement law had ingrafted on it a law of removal. The taking surety of the impotent poor, that they would repair to the places where they were born, or had dwelt for the last three years, had been found ineffectual; the officers were therefore directed to convey the impotent poor on horseback, in cart, chariot, or otherwise, to the next constable, and so from constable to constable, till they be brought to the place where they were born, or most conversant for the space of three years, there to be kept and nourished of alms.

Gradual improvements were introduced in the detail by several successive statutes. The 3d and 4th Edward VI. provides for the keeping of a book in every city, corporate town, and parish, containing the names of householders and of the impotent poor. It makes some approach to a special organization of officers for the objects. The minister and churchwardens are to appoint collectors of alms; the alms, however, are voluntary, except to the extent to which they can be enforced by the exhortation of the minister and bishop: it being provided, that if any one able to further this charitable work do obstinately and frowardly refuse to give, or do discourage others, the minister and churchwardens are to exhort him gently. If he will not be so persuaded, the bishop is to send for him to induce and persuade him by charitable ways and means, and so, according to his discretion, to take order for the reformation thereof. These provisions being made, beggary is still prohibited, upon the pains limited in the previous statutes.

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[1] With regard to the erroneous impression until recently prevalent in England, that poor-laws were institutions peculiar to this country, it is important to observe that the system of law for repression of mendicancy and relief of the poor here described, was a direct and palpable imitation of a continental institution. Six years before the enactment of the 27th Henry VIII. (that is, in the year 1530), the magistrates of Ypres in Belgium enacted a set of regulations, which, as stated by Mr Hallam, manifestly form the model which was followed a few years afterwards by the legislature of this country. The regulations in question appear to have been adopted in the adjacent provinces of the Netherlands under the sanction of an edict of Charles V. (See a paper by Mr Hallam in the first volume of the Transactions of the Statistical Society.) The still earlier legislation of the Romans may be traced from the provision for the *lex frumentaria* of the younger Gracchus all through the subsequent period of the republic and the empire both in the West and East. The ecclesiastical provisions of the middle ages were only too ample, and are traceable with equal ease and fulness. (See Pashley on Poor-Laws, 1852, chap. iv.) The yet earlier legislation of the Greeks has left frequent traces to be found, especially in the Attic orators. A very amusing illustration is to be found in the oration of Lysias, *Ὑπὲρ τοῦ ἀδυνατοῦ*. (See Boeck Staatsh, i. 343.)

Compulsory tax.

As might be expected, the gentle askings of the collectors, and the exhortations of the minister, the charitable ways and means of the bishop, appear to have been without effect in persuading the parishioners to intrust to the collectors the distribution of their alms. We find, therefore, twelve years afterwards (5th Elizabeth, chap. 3, passed in 1563), an attempt made to give additional effect to these provisions, by enabling the bishop to bind any person to appear at the next sessions, if his froward and wilful mind should obstinately refuse to give weekly relief to the poor according to his ability. Here the justices are to come in to the aid of the bishop, and are charitably and gently to persuade and move the said obstinate person to extend his charity. If he will not be persuaded, the justices with the churchwardens may tax the obstinate person according to their discretion; and on his refusal to pay, the justices, on the complaint of the churchwardens, are to commit him to jail until he does pay the sum taxed, and arrears. Thus was created a compulsory tax, though at first only as an alternative where voluntary contributions were refused.

The important statute, 14th Elizabeth, represents in its recitals, that "all parts of this realm of England and Wales be presently with rogues, vagabonds, and sturdy beggars exceedingly pestered, by means whereof daily happeneth in the same realm horrible murders, thefts, and other great outrage." The sense of these evils seems to have dictated a resort to a new variety of punishments; all persons defined in the act as rogues and vagabonds, or sturdy beggars, are for the first offence to be grievously whipped and burned to the gristle of the right ear with a hot iron, of the compass of an inch about; for the second, they are to be deemed felons; for the third, to suffer death as felons, without benefit of clergy. But now chiefly is to be observed the improvements in assessing the burthen; the justices having power to settle the poor for their abidings, and to set down what portion the weekly charge towards the relief and sustentation of the poor people would amount unto, and that done, shall by their good discretions tax and assess all the inhabitants dwelling within the divisions limited for the settling of the poor.

License to beg.

This statute contained, like some of its predecessors, an enactment giving a limited license for begging, provided that the poor people ask relief of victualling only in the same parish where they do dwell, so the same be at the time and in the manner directed by the churchwardens and overseers of the poor. This license has been extended, modified, and restrained, but still kept in existence, especially in the case of discharged soldiers and prisoners, up to recent times.

43 Eliz. cap. 2.

So far we have seen the gradual accumulation of all the elements contained in the poor-laws up to the time of the last amendment in the system made in the reign of the late King William IV. The statute which permanently fixed all these elements in one system was passed in the last year of the reign of Elizabeth, the celebrated statute the 43d Elizabeth, chap. 2. In this statute we find extreme severity abandoned, and its place supplied with a reasonable test of destitution of such as may be presumed to be voluntary beggars or idlers. The able-bodied, married or unmarried, are to be set to work; children may be apprenticed; only the "lame, impotent, old, blind, and such others among them, being poor and not able to work," are to have "necessary relief," without being set to work. For the latter class of poor, habitations may be provided at the expense of the parish, on the waste or common; and for the support of these, but not of any who are able to work, natural relations, that is, father, mother, grandfather, grandmother, and children, may be compelled to contribute.

The voluntary contribution, and the co-operation of the minister and bishop, are abandoned. A tax upon the inhabitants, and upon the occupiers of property, strictly defined, and upon the parson or vicar, is directed to be levied in every parish; effectual means are given for the assessment, collection, and levy of the tax; for appeal for remedy against its unjust assessment; for the contribution of adjoining parishes and hundreds, where the means of the single parish failed; above all, a special authority is created for giving effect to the provisions of the law. Overseers, not less than two, nor more than four, are to be appointed in every parish yearly, in Easter week, to act with the churchwardens, subject to the orders of the justices, and liable to penalties for neglect of their office.

Such was the system in operation for above two centuries and a quarter, from 1601 to 1834, without material modification: its whole provisions were extended in the reign of Charles II. to town-lands; the law of settlement was also extended and refined, in the same and subsequent reigns; and the provision for setting the able-bodied to work was rendered more effectual by the 9th George I. chap. 7, which enabled every parish to provide a workhouse, or, if too small or too poor, to combine with others for the purpose of maintaining a workhouse, and which rendered the offer of relief in a workhouse a sufficient bar to the claim to any other relief.

Diminution of vagrancy.

These statutes, aided by all those other causes which operated upon the morals and the general prosperity of the people, had produced the effect intended by their authors; and whatever may have been the portion attributable to any of the several causes in operation, the result unquestionably was, that vagabondage and idleness were found in the last half of the last century to prevail in England to a less extent than in any of the larger states of Europe, with the single exception of Holland. As the extremity of the evil had formerly produced severity in the law, so the disappearance of the evil produced a disastrous relaxation in the restrictions of which the experience and prudence of the previous times had discovered the necessity.

Relaxation of the law.

About the middle of the last century, there began to be indicated in the acts of the legislature a growing opinion, that the severity of the tests applied to the recipients of public charity required to be diminished. In the 7th year of the reign of George III., guardians were especially appointed in the city of London, the city of Westminster, the bills of mortality, the liberties of the Tower, not with any administrative or executive powers, but "to guard against the dangerous consequences which may arise from the false parsimony, negligence, inadvertency, or the annual change of parish officers." These guardians were to protect the poor children of the metropolitan districts to which the act applied, by visiting the places in which they were kept, reporting on their condition, and calling on the assistance of the magistracy where it might seem necessary.

Throughout the whole of the reign of George III. the example thus set was followed by constantly succeeding and increasing relaxations of the rigour of the old law; some of the most conspicuous instances of which are to be found in Gilbert's act, passed in the twenty-second year of that reign, 1782, which, instead of rendering the workhouse a means of testing voluntary pauperism, by employing the able-bodied, thereby deterring them from habits of pauperism, by rendering their state less eligible than one of independence, reverses this principle entirely. It confines the use of the workhouse to that of a mere receptacle for the aged, impotent, and infant poor; expressly provides, that the able-bodied shall not be required to enter it; and proceeds to the absurd extent in favour of the able-bodied pauper, of compelling the guardians appointed under the act to find work near their own houses, for all applicants able and professing to be willing to work, but unable to get employment; and to make up any supposed deficiency of wages out of the poor-rates.

The evils of able-bodied pauperism were now proceeding with alarming rapidity. The consummation of the false policy of the legislature during this reign was attained in East's act, 55 Geo. III. chap. 137 (passed 1815). It consists of a complete abrogation of almost all the salutary portions of the 9th Geo. I. chap. 7. The relief was no longer required to be received in the workhouse, it was to be *paid* to any poor person or persons at his or her or their home or homes, house or houses. Justices were empowered to order this relief for any time they might be pleased to define, not exceeding three months; and two justices might make subsequent orders for relief for a period not exceeding six months. The preambles and recitals in this statute consist, as might have been anticipated from the previous course of legislation, of descriptions of the grossest disorders on the part of those maintained by the public charity.

The insolence and general demoralization of the pauper, the most alarming deterioration in the industry of the labouring classes, especially the agricultural labourers of the south of England, the unscrupulous interference of the employers with the wages and the mode of remuneration of the employed, were abundantly shown by the committees of both houses of parliament, appointed to inquire into the progress of the poor-laws, especially by that appointed on the motion of Mr Sturges Bourne (in 1817), and upon the report of which the act known as Sturges Bourne's act (59 Geo. III., c. 12) was founded. This act does not entirely abandon the views which dictated the dangerous provisions of East's act. Generally, however, it was a salutary measure, providing for the election of bodies of persons called select vestries, who were to supersede the overseers, and, in some measure, the justices, more effectually to avoid the evils consequent upon the administration being intrusted to annual and unpaid officers. It made provision also for the performance of the overseers' duties, by paid and permanent assistant overseers.

From the end of George III.'s reign to the year 1834, though legislative changes were not unfrequent, they were confined to matters of detail, involving neither the abandonment nor the adoption of any important principle.

CHAPTER III.

EFFECTS OF POOR-LAWS IN ENGLAND.

Commission of Inquiry.

Effects of previous legislation.

In the course of the foregoing description of some of the principal statutes, the useful or injurious principles involved in them have been shortly referred to; the effects operated by the working out of those principles have been less remarked upon.

Beneficial effects.

In the main, the *good effects* had consisted in reclaiming from a vagrant and profligate course of life a large proportion of the population. The settlement laws especially had been instrumental in this; for we find that the creation of the claim to relief from the parish funds had so far attracted the idle and dissolute from the practice of common begging, that, in the reign of Charles II., after a period of great commotions, when many disbanded soldiers and sailors, and others, who, in a period of turmoil, are either forced upon or voluntarily resort to an unsettled life, had much swelled the mass of those who in previous times would have been found in the ranks of sturdy and valiant beggars, the same order of people were now found to be systematic though rapacious paupers, making the parish fund the means of levying their contributions on society.[1]

Operation.

We find in a statute of Charles II. in the second year of the Restoration (13 and 14 Car. II. cap. 12), a multifarious law of settlement created, upon reasons thus expressed in the recital: "Whereas, by reason of some defects in the law, poor people are not restrained from going from one parish to another, and therefore *do endeavour to settle themselves in those parishes where there is the best stock*, the largest commons or wastes to build cottages, and the most woods for them to burn and destroy; and when they have consumed it, then to another parish; and at last become rogues and vagabonds, to the great discouragement of parishioners to provide stocks, where it is liable to be devoured by strangers." From this period the whole of the efforts of the legislation are incessantly made to prevent the too easy settling of the poor upon the parish; but they all equally prove that settled pauperism had more and more taken the place of vagrant mendicancy.

If to the poor-laws can be attributed this good effect, they must also necessarily have the credit of preventing that train of evils which follows upon the existence of a large mass of mendicants and vagrants in any community. The corruption, the demoralization, the inevitable bodily misery, to the mendicant himself, his connections, and his offspring; the extortion, depredation, and the more violent crime which such a class have almost unlimited opportunity and frequent temptation to commit; next the deterioration in the feelings and habits of those whom circumstances may bring in contact with them; the refuge which they afford to all who are inclined or tempted to fall off from the more steady and respectable occupations of life, many of whom are even tempted by the mere spirit of adventure to become recruits; add to these the alarm and practical annoyance, which renders the industry and morality of all other classes less a security for enjoyment; and we have some idea of the train of evils which was cut off when vagrancy on the great scale was at length, in England, successfully suppressed, to be replaced in a great measure by voluntary pauperism.

Injurious effects.

The *bad effects*, as they arose in detail, usually led to the successive modifications which we find the law in its progress undergoing from time to time. Many of the evils temporarily and partially felt might even now be described with advantage, and as warnings to future legislators; but generally their interest would at present be greater to the historian and antiquary than in a practical point of view. At no period had these laws attained such an influence on the interests of the community of England and Wales, as about the years 1831 and 1832, when the effects of the whole system had reached a greater height than had ever yet been attained.

In these years many of the anticipations of those who had seen the evil tendency of the poor-laws, and had prophesied that the results of the system must be disastrous, were realized in such a way as to produce a conviction in the most supine, that either a remedy must be applied, or a wide-spread ruin be submitted to. In an article in this work, written in the year 1823, by one of the most humane and enlightened men who had ever given their attention to the subject, it was shown that a crisis was impending, and could not be far removed; that, as the law then stood, the poor-rates were increasing in the same ratio in which the prudence and forethought of the receivers of relief were being destroyed. It was shown, that "whenever the charge upon the land in support of those who do not add enough to the annual produce of the country to support themselves is so great that the land can be no longer cultivated with profit, then of course it will be thrown up." In 1832 was seen the phenomenon of whole parishes of fertile land being abandoned, "the landlords giving up their rents, the farmers their tenancy, the clergyman his glebe and the tithes." We find the paupers assembled and refusing to accept of the offer of the whole land of the parish, avowing that “they liked the present system better.”[1]

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[1] See Report on the Law of Settlement and Removal, 1851, pp. 40–43, and the passages in the Appendix there referred to.

In the article referred to, it had been shown that the system then in operation was fraught with the danger of discontented turbulence. “Every one is brought up with the belief that the state is bound to provide him with employment and support. When, therefore, the employment assigned him is such as he does not approve, and the recompense awarded him falls below his expectations (and when the employment is a loss to the public, the recompense must often be below even reasonable expectations), he becomes an irritated and uneasy subject; and, unless he is restrained by the fear of detection, or by the better influence of moral principles, he vents his spleen by any mischief that is in his power, and the burning of stackyards, or the destruction of machinery, results from an unsatisfactory interview with the overseer, or an ineffectual appeal to the bench of magistrates.”

In the winter of 1831–1832 we find the practical exemplification of these remarks. In a period of great general prosperity, we find that portion of England in which the poor-laws had had their greatest operation, and in which by much the largest expenditure of poor-rates had been made, the scene of daily riot and nightly incendiarism; and we discover a state of things which, in the sober language of statistics, is thus described: “Of ninety-three parishes in four ill-administered counties, the population is 113,147, and the expenditure L.81,978, or fourteen and fivepence per head; and of eighty parishes in three well-administered counties, the population is 105,728, and the expenditure L.30,820, or five and ninepence per head; and those counties in which the expenditure is large are those in which the industry and skill of the labourers are passing away, the connection between the master and servant has become precarious, the unmarried are defrauded of their fair earnings, and riots and incendiarism have prevailed. The three counties in which it is comparatively small are those in which scarcely any instance of fire or tumult appears to have occurred; in which mutual attachment exists between the workman and his employer; in which wages depend not on marriage, but on ability, and the diligence and skill of the labourers are unimpaired or increased.”

The danger had become too real to be neglected if a remedy could be found; but parliamentary inquiries, both in the upper and lower house, had repeatedly taken place comparatively without result, the largest effect produced by any committee of either house being that of the committee appointed in 1817, which in the year 1819 produced Sturges Bourne’s act; an act, as events proved, almost wholly unproductive of effect in checking the course of pauperism.

An effort of another kind was now felt to be necessary, and was accordingly made. A Commission of Inquiry was appointed, consisting of individuals remarkable alike for their interest in the subject and their knowledge of its principles and details; its powers, though only those of ordinary commissioners of inquiry, far exceeding, for useful purposes, those of a parliamentary committee. Its labours were continued incessantly for two years, uninterrupted by the vacation or recess. Nor were these confined alone to the examination of witnesses summoned from different parts of the country. The commission were enabled to examine the locality itself, the documentary evidence, the living witnesses, and the actual operation of the system on the spot, and this by the members of their own body, as well as by assistant-commissioners appointed to visit and examine all parts of the country, some of whom extended their inquiries into Scotland, France, Flanders, and Guernsey, whilst they also collected a vast mass of interesting evidence from our ambassadors and diplomatic agents in different countries of Europe and America.

The result was a scrutinizing and minute inquiry; which was followed by the suggestion of amendments in the law, the practical deductions from the experience, yet so systematic, that their operation could be calculated almost with certainty, and which were, therefore, proportionally to be relied upon. As the success in inquiring had been great, so was the confidence of the legislature readily given; and the most important statute upon the subject passed since the statute of Elizabeth was carried through both houses by large and confident majorities.

A description of the evils found in operation at the time of the inquiry, of the remedies proposed for those evils, and of the enactments actually adopted, will afford the most complete and consistent view of the present system of English poor-laws. The statement of the operation of the previous law, and of the remedies proposed, will be condensed from the Report of the Commissioners of Inquiry; that of the enactments passed, from the Act for the Amendment and better Administration of the Laws relating to the Poor in England and Wales, being 4 and 5 William IV. cap. 76.

The poor entitled to relief consist, *first*, of those who are impotent through old age or bodily infirmity, through infancy, through accident, or through mental infirmity; and, *secondly*, of the able-bodied poor.

I.—RELIEF OF THE ABLE-BODIED.

It was in the relief of the able-bodied that the greatest pecuniary expenditure, and, above all, that the greatest moral evils, were incurred. The relief granted was in a great measure unconditional; in many districts it had superseded the necessity of practising even the thrift and husbandry necessary in expending the funds placed at the pauper’s disposal.

The great source of abuse was found to be the out-door relief afforded to the able-bodied on their own account, or on that of their families. This was given either in kind or in money.

1. *Out-Door Relief of the Able-Bodied in Kind.*

The out-door relief of the able-bodied, when given in kind, was found to consist rarely of food, rather less unfrequently of fuel, and still less unfrequently of clothes, particularly shoes; but its most usual form was that of relieving the applicants, either wholly or partially, from the expense of obtaining house-room. This last mode of relief was extensively prevalent, and productive of important consequences, both direct and indirect.

Partial relief from the expense of obtaining house-room was given, or professed to be given, whenever the occupant of a cottage or an apartment was exempted on the ground of poverty from the payment of rates. In a great number of cases the labourer, if a parishioner, was not only exempted from rates, but his rent was paid out of the parish funds.

2. *Out-Door Relief of the Able-Bodied in Money.*

The out-door relief afforded in money to the able-bodied on their own account or on that of their families was found to be still more prevalent. This was generally effected by one or other of the five following expedients, which may be concisely designated as, first, relief without labour; secondly, the allowance system; thirdly, the roundsman system; fourthly, parish employment; and, fifthly, the labour-rate system.

Relief without Labour.—By the parish giving to those who

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[1] See, as to the parish of Cholesbury in Berkshire, the Report from his Majesty’s Commissioners for Inquiring into the Administration and Practical Operation of the Poor-Laws, 8vo Fellowes, 1834. See also instances in Warwickshire, in Mr Villiers’s Report, in Appendix (A).

Operation.

Operation.

were or professed to be without employment, a daily or a weekly sum, without requiring from the applicant any labour.

Sometimes relief, to an amount insufficient for a complete subsistence, was afforded, without imposing any further condition than that the applicant should shift, as it was called, for himself, and give the parish no further trouble. In a still greater number of instances the relief was found to have been given on the plea that the applicant had not been able to obtain work, that he had lost a day or a longer period, and was entitled, therefore, to receive from the unlimited resources of the parish what he had not been able to obtain from a private employer.

Allowance.—By the parish allowing to labourers who were employed by individuals, *relief in aid of wages.*

In some places allowance was found to have been given only occasionally, or to meet occasional wants; to buy, for instance, a coat or a pair of shoes, or to pay the rent of a cottage or an apartment. In others, it was considered that a weekly sum, or more frequently the value of a certain quantity of flour or bread, was to be received by each member of a family.

The latter practice was found to have been sometimes matured into a system, forming the law of a whole district, sanctioned and enforced by the magistrates, and promulgated in the form of local statutes.[1] The allowance fixed by these scales was usually called *bread-money.* Of this kind of relief it was observed, that

" No attention was paid to either the character of the applicant or the causes of his distress. In fact, he was considered as entitled to it without pleading any distress.

" The *bread-money* was hardly looked upon by the labourers in the light of parish relief. They considered it as much their right as the wages they received from their employers, and, in their own minds, made a wide distinction between ' taking their *bread-money*' and ' going on the parish.' "

It was further to be observed, that even in those parishes in which the amount of allowance was supposed to depend upon that of the applicant's earnings, the inquiry as to the amount of those earnings was never carried back further than the current or the previous week or fortnight. The consequence was, that many of those who at particular periods of the year received wages far exceeding the average amount of the earnings of the most industrious labourer, received also large allowances from the parish.[2]

Again, there were other parishes in which no sort of inquiry whatever was made respecting earnings; but the birth of a child endowed the parent with an allowance, whatever might have been his previous income.[3] It was to be observed, also, that under the *scale system* a child was very soon considered as an independent claimant for relief, and entitled to it, though residing with his parents, and though they might have been at full work on high wages.[4]

The Roundsman System.—By the parish paying the occupiers of property to employ the applicants for relief at a rate of wages fixed by the parish, and depending not on the services but on the wants of the applicants, the employer being repaid out of the poor-rate all that he had advanced in wages beyond a certain sum. This was the house-row, or roundsman, or billet, or ticket, or stem, system.

According to this plan, the parish in general made some agreement with a farmer to sell to him the labour of one or more paupers at a certain price, and paid to the pauper out of the parish funds the difference between that price and the allowance which the scale, according to the price of bread and the number of his family, awarded to him. It had received the name of the billet or ticket system, from a ticket signed by the overseer, which the pauper in general carried to the farmer as a warrant for his being employed, and took back to the overseer, signed by the farmer, as a proof that he had fulfilled the conditions of relief. In other cases the parish contracted with some individual to have some work performed for him by the paupers at a given price, the parish paying the paupers. In many places the roundsman system was effected by means of an auction.[5]

Parish Employment.—By the parish employing and paying the applicants for relief.

The 43d Elizabeth does not authorize relief to be afforded to any but the impotent, except in return for work. And much as this part of the statute had been neglected, its validity was still recognised by the judges. In the King *v.* Collett, 2, Barnewell and Cresswell, 324, Lord Tenterden decided it to be the duty of overseers to provide work, if possible, before they afforded relief. And whatever might have been the difficulty of finding *profitable* work, one could scarcely suppose the existence of a parish in which it would not be *possible* to provide some work, were it merely to dig holes and fill them again. But though such was the law, it appears, from the parliamentary returns, that payment for work was the most unusual form in which relief was administered. The poor-rate returns for the year ended the 25th of March 1832 state, that out of L.7,036,968 expended in that year for the relief of the poor, less than L.354,000, or scarcely more than one twentieth part, was paid for work, including work on the roads and in the workhouses. This might easily be accounted for.

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[1] " *Town of Cambridge.*—The churchwardens and overseers of the poor are requested to regulate the incomes of such persons as may apply to them for relief or employment, according to the price of fine bread, namely,

" A single woman, the price of...3½ quartern loaves per week.
" A single man........................4½ ... ditto.
" A man and his wife.................8 ... ditto.
" A man and his wife and one child...9½ quartern loaves per week.
" Ditto ditto and two children......11 ... ditto.
" Ditto ditto and three ditto.........13 ... ditto.

" Man, wife, four children and upwards, at the price of 2½ quartern loaves per head per week.

" It will be necessary to add to the above income in all cases of sickness or other kind of distress, and particularly of such persons or families who deserve encouragement by their good behaviour, whom parish-officers should mark both by commendation and reward.

" By order of the magistrates assembled at the town-hall, Cambridge,—A Chevell, clerk to the magistrates.—*Nov.* 27, 1829." (Report, p. 22.)

[2] Mr Bishop found a parish in the Bedford Level, in which a recently drained tract of fertile land requires more labour than the settled inhabitants can provide, and the average yearly earnings of a labourer's family are from L.60 to L.70; but during a frost, and generally from November to March, almost every labourer comes on the parish. When they commented on these facts in their conversation with a resident magistrate, his answer was, " Why, what are we to do? they spend it all, and then come and say they are starving; and you must relieve them." " In our vestry," says Mr Russell, " which meets every Monday, the calculation is confined to the earnings of the past fortnight. No further retrospect is ever taken either for or against the claimant. In some parishes I believe the account is settled once a week instead of once a fortnight." Sometimes the inquiry does not go back even to the beginning of the week at the end of which the claim is made. (*Ibid.* p. 29.)

[3] In the northern division of Devonshire, says Mr Villiers, " The practice of granting allowance for children is so general and confirmed, that the pauper is in the habit of giving formal notice to the overseer of the pregnancy of his wife. Should the overseer refuse the application for the fixed sum allowed for the second, third, or fourth child, the magistrates' single inquiry, on his appearance before them under a summons, would have been as to the custom of the parish or the hundred. ' At what number does allowance begin with you?' was the common mode of putting the question, as I was repeatedly assured by overseers. The previous or present earnings of the pauper, or of any of his family, were never mentioned." (*Ibid.* p. 31.)

[4] At Friston, Suffolk, Mr Stuart states that " a child is entitled to relief at the rate of three shillings a week on his own account from the age of fourteen." " At Bottisham, Cambridge," says Mr Power, " a boy of sixteen receives two shillings and sixpence for the week; he lives at home with his father; the family consists of his father, mother, brother, and himself. Seventeen is the age at which a young man is considered entitled to separate relief as an unemployed labourer; his pay then is three shillings and sixpence. The allowance to our single young men out of employ used to be two shillings and tenpence; according to scale, four quartern loaves, present price eightpence-halfpenny. Last November they came to the sessions in a body to complain of the insufficiency, and it was then raised to three shillings and sixpence. This sum they receive when above a certain age, although residing with their families." (*Ibid.* p. 31.)

[5] Mr Richardson states that, " in Sulgrave, Northamptonshire, the old and infirm are sold at the monthly meeting to the best bidder, at prices varying, according to the time of the year, from one shilling and sixpence a week to three shillings; that at Yardley-Hastings, all the unemployed men are put up to sale weekly; and that the clergyman of the parish told him that he had seen ten men the last week knocked down to one of the farmers for five shillings, and that there were at that time about seventy men let out in this manner out of a body of 170." (*Ibid.* p. 28.)

In the first place, to afford relief gratuitously proved less troublesome to the parochial authorities than to require work in return for it. Wherever work was to be paid for, there must have been superintendence; but where paupers were the work-people, much more than the average degree of superintendence was necessary. In ordinary cases, all that the superintendent inquired was, whether the workmen had performed an average day's work; and where the work was piece-work, he needed not make even that inquiry. The practice of his trade fixed the market-price of the work, and he paid it without asking whether the workman had been one hour or one day in performing it, or whether it exceeded or fell below his wants. But the superintendent of pauper labourers had to ascertain, not what was an average day's work, or what was the market-price of a given service, but what was a fair day's work for a given individual, his strength and habits considered; at what rate of pay for that work, the number of his family considered, he would be able to earn the sum necessary for his and their subsistence; and, lastly, whether he had in fact performed the amount which, after taking all these elements into calculation, it appeared that he ought to have performed. It will easily be anticipated that this superintendence was very rarely given; and that in far the greater number of instances in which work was professedly required from paupers, in fact no work was done. In the second place, collecting the paupers in gangs for the performance of parish work was found to be more immediately injurious to their conduct than even allowance or relief without requiring any work at all. Whatever might have been the general character of the parish labourers, all the worst of the inhabitants were sure to be amongst the number; and it is well known that the effect of such an association is always to degrade the good, not to elevate the bad. It was amongst these gangs, who had scarcely any other employment or amusement than to collect in groups, and talk over their grievances, that the riots of 1830 appear to have originated. And, thirdly, parish employment did not afford direct profit to any individual. Under the greatest part of the other systems of relief, the immediate employers of labour could throw on the parish a part of the wages of their labourers. They preferred, therefore, those modes of relief which they could turn to their own account, and out of which they could extract profit under the mask of charity.[1]

In some of the agricultural districts, the prevalent mismanagement in this respect had created in the minds of the paupers a notion that it was their right to be exempted from the same degree of labour as independent labourers. But in many places, whilst the labour required by the parish was trifling, the pay equalled or exceeded that of the independent labourer.[2]

The Labour-Rate System.—By an agreement amongst the rate-payers, that each of them should employ and pay out of his own money a certain number of the labourers who had settlements in the parish, in proportion, not to his real demand for labour, but according to his rental or to his contribution to the rates, or to the number of horses that he kept for tillage, or to the number of acres that he occupied, or according to some other scale.

II.—OUT-DOOR RELIEF OF THE IMPOTENT.

The out-door relief to the impotent, using that word as comprehending all except the able-bodied and their families, was subject to less abuse. The great source of poor-law mal-administration was the desire of many of those who regulated the distribution of the parochial funds, to extract from it a profit to themselves. The out-door relief to the able-bodied, and all relief which was administered in the workhouse, afforded ample opportunities for effecting this purpose; but no use could be made of the labour of the aged and sick, and there was little room for jobbing if their pensions were paid in money. Accordingly, it was found that even in places distinguished in general by the most wanton parochial profusion, the allowances to the aged and infirm were moderate.

General Remarks on Out-door Relief.

We have dwelt at some length on out-door relief, because it appears to be the relief which was most extensively given, and because it appears to have contained in itself the elements of an almost indefinite extension; of an extension, in short, which might ultimately have absorbed the whole fund out of which it arose. Amongst the elements of extension were the constantly diminishing reluctance to claim an apparent benefit, the receipt of which imposed no sacrifice, except a sensation of shame, quickly obliterated by habit, even if not prevented by example; the difficulty, often amounting to impossibility, on the part of those who administered and awarded relief, of ascertaining whether any and what necessity for it existed; and the existence in many cases of positive motives on their parts to grant it when unnecessary, or themselves to create the necessity.

From the evidence collected by the Commissioners, it will be seen how zealous must be the agency, and how intense the vigilance, to prevent fraudulent claims from crowding in under such a system of relief. But it would require still greater vigilance to prevent the *bona fide* claimants from degenerating into impostors; and it was an aphorism amongst the active parish-officers, that " cases which are good to-day are bad to-morrow, unless they are incessantly watched." A person obtained relief upon the ground of sickness; but when he became capable of returning to moderate work, he was tempted, by the enjoyment of subsistence without labour, to conceal his convalescence, and fraudulently extend the period of relief. When it really depended upon the receivers whether the relief should cease with its occasion, it was too much to expect of their virtue that they should, in any considerable number of instances, voluntarily forego the pension.

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[1] "Either the work was completed by two or three o'clock, and the rest of the day spent in idleness, or the men consumed the whole day in the lazy performance of the work of a portion of the day."..."In Pollington, Yorkshire, they send many of them upon the highways, but they only work *four* hours per day. This is because there is not employment sufficient in that way; they sleep more than they work, and if any but the surveyor found them sleeping, they would laugh at them. In Rancliffe they employed a man in the winter of 1830-1831 to look over them; but they threatened *to drown* him, and he was obliged to withdraw."..."In the parish of Mancetter, in the county of Warwick, the overseer stated that young able men received two shillings and sixpence a week, and the magistrates would not allow the parish to employ them more than three days in the week, in order that they might get work for themselves. Upon inquiry, it appeared that their characters soon became so infamous, that no person would employ them, having devoted their spare time to thieving and poaching. In the township of Atherstone, Mr Wellday, a manufacturer, impatient of contributing his property to the encouragement of vice and idleness by paying men without exacting labour, purchased some water-carts himself, for the purpose of giving employment to paupers. The magistrates refused to allow them to be used after twelve o'clock in the day, in order that these men might procure work for themselves. They were also described as becoming the most worthless characters in the town." (Report, p. 37, 38.)

[2] Eastbourne, in Sussex, was a striking example. In that place, in which the average wages earned from individuals by hard work are twelve shillings a week, the parish pays for nominal labour as much as sixteen shillings a week. Two families alone received from it, in the year ended Lady-day 1832, L.92. 4s.; and the wives of the few independent labourers regret that their husbands are not paupers. (Ibid. p. 39.)

Another evil connected with out-door relief, and arising from its undefined character, was the natural tendency to award to the deserving more than was necessary, or, where more than necessary relief was afforded to all, to distinguish the deserving by extra allowances. The scale which we have already referred to, promulgated by the magistrates for the town of Cambridge, as well as several others, all directed the parish-officers to reward or encourage the deserving. The whole evidence showed the danger of such an attempt. It appeared that such endeavours to constitute the distributors of relief into a tribunal for the reward of merit, out of the property of others, had not only failed in effecting the benevolent intentions of their promoters, but had become sources of fraud on the part of the distributors, and of discontent and violence on the part of the claimants.

A common consequence was, that to satisfy the clamours of the undeserving, the general scale of relief was raised; but the ultimate result of such a proceeding appears always to have been to augment the distress which it was intended to mitigate, and to render still more fierce the discontent which it was intended to appease. Profuse allowances excited the most extravagant expectations on the part of the claimants, who conceived that an inexhaustible fund was devoted to their use, and that they were wronged to the extent of whatever fell short of their claims. Such relief partook of the nature of indiscriminate alms-giving in its effects, as a bounty on indolence and vice; but the apparently legal sanction to this parochial alms-giving rendered the discontent on denial the most intense. Wherever, indeed, public charities are profusely administered, we hear, from those who are engaged in their administration, complaints of the discontent and disorders introduced.

It appeared from all the Commissioners' returns, that in every district the discontent of the labouring classes was proportioned to the money disbursed in poor-rates or in voluntary charities. The able-bodied unmarried labourers were discontented, from being put to a disadvantage as compared with the married. The paupers were discontented, from their expectations being raised by the ordinary administration of the system, beyond any means of satisfying them.[1]

Those who worked, though receiving good wages, being denominated *poor*, and classed with the really indigent, thought themselves entitled to a share of the " poor funds." Whatever addition was made to allowances under these circumstances excited the expectation of still further allowances, increased the conception of the extent of the right, and insured proportionate disappointment and hatred if that expectation were not satisfied. On the other hand, wherever the objects of expectation had been made definite, where wages, upon the performance of work, had been substituted for eleemosynary aid, and those wages had been allowed to remain matter of contract, employment had again produced content, and kindness became once more a cause of gratitude.

III.—IN-DOORS RELIEF.

In-doors relief, that which was given within the walls of the poor-house, or, as it was usually, but very seldom properly, denominated, the workhouse, was also subject to great mal-administration. But in by far the greater number of cases it was a large alms-house, in which the young were trained in idleness, and ignorance, and vice; the able-bodied maintained in sluggish and sensual indolence; the aged and more respectable exposed to all the misery incident to dwelling in such a society, without government or classification; and the whole body of inmates subsisting on food far exceeding, both in kind and in amount, not merely the diet of the independent labourer, but that of the majority of the persons who contributed to their support.

Progress of pauperism.

The progress of pauperism, as far as it can be inferred from the progress of expenditure, had been such under the unamended law during the present century as is exhibited in the following table;[2] to which the prices of wheat, and the quantities which might have been purchased by the total sums expended, are added, to check somewhat the misapprehension which might otherwise arise as to the true value of the sums expended through the fluctuating values of money during the interval to which the table extends.

Years.	Sums expended for Relief of the Poor.	Population o England and Wales.*	Average Price of Wheat per Quarter.		Number of Quarters of Wheat for which the money could have been exchanged.
	L.		s.	d.	
1801	4,017,871	8,872,980	115	11	693,234
1803	4,077,891	9,148,314	57	1	1,428,751
1811	6,656,105	10,163,676	92	5	1,440,455
1814	6,294,581	10,755,034	72	1	1,746,474
1815	5,418,846	10,979,437	63	8	1,702,255
1816	5,724,839	11,160,557	76	2	1,503,240
1817	6,910,925	11,349,750	94	0	1,470,409
1818	7,870,801	11,524,389	83	8	1,881,466
1819	7,516,704	11,700,965	72	3	2,080,748
1820	7,330,256	11,893,155	65	10	2,226,913
1821	6,959,249	11,978,875	54	5	2,557,763
1822	6,358,702	12,313,810	43	3	2,940,440
1823	5,772,958	12,508,956	51	9	2,231,094
1824	5,736,898	12,699,098	62	0	1,850,612
1825	5,786,989	12,881,906	66	6	1,740,447
1826	5,928,501	13,056,931	56	11	2,083,221
1827	6,441,088	13,242,019	56	9	2,269,987
1828	6,298,000	13,441,913	60	5	2,084,855
1829	6,332,410	13,620,701	66	3	1,911,671
1830	6,829,042	13,811,467	64	3	2,125,772
1831	6,798,888	13,897,187	66	4	2,049,916
1832	7,036,968	14,105,645	58	8	2,398,966
1833	6,790,799	14,317,229	52	11	2,566,601

* The numbers given in this column for the years 1801, 1811, 1821, and 1831, are those ascertained at the enumeration of those years; those stated for the intermediate and for subsequent years are computed from the baptisms and burials, and from the rate of increase, as ascertained at each census.

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[1] " They, as well as the independent labourers, to whom the term poor is equally applied, are instructed," says Mr Chadwick, " that they have a right to ' a *reasonable* subsistence,' or ' a *fair* subsistence,' or ' an *adequate* subsistence.' When I have asked of the rate-distributors what '*fair*,' or '*reasonable*,' or '*adequate*' meant, I have in every instance been answered differently; some stating they thought it meant such as would give a good allowance of ' meat every day,' which no poor man (meaning a pauper) should be without; although a large proportion of the rate-payers do go without it." It is abundantly shown in the course of this inquiry, that where the terms used by the public authorities are vague, they are always filled up by the desires of the claimants, and the desires always wait on the imagination, which is the worst regulated and the most vivid in the most ignorant of the people. In Newbury and Reading, the money dispensed in poor-rates and charity is as great as could be desired by the warmest advocate either of compulsory or of voluntary relief; and yet, during the agricultural riots, many of the inhabitants in both towns were under strong apprehensions of the rising of the very people amongst whom the poor-rates and charities are so profusely distributed. The violence of most of the mobs seems to have arisen from an idea that all their privations arose from the cupidity or fraud of those intrusted with the management of the fund provided for the poor. (Report, p. 50.)

[2] For the like information, collected for the years subsequent to 1833, during which the amended law has been in operation, see the table at page 315.

The following represents the results of the above table at the periods of the decennial census.

Years of the Census.	Cost per head on total Population. s.	d.
1801	9	1
1811	13	1
1821	10	7
1831	9	9

The foregoing table, however, can by no means be adopted as indicating with any accuracy the real progress of the evil. In the first place, the progress in the amount expended only indicates an increased proportion of pauperism, inasmuch as the increase in the sums expended exceeds the increase in the population. Thus, from the year 1803 to the year 1823, the population increased from nine to twelve millions, whilst the sums expended for relief of the poor increased from four to five and three-fourth millions. This indicates but a small increase in pauperism relatively to the increase of population, and the number of paupers in every hundred persons might have been nearly the same at the two periods compared. We find, however, that the increase in the value of the money expended, as reckoned in the wheat purchaseable by it, was as fourteen to twenty-two, that is, an increase in pauperism which would have exceeded the progress of the population in the proportion of twenty per cent.; and in this period it is to be supposed, either that the numbers of paupers may have increased in the proportion of twenty per cent., or that the effective relief, that is, the quantity of commodities given on the one side and received on the other, had at least increased in the proportion of twenty per cent. But, during all this period, other necessaries and commodities of life had diminished in price in a still greater proportion. Thus it was calculated by Mr Porter,[1] from the extensive data contained in his tables, that the sum of nine shillings and ninepence, the amount of relief per head, in the year 1831, would have purchased as much as seventeen shillings would have bought in 1801.

The sums returned as expended in poor-rates, though, since 1834 and at present, they represent the whole amount of the burthen, did, in fact, up to the year 1834, include but a small part of the whole charge. Of the various modes in which relief was given to the able-bodied labourer, or rather extorted from a portion of the parishioners, two of those above described, viz. relief on the roundsman system, and that on the labour-rate system, were means of casting the burthen of a man's support upon a parishioner, without the levying or expending of any rate. No means exist to enable us to calculate the amount of the burthen thus incurred by the occupiers; and of course the means of calculating the sacrifices of landlords, who made deductions of rate in regard of these charges, are equally wanting. We however find, that amongst the most conspicuous instances in which the rents of a parish had been nearly or entirely absorbed in the relief afforded by these two systems, very small rates had been levied upon the occupiers in money. The Commissioners' evidence, particularly their Appendix (D), is full of instances of this source of indirect and unrecorded loss.[2]

It must also be borne in mind, that in proportion as these modes of relief to the able-bodied were extended, and as the real amount of the burthen was thus concealed, the deterioration of the labourer's habits of industry, involving, not a loss of the particular year, but a permanent destruction of his utility as a labourer, as well as of his prudence and morality, were proceeding in a ratio even more rapid than the progress of these insidious forms of relief.

Objections to amendment,

It might have been hoped, that, under such circumstances, a general feeling would have arisen that these abuses were intolerable, and must be put an end to at any risk or at any sacrifice. But many who acknowledged the evil seemed to expect the cure of an inveterate disease without exposing the patient to any suffering, or even discomfort. They exclaimed against the burthen as intolerable, but objected to any amendment, if it appeared that it must be, or might be, attended with any inconvenience. And amongst all parties, labourers, employers of labourers, and owners of property, many were to be found who thought that they would suffer some immediate injury from any change which should tend to throw the labouring classes on their own resources.

1. On the part of labourers;

The labourer felt that the existing system, though it generally gave him low wages, always gave him easy work. It gave him likewise, strange as it may appear, what he valued more, a sort of independence. He needed not bestir himself to seek work, he needed not study to please his master, he needed not put any restraint upon his temper, he needed not ask relief as a favour. He had all a slave's security for subsistence, without his liability to punishment. As a single man, indeed, his income did not exceed a bare subsistence; but he had only to marry, and it increased. Even then it was unequal to the support of a family, but it rose on the birth of every child. If his family were numerous, the parish became his principal paymaster; for, small as the usual allowance of two shillings a-head might be, yet, when there were more than three children, it generally exceeded the average wages given in a pauperised district. A man with a wife and six children, entitled, according to the scale, to have his wages made up to sixteen shillings a week, in a parish where the usual wages paid by individuals did not exceed ten shillings or twelve shillings, was almost an irresponsible being. All other classes of society were exposed to the vicissitudes of hope and fear; he alone had nothing to lose or gain.[1]

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[1] See the Progress of the Nation, by G. R. Porter, Esq. small 8vo, 1836, p. 83.

[2] Mr Cowell's Report contains the examination of a large farmer and proprietor at Great Shelford, who, on 500 acres, situated in that parish, pays ten shillings per acre poor-rate, or L.250 a year. In addition, though he requires for his farm only sixteen regular labourers, he constantly employs twenty or twenty-one. The wages of these supernumerary labourers amount to L.150 a year, and he calculates the value of what they produce at L.50 a year; so that his real contribution to the relief of the poor is not L.250, the sum which would appear in the parliamentary returns, but L.350. In the same Report is to be found a letter from Mr Wedd of Royston, containing the following passages:—

"An occupier of land near this place told me to-day that he pays L.100 for poor-rates, and is compelled to employ fourteen men and six boys, and requires the labour of only ten men and three boys. His extra labour at ten shillings a week, which is the current rate for men, and half as much for boys, is L.130."

"Another occupier stated yesterday that he held 165 acres of land, of which half was pasture. He was compelled to employ twelve men and boys, and his farm required the labour of only five. He is about to give notice that he will quit. Every useless labourer is calculated to add five shillings an acre to the rent of a farm of 100 acres."

It contains also a letter from Mr Nash of Royston, the occupier of a farm in a neighbouring parish, stating that "The overseer, on the plea that he could no longer collect the money for the poor-rates without resorting to coercive measures, and that the unemployed poor must be apportioned amongst the occupiers of land in proportion to their respective quantities, had required him to take two more men. Mr Nash was consequently obliged to displace two excellent labourers, and of the two men sent in their stead one was a married man with a family sickly, and not much inclined to work; the other a single man addicted to drinking."

The subsequent history of these two men appears in Mr Power's Report. One killed a favourite blood mare of Mr Nash's, and the other he was obliged to prosecute for stealing his corn. (Report, p. 55.)

It appeared to the pauper, that the government had undertaken to repeal, in his favour, the ordinary laws of nature; to enact that the children should not suffer for the misconduct of their parents, the wife for that of the husband, or the husband for that of the wife; that no one should lose the means of comfortable subsistence, whatever might be his indolence, prodigality, or vice; in short, that the penalty which, after all, must be paid by some one for idleness and improvidence, should fall, not on the guilty person, or on his family, but on the proprietors of the lands and houses encumbered by his settlement. Can we wonder if the uneducated were seduced into approving a system which aimed its allurements at all the weakest parts of our nature, which offered marriage to the young, security to the anxious, ease to the lazy, and impunity to the profligate?

2. On the part of employers;

The employers of paupers were attached to a system which enabled them to dismiss and resume their labourers according to their daily or even hourly want of them, to reduce wages to the minimum of what would support an unmarried man, and to throw upon others the payment of a part, frequently of the greater part, and sometimes almost the whole, of the wages actually received by their labourers. And even if they paid in rates what they would otherwise pay in wages, they preferred the payment of rates, which occurred at intervals, and the payment of which might from time to time be put off, to the weekly ready-money expenditure of wages. High rates, too, were a ground for demanding an abatement from rent; but high wages were not.[2]

3. On the part of proprietors.

The owners of rateable property might, at least, have been expected to be favourable to any change which should avert their impending ruin. But of the property liable to poor-rates, there is a portion, and a portion of considerable importance, less from its value, than from the number of rate-payers amongst whom it is divided, and their influence in vestries, which not only is, in practice, exempted from contributing to the parochial fund, but derives its principal value from the mal-administration of that fund. This property consists of cottages or apartments inhabited by the poor. In almost all places the dwellings of the poor, or at least of the settled poor, were exempted from rates, and, besides, the rent was, in a very large proportion, paid by the parish. The former practice enabled the proprietor often to increase the rent by the amount of rate remitted, and always to be an owner of real property, and yet escape the principal burdens to which such property was subjected. The latter practice gave him a solvent tenant, and, if he had influence with the vestry or with the overseer, a liberal one.

Of the higher classes of landlords, those who reside in towns seldom took much part in parochial government, or had any distinct ideas as to the extent or the effects of its mismanagement; and the majority of those who had become familiarized with the abuses of the villages seem to have acquired habits of thinking and feeling and acting which unfitted them to originate any real and extensive amendment, or even to understand the principles upon which it ought to be based. To suppose that the poor are the proper managers of their own concerns; that a man's wages ought to depend on his services, not on his wants; that the earnings of an ordinary labourer are naturally equal to the support of an ordinary family; that the welfare of that family naturally depends on his conduct; that he is bound to exercise any sort of prudence or economy; that anything is to be hoped from voluntary charity; are views which many of those who had long resided in pauperised rural districts seem to have rejected as too absurd for formal refutation.

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[1] Even in Barnard Castle, in Durham, Mr Wilson states, that if any remonstrance is made on account of the applicant's bad character, the reply of the magistrate commonly is, "the children must not suffer for it."

The following answers are specimens of the feeling and conduct in the southern districts:—"The answer given by the magistrates, when a man's bad conduct is urged by the overseer against his relief, is, 'We cannot help that; his wife and family are not to suffer because the man has done wrong.'"

"Too frequently petty thieving, drunkenness, or impertinence to a master, throw able-bodied labourers, perhaps with large families, on the parish funds, when relief is demanded as a right, and, if refused, enforced by a magistrate's order, without reference to the cause which has produced his distress, viz. his own misconduct, which remains as a barrier to his obtaining any fresh situation, and leaves him a dead weight upon the honesty and industry of his parish."

Mr Stuart states, that in Suffolk, children deserted by their parents are in general well taken care of, and that the crime of deserting them is largely encouraged by the certainty that the parish must support the family. Even the inconvenience which might fall on the husband by the punishment of his wife for theft, is made the subject of pecuniary compensation at the expense of the injured parish. Under what other system could there be a judicial instrument concluding thus:—

"And whereas it appears to us that the wife of the said Robert Reed is now confined in the house of correction at Cambridge, and that he is put to considerable expense in providing a person to look after his said five children, we do therefore *order* the churchwardens and overseers of the poor of the said parish, or such of them to whom these presents shall come, to pay unto the said Robert Reed the sum of eleven shillings weekly and every week, for and towards the support and maintenance of himself and family, for one month from the day of the date hereof. Given under our hands and seals this twentieth day of February, in the year of our Lord one thousand eight hundred and thirty-three." (Report, p. 59.)

[2] In Mr Richardson's instructive statement of the reforms effected by Mr Litchfield, in Farthingoe, Northamptonshire, we find that Mr Litchfield has been opposed, not only by the labourers, but by the farmers; first, because they grudged giving the labourer with no children eight shillings a week; secondly, because they were afraid to displease the labourer who had two children, and preferred head-money; and, thirdly, because they were fearful lest, if the rates were lowered, their rents would be raised; and that they encouraged the labourers, at first openly, and afterwards covertly, in their attempts to deter Mr Litchfield by menaces and insult.

"When a valuer," says Mr Cowell, "values a farm to an in-coming tenant, or fixes the rent from time to time (in these parts they have no leases), he says, 'What are your poor-rates?' If the tenant answer, 'Rates are low, but wages are high,' the valuer says, 'I have nothing to do with *wages*, that is your affair; but *rates* are a *positive thing*, and I allow for *them*.' This Mr Ellman considers as a bad custom, as it holds out an inducement to the farmer to prefer low wages and high rates. Tenants at will, says Mr Cogshill, too often think, the more poor-rates the less rent. Confidence between landlord and tenant seems quite lost. I have witnessed a good deal of this."

The following replies to question 36 of the Commissioners' Rural Queries are further testimonies to the same effect.

"I think the poor-laws have not diminished the capital, but rather the rent of the landlord, as the tenant considers rents and rates as payment for the farm, and one can only be increased at the expense of the other."

"The farmers are aware that, excepting in cases of long tenures and very sudden augmentation of rates, the burden does not at all affect them. It is a rent paid to the parish instead of the landowner."

"It should be understood that poor-rates are deducted in all calculations for rent; and that landlords pay them, and not the farmers."

"Capital is decreasing, from the loose manner in which the laws are administered, and the tenants feeling that they do not in effect pay the rates, but the landlord. I cannot otherwise account for the apathy with which they view, and the tenacity with which, in many instances, they defend abuses." (Report, pp. 60, 61, 62.)

Effects of System.

Effects of system on proprietors,

Yet were the effects of the system such, that it might reasonably have been expected that any plan affording a reasonable prospect of a remedy would have been welcomed by all classes. The proprietors, who had been mulcted every year of a larger and larger portion of their income, were not only deprived of the benefits to their property naturally dependent on a constant increase of the population and in the consumption of produce, each such increase bringing with it an accumulating charge of pauperism. Instances of the total abandonment of the land had not yet become numerous, but the approach towards it was in many cases imminent, and in all certain and rapid;[1] whilst every diminution of cultivation was seen to have a double effect in increasing the rate on the remaining cultivation, the number of unemployed labourers being increased at the same instant as the fund for payment of rates was diminished; and the abandonment of property once begun caused the deterioration in the rest to proceed at an accelerated ratio.

on employers,

The employers found the services of their labourers deteriorated by the loss of industry, skill, and intelligence, which can only be secured by a recognition, on the part of the labourer, of the value to himself of such qualities; and they had to contend with many other habits of insolence and insubordination, the natural results of the labourer's ceasing to depend upon his good character.

on the labourers.

But by far the severest sufferers were those for whose benefit the system was supposed to have been introduced and perpetuated,—the labourers and their families. Amongst these the effects were not confined to those who were actually relieved. Instances were everywhere found in which the prudence and forethought of a labourer became his punishment instead of a reward. So onerous was the entire support of a man with a large family, and entirely destitute, that the rate-payers in agricultural parishes were generally agreed in employing such a one, so as to keep his family off the rates, in preference to another who had not married, or who had no family, or who had the means, by greater prudence or by any good fortune, for a while to support himself.[2] The system, in short, was this.

Piece-work was refused to the single man, or to the married man, if he had any property, because they could exist upon day-wages; it was refused to the active and intelligent labourer, because he could earn too much. The enterprising man, who had fled from the tyranny and pauperism of his parish to some place where there was a demand and a reward for his services, was driven from a situation which suited him, and an employer to whom he was attached, by a labour-rate or some other device against non-parishioners, and forced back to his settlement to receive as alms a portion only of what he was before obtaining by his own exertions. He was driven from a place where he was earning, as a free labourer, twelve or fourteen shillings a week, and was offered road-work as a pauper at sixpence a day, or perhaps he was put up by the parish authorities to auction, and sold to the farmer who would take him at the lowest allowance.

Effects of System.

Can we wonder, then, if the labourer abandoned virtues of which this was the reward; if he gave up the economy in return for which he had been proscribed, the diligence for which he had been condemned to involuntary idleness, and the prudence, if it can be called such, which diminished his means just as much as it diminished his wants? Can we wonder if, smarting under these oppressions, he considered the law, and all who administered the law, as his enemies, the fair objects of his fraud or his violence? Can we wonder if, to increase his income, and to revenge himself on the parish, he married, and thus helped to increase that local excess of population which was gradually eating away the fund out of which he and all the other labourers of the parish were to be maintained?

But though the injustice perpetrated upon the man who struggled, as far as he could struggle, against the oppression of the system, who refused, as far as he could refuse, to be its accomplice, was at first sight the most revolting, the severest sufferers were those that had become callous to their own degradation, who valued parish support as their privilege, and demanded it as their right, and complained only that it was limited in amount, or that some sort of labour or confinement was exacted in return. No man's principles can be corrupted without injury to society in general; but the person most injured is the person whose principles have been corrupted. The constant war which the pauper had to wage with all who employed or paid him, was destructive of his honesty and his temper; as his subsistence did not depend on his exertions, he lost all that sweetens labour, its association with reward, and got through his work, such as it was, with the reluctance of a slave. His pay, earned by importunity or fraud, or even violence, was not husbanded with the carefulness which would be given to the results of industry, but wasted in the intemperance to which his ample leisure invited him. The ground upon which relief was ordered to the idle and dissolute was, that the wife and children must not suffer for the vices of the head of the family; but as that relief was almost always given into the hands of the vicious husband or parent, this excuse was obviously absurd. It appears from the evidence that the great supporters of the beer-shops were the paupers.

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[1] See the Commissioners' Report, page 65, where instances like the following are given from all parts of the country. The present is taken from Leicestershire, a county not within the range of the extreme operation of pauperism. "Mr Pilkington's description of several places in Leicestershire is equally alarming. In Hinckley he found the poor-rate exceeding one pound an acre, and rapidly increasing, and a general opinion that the day is not distant when rent must cease altogether. On visiting Wigston Magna. in November 1832, he was informed that the value of property had fallen one half since 1820, and was not saleable even at that reduction. It does not appear, indeed, that it ought to have sold for more than two or three years' purchase, the net rental not amounting to L.4000 a year, and the poor-rate expenditure growing at the rate of L.1000 increase in a single year. And on his return to that neighbourhood, three months afterwards, the statement made to him was, that property in land was gone; that even the rates could not be collected without regular summons and judicial sales; and that the present system must insure, and very shortly, the total ruin of every individual of any property in the parish. We cannot wonder, after this, at the statement of an eminent solicitor at Loughborough, that it is now scarcely possible to effect a sale of property in that neighbourhood at any price."

The following answers, taken from a multitude of others of a similar nature, contained in Appendix (B), are to the same effect:—

"Annual value of the real property, as assessed April 1815, L.3390; annual value of the real property, as assessed November 1829, L.1959. 5s. It has undoubtedly fallen in value since the last valuation, *i. e.* in the last two years; and the population has been more than trebled in thirty years—1801, 306; 1811, 707; 1821, 897; 1831, 938; and that in spite of an emigration of considerable amount, at the parish expense, in 1829. The eighteen-penny children will eat up this parish in ten years more, unless some relief be afforded us." (Report, pp. 65, 66.)

[2] See striking evidences of these influences in the Report, page 78. "Will it be believed that such is not merely the cruelty, but the folly, of the rate-payers in many places, that they prohibit this conduct (the anxiety of an independent labourer to make provisions for his family by his own exertions)—that they conspire to deny the man who, in defiance of the examples of all around him, has dared to save, and attempts to keep his savings, the permission to work for his bread? Such a statement appears so monstrous, that we will substantiate it by some extracts from our evidence."

Sir Harry Verney, in a communication which will be found in Appendix (C), says, "In the hundred of Buckingham, in which I act as a magistrate, many instances occur where labourers are unable to obtain employment, because they have property of their own. For instance, in the parish of Steeple Claydon, John Lines, formerly a soldier, a very good workman, is refused employment because he receives a pension. The farmers say that they cannot afford to employ those for whom they are not bound by law to provide."

The worst of results, however, are still to be mentioned. In all ranks of society, the great sources of happiness and virtue were the domestic affections, and this was particularly the case amongst those who had so few resources as the labouring classes. Now pauperism seems to have become an engine for the purpose of disconnecting each member of a family from all the others, and of reducing all to the state of domesticated animals, fed, lodged, and provided for by the parish, without mutual dependence or mutual interest.[1]

CHAPTER IV.

REMEDIAL MEASURES PROPOSED AND ADOPTED.

The manifest progress from year to year of all these evils; their consummation in many places, and the impending danger of the like consummation in all others; above all, the rural outrages, riots, and incendiarism which prevailed to a most alarming extent from the years 1828 to 1832, more especially in those districts where pauperism most prevailed, and the failure of all previous inquiries by parliamentary committees to devise any effectual remedy whatsoever for even the least of the mischiefs, led to the experiment of a royal commission of inquiry, appointed in 1832, which brought its investigations to a conclusion in 1834 in the form of a very valuable report, presented to both Houses of Parliament early in that year, and in the preparation of the bill which became law, and is the basis of all subsequent legislation, the Poor-Law Amendment Act (4 and 5 Will. IV., c. 76).

The following description will exhibit a mere summary of the remedies proposed and adopted, with little more than hints of the reasonings upon which they were founded.

The Commissioners by no means adopted the opinion that a poor-law could, in a community like ours, be dispensed with. They found that the most pressing of the evils of the poor-laws were those connected with the relief of the able-bodied, and for these they suggested their first remedies. They assumed as their principle of administration, that the public is warranted in imposing such conditions on the individual relieved, as are conducive to the benefit either of the individual himself, or of the country at large at whose expense he is relieved.

Principle of administering relief.

They proposed, then, as the first and most essential of all conditions of relief, that the situation of the pauper, upon the whole, should not be made really or apparently so eligible as the situation of the independent labourer of the lowest class. It was shown throughout the evidence, that as the condition of the pauper class was elevated, the condition of the independent class was depressed, their industry impaired, their employment rendered unsteady, and its remuneration diminished. Such persons, therefore, were under the strongest inducements to quit the *less eligible class of labourers*, and enter the *more eligible class of paupers.* The Commissioners maintained that the converse would be, and was found to be, the effect of placing the pauper class in its proper position below the condition of the independent labourer. They found, on a large examination of the cases of strict administration of relief on the principle of letting the labourer find in the parish the hardest taskmaster and the worst paymaster he can have, that the parish had always become his last, and not his first, resource; and they found largely exemplified those specific results which invariably ensue from such an administration.

Effects of this.

The first and immediate effect, was the conversion of the able-bodied paupers into independent labourers. The second result, indeed a corollary of the first, was the reduction of the parochial expenditure, constituting an increase of the fund for the employment of independent labourers. The third effect, closely connected with and following the absorption of able-bodied paupers, and their conversion into independent labourers, was the rise in wages. The fourth class of the observed specific effects was the diminution, not only of pauper-marriages, but of those imprudent marriages contracted with the knowledge and confidence that the worst result to be apprehended was an eventual dependence upon the poor-rate. The fifth and last specific effect dwelt upon by the Commissioners, and illustrated by their evidence, was the diminution of crime, and the contentment of the labourers increasing with their industry.

The Commissioners, in endeavouring to obtain the general adoption of this principle, cautiously avoided the recommendation of speculative remedies; they dwelt anxiously and emphatically upon the necessity and the safety of adopting a course of legislation which may be considered as wholly experimental. They propose, therefore, no changes in the principle of the law, but confine their recommendations to this, that the means which have been found the most effective in practice, should be applied wherever it was found applicable with the prospect of a beneficial result.

To secure this operation, they recommend the adoption of a new and more responsible agency to co-operate with and control that which had been found for the most part inefficient, or greatly efficient for mischief. Some excrescences in the law they proposed to lop off, but no additions beyond the improvement of the agency were proposed to be introduced in the principle of the statute of Elizabeth, and the succeeding legislation. They recommend, therefore, "that those modes of administering relief which have been tried and found beneficial, be generally enforced" (Report, p. 261); and "that the practice of giving relief in well-regulated workhouses, and the abolition of partial relief to the able-bodied, having been tried and found beneficial, be extended to all places." (*Ibid.* p. 262.)

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[1] "The effect of allowance," says Mr Stuart, "is to weaken, if not to destroy, all the ties of affection between parent and child. Whenever a lad comes to earn wages, or to receive parish relief on his own account" (and this we must recollect is at the age of fourteen), "although he may continue to lodge with his parents, he does not throw his money into a common purse, and board with them, but buys his own loaf and piece of bacon, which he devours alone. The most disgraceful quarrels arise from mutual accusations of theft; and as the child knows that he has been nurtured at the expense of the parish, he has no filial attachment to his parents. The circumstances of the pauper stand in an inverted relation to those of every other rank in society. Instead of a family being a source of care, anxiety, and expense, for which he hopes to be rewarded by the filial return of assistance and support when they grow up, there is no period in his life in which he tastes less of solicitude, or in which he has the means of obtaining all the necessaries of life in greater abundance; but as he is always sure of maintenance, it is in general the practice to enjoy life when he can, and no thought is taken for the morrow. Those parents who are thoroughly degraded and demoralized by the effects of 'allowance,' not only take no means to train up their children to habits of industry, but do their utmost to prevent their obtaining employment, lest it should come to the knowledge of the parish-officers, and be laid hold of for the purpose of taking away the allowance."

"At Princes Risborough, we turned over the minute-book of the Select Vestry, and found the following entries:

"'Samuel Simmons's wife applied to be allowed something for looking after her mother, who is confined to her bed; the mother now receives 3s. 6d. weekly. To be allowed an additional 6d. for a few weeks.'

"'David Walker's wife applied to be allowed something for looking after her father and mother (old Stevens and his wife), now ill, who receive 6s. weekly. To be allowed 1s. weekly.'

"'Mary Lacy applies for something for waiting on her mother, now ill. Left to the governor.'

"'Elizabeth Prime applies to have something allowed for her sister looking after her father, now ill. Left to the governor.'" (Report, pp. 96, 97.)

Workhouse recommendations.

The first and chief specific measure recommended by them was thus described:—" *First*, That, except as to medical attendance, and subject to the exception respecting apprenticeship hereinafter stated, all relief whatever to able-bodied persons, or to their families, otherwise than in well-regulated workhouses (*i. e.* places where they may be set to work according to the spirit and intention of the 43d of Elizabeth), shall be declared unlawful, and shall cease, in manner and at periods hereafter specified; and that all relief afforded in respect of children under the age of sixteen shall be considered as afforded to their parents." (*Ibid.* p. 262.)

This adoption of the workhouse and its restrictions as the condition upon which relief was to be administered, was advised, because it would operate, in the first place, as a self-acting test of the claim of the applicant, it being urged "That it is demoralizing and ruinous to offer to the able-bodied of the best characters more than a simple subsistence. The person of bad character, if he be allowed anything, could not be allowed less. By the means which we propose, the line between those who do, and those who do not, need relief, is drawn, and drawn perfectly. If the claimant does not comply with the terms on which relief is given to the destitute, he gets nothing; and if he does comply, the compliance proves the truth of the claim, namely, his destitution. If, then, regulations were established and enforced with the degree of strictness that has been attained in the dispauperised parishes, the workhouse doors might be thrown open to all who would enter them, and conform to the regulations. Not only would no agency for contending against fraudulent rapacity and perjury, no stages of appeals (vexatious to the appellants and painful to the magistrates), be requisite to keep the able-bodied from the parish; but the intentions of the statute of Elizabeth, in setting the idle to work, might be accomplished, and vagrants and mendicants actually forced on the parish, that is, forced into a condition of salutary restriction and labour. It would be found that they might be supported much cheaper under proper regulations than when living at large by mendicity or depredation." (*Ibid.* p. 264.)

In the *second* place, it was observed by the Commissioners, that "Little need be said on the next effect of the abolition of partial relief (even independently of workhouse regulations), in drawing a broad line of distinction between the paupers and the independent labourers. Experience has shown, that it will induce many of those whose wants arise from their idleness, to earn the means of subsistence; repress the fraudulent claims of those who have now adequate means of independent support; and obtain for others assistance from their friends, who are willing to see their relations pensioners, but would exert themselves to prevent their being inmates of a workhouse." (*Ibid.* p. 276.)

In the *third* place, it was relied on to remove much of the evil arising from the situation of the distributors of relief, who, having many modes of relief at their disposal, were rendered liable to odium and revenge when they chose a more strict mode of administration, and were liable to be seduced by all the motives which the love of popularity, fear, or the cajolery, importunity, or menaces of the applicant presented, to adopt a lax administration.

ow far dopted.

These reasons appear to have entirely prevailed with the legislature, who accordingly adopted them in principle, only modifying them thus far in their form. Combining the effect of this recommendation with the one subsequently to be described, the institution of a central board, the legislature—not fixing any determinate period, but bearing in mind the magnitude of the amount of the existing out-door relief to able-bodied men and their families, with the possibility that the means might not suffice at the periods to be specified, for affording all the workhouse relief that might be required upon a sudden cessation of all other relief—adopted the plan of leaving the determination of the period at which out-door relief should cease, and relief in the workhouse become the invariable rule, to the judgment of the central board; that board having power to adopt a different course in different districts, to adopt the workhouse relief entirely and at once where the means existed, and in others to prepare the way by procuring workhouses, and the gradual substitution of relief in kind for relief in money, and by other intermediate and preparatory operations. (See the Act, sect. 52.) As a consequence of adopting this course, all restrictions imposed by previous acts upon officers, with a view of preventing them from applying the workhouse to able-bodied men, are repealed (sect. 53); and authority to direct the purchase, the furnishing, and the management of workhouses is given to the central board.

Parents' liability.

The legislature adopted, without change, except by way of addition, so much of this recommendation as has the effect of identifying the relief to an unemancipated child with the relief to the parent; the intended effect being to render the parent as responsible for providing for his children as for himself, and subject to the same consequences of neglect in either case, so that he cannot seek relief for his child, without submitting to the condition upon which alone he could obtain it for himself, or otherwise. The legislature adopted with this recommendation these expansions and additions: Relief of the wife is made relief to the husband; of the child, to the parent, to the father if living, or otherwise to the widow (sect. 56); and of the bastard child, to the mother (sect. 71). Moreover, a man marrying since the act, is made liable to maintain the children which his wife has at the time of her marriage, until they attain the age of sixteen, or until her death (sect. 57); this last provision being made with the view that the man is liable to all the civil obligations of his wife existing at the time of her marriage, excepting this obligation, which must commonly have been of all her obligations the most notorious. As the law stood, a woman's family, legitimate or illegitimate, was, by her marriage, cast on the parish for support, and the allowances made to them constituted an annuity to the married couple, forming an inducement of extraordinary frequency to marriages in all other respects the most improvident.

Central control.

The Commissioners' second specific measure was thus proposed:—" We recommend, therefore, the appointment of a central board to control the administration of the poor-laws, with such assistant commissioners as may be found requisite; and that the commissioners be empowered and directed to frame and enforce regulations for the government of workhouses, and as to the nature and amount of the relief to be given and the labour to be exacted in them; and that such regulations shall, as far as may be practicable, be uniform throughout the country." (Report, p. 296.)

The reasons for the establishment of this agency are eloquently and instructively stated in the Report; especially the reasons for relying rather upon a constantly-acting agency, with the means of judging at every moment of the extent to which its measures would then apply, in preference to relying upon a mere legislative enactment, however valuable the principle involved, or stringent its provisions might be. Instances of a striking kind are given, not only of the failure of such enactments, but of their conversion to purposes directly contrary to their object, where no authority was erected responsible for conducting their operations. The other grounds for this recommendation were chiefly the impossibility of choosing a succession of overseers or other annual officers with ap-

Remedial Measures.

Remedial Measures.

propriate knowledge, still less with the enlarged experience of the means to be used, or an enlightened appreciation of the objects to be attained; next, the short duration of the office, which, even where able officers are occasionally found, prevents the continued application of their experience, precisely at the time when their efficiency has become the greatest; next, the division of the districts for which they served, preventing co-operation or the dispersion of the knowledge obtained on one spot over the others to which it might be applicable. Scarcely an instance was found of a parish being dispauperised, the example of which was followed even by a single adjoining parish. Reference was also made to the inadequacy of the motives of any officer to support a sound administration: his responsibility little or none,—his gain no more than that of every other rate-payer occupying as largely as himself,—the loss of time and of energy,—the danger of misapprehension by those he sought to serve, and of failure in the whole object, great,—the certainty of odium from the pauper and from the prejudiced amongst his fellow-parishioners, and of jealousy from rival officers, being inevitable,—on the other hand, the strength of the interests in abusive administration, by which one man may make to himself a gain of the losses of many, whilst by the best administration he can only save himself from the loss falling to the share of one,—the confederacy of those who recognise their interest in such corrupt gain,—the popularity to be acquired by liberality in the disposal of funds contributed by others,—form some few of the motives to uphold abusive administration. In these views the Commissioners adopted the conclusion, that whatever might be the intentions of the legislature, they would be best carried out by a permanent authority, accumulating experience in itself, independent of local control, uninterested in favour of local abuse, but responsible for carrying into effect the law which it was appointed to execute. This recommendation was adopted by the legislature, according to the spirit in which it was made. A board of three commissioners was to be appointed by the king (sects. 1 to 11), themselves appointing assistant commissioners, capable of receiving the powers of the commission by delegation (sects. 8 to 13); the commission having power to direct and control the whole administration of relief throughout England and Wales, and especially the government of workhouses, and it being left to them to determine the extent to which the measures to be carried out should be rendered uniform.

Union of parishes. But the districts for the administration of relief, that is, parishes by the statute of Elizabeth, and town-lands by the 13th and 14th Charles II., had been fortuitously created, sometimes containing but one householder, sometimes containing a population exceeding 100,000. There were in 1831, in England and Wales, fifty-six parishes containing less than ten persons, and which may be therefore calculated, one with the other, to contain but two adult males; a hundred and forty-eight parishes containing but from ten to twenty persons, the largest of these on the average containing five adult males; and five hundred and thirty-three parishes containing from twenty to fifty persons, the largest of which would give less than twelve adult males per parish. Taking into consideration the small number of our adult male population who can read and write, a conception may be formed of the absurdity of the expectation, that every parish can adequately supply a constant succession of annual officers competent to perform the very complicate and difficult duties of the levier and collector of rates, and distributor of relief.

The evidence shows a large proportion of the overseers exercising these functions, though unable otherwise to sign their accounts than by their mark, attested by the justice's clerk. But if it was difficult to find a supply of officers for these districts, it would have been preposterous to expect that each district should supply itself with an efficient workhouse, however indispensable that should be as a means of protection to its population. It was found, on an examination of the largest, of the smallest, and of the intermediate parishes, in the seven first counties in England, taken in alphabetical order, that the largest districts gave the lowest cost per head, the smallest gave the greatest cost per head, and those of intermediate size an intermediate cost. The results are thus stated in the Report: The sixty-seven largest parishes gave 9s. $0\frac{3}{4}$d. per head in population; the sixty-six intermediate gave 14s. 4d. per head in population; the sixty-seven least gave 14s. $11\frac{3}{4}$d. per head in population; whilst, if we take all England, there are the still more striking results, viz. the hundred absolutely largest parishes, containing a population of 3,196,064, gave 6s. 7d. per head; the hundred intermediate parishes, containing a population of 19,841, gave 15s. per head; the hundred least parishes from which poor-rate returns are made, with a population of 1708, gave L.1. 11s. $11\frac{1}{2}$d. per head.

Such are the results as tested by the cost of administration in the larger and in the smaller districts; but the moral effects in producing pauperism were as disastrous in the smaller districts. The Commissioners observe, that they "have no recent returns of proportions of paupers in the parishes referred to in the preceding statement; but on referring to the parliamentary returns of the number of paupers in each parish in the years 1803 and 1813, it appears that the number of persons relieved in the large and small parishes bore some proportion to their relative amount of rates. In the three hundred parishes of which the comparative amount of the poor's rates on the population has been stated, the average number of persons relieved was, in the hundred largest parishes, in 1803, 1 in 16, or $6\frac{1}{4}$ per cent.; in 1813, 1 in 13, or $7\frac{3}{4}$ per cent.: in the hundred intermediate ditto, in 1803, 1 in 10, or 10 per cent.; in 1813, 1 in 8, or $12\frac{1}{2}$ per cent.; and in the hundred smallest ditto, in 1803, 1 in 6, or $16\frac{2}{3}$ per cent.; in 1813, 1 in 4, or 25 per cent." And the progress of the disaster was shown to be most rapid in the smallest districts: thus, "the increase of pauperism on population, from 1803 to 1813, was, in the hundred largest parishes, $1\frac{1}{2}$ per cent.; in the hundred intermediate ditto, $2\frac{1}{2}$ per cent.; and in the hundred smallest ditto, $8\frac{1}{3}$ per cent." The economy of extended management was thus experimentally proved in every possible direction, and the moral interests were shown to be the same with the pecuniary.

The Commissioners entered largely into the examination of this subject in all its bearings, and ended by recommending "that the central board be empowered to cause any number of parishes which they may think convenient, to be incorporated for the purpose of workhouse management, and for providing new workhouses where necessary; to declare their workhouses to be the common workhouses of the incorporated district, and to assign to those workhouses separate classes of poor, though composed of the poor of distinct parishes, each distinct parish paying to the support of the permanent workhouse establishment, in proportion to the average amount of the expense incurred for the relief of its poor for the three previous years, and paying separately for the food and clothing of its own paupers." This recommendation was adopted by the legislature in all points. The common workhouses are provided for by sections 23, 24, 26; the maintenance of the workhouse and establishment charges is fixed in the proportion of the average expenditure of the three previous years by section 28, with the power of taking future averages; the cost of the maintenance of its individual paupers being borne by each parish, under section 26.

Accounts. The necessity of providing for a clear and uniform system of accounts was shown in an extraordinary manner in the inquiries of the Commission; but it is too obvious to reemedial Measures.

quire further remark, and the previous observations show in some measure the difficulty of obtaining efficient parochial officers, and the necessity of resorting to further means to attain the object.

The Commissioners recommended "that the central board be empowered and required to take measures for the general adoption of a complete, clear, and, as far as may be practicable, uniform system of accounts." This recommendation was also adopted in full by the legislature, the Commissioners' powers being given by section 15, the audit being provided for by sections 46 and 89.

Paid and permanent officers.

Upon the subject of officers, the Commissioners recommend, "that the central board be empowered to incorporate, for the purpose of appointing and paying permanent officers, and for the execution of works of public labour;" and "that the central board be directed to state the general qualifications which shall be necessary to candidates for paid offices connected with the relief of the poor, to recommend to parishes and incorporations proper persons to act as paid officers, and to remove any paid officers whom they shall think unfit for their situations."

This also is adopted in the 46th section of the act, except that the Commissioners have no power to recommend the persons to act as paid officers, but have ample powers to determine, by regulation, the qualification and removal of all paid officers. The chief remaining recommendation affecting the general administration of the law by the Commissioners was, "that the board be required to submit a report annually to one of your majesty's principal secretaries of state, containing, 1. an account of their proceedings; 2. any further amendments which they may think it advisable to suggest; 3. the evidence on which the suggestions are founded; 4. bills carrying those amendments, if any, into effect, which bills the board shall be empowered to prepare with professional assistance."

This is also adopted, as far as the annual report is concerned, without, however, any definition in the act of the subjects upon which the Commissioners are to report, that being left to their discretion and to the condition of affairs to determine, section 5; they are to make a current record of their proceedings, section 4; and they are bound to give any information respecting their proceedings which the secretary of state may at any time call for, section 6.

Remedial Measures.

Settlement law.

The remaining recommendations of the Commissioners relate chiefly to the law of settlement and that of bastardy. These subjects were more important when all who could gain a settlement might claim the benefit of that settlement, without any check. The improved administration, especially the inducements which now act as restraints upon the applications for relief, have diminished the motives to the voluntary pauper to fix his settlement in a good parish, and have proportionally diminished the danger to parishes, both from the attempts of the pauper, and from the exertions of the officers of other parishes to shift their burthens, by giving to their own poor the means to acquire a new settlement elsewhere. The most important change in the settlement law recommended and adopted, was that which repealed the settlement by hiring and service; a settlement which impeded the free circulation, the effects of which in restraining labourers to their parishes, and creating a reliance on their parishes, was shown to constitute the great plague-spot of the poor-law system as it then existed.[1] This law of settlement was repealed by the 64th and 65th sections, as were the settlement by occupation of a tenement without payment of poor-rates by the 66th, and that by apprenticeship to the sea-service by the 67th; and improvements in the whole law of removal, by which great wrong had been mutually done by parishes one to the other, were introduced by the 79th and following sections.

Bastardy law.

The bastardy law had made it a more prudent speculation for a woman to have a family of bastard children than to have an equal number of legitimate children, by enabling her to cast off the burthen of the children, which the widow could not do, and thus to enforce from the parish, and through the parish from whomsoever she charged as the father, such a contribution as would induce her to keep them. This law, also, by subjecting the person charged as the father, and who could not give security to pay, to imprisonment, was a means of terror by which a woman was often enabled to compel a marriage; a means to which recourse was had to an extent almost incredible.[2]

These demoralizing influences the legislature, by the re-

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[1] "The Reverend R. R. Bailey, chaplain to the Tower, who has had extensive opportunities of observing the operation of the poor-laws in the rural districts, was asked,—'Can you give any instances within your own knowledge, of the operation of the existing law of settlement? I was requested by Colonel Bogson, Kesgrove House, to furnish him with a farming bailiff. I found a man in all respects qualified for his situation; he was working at nine shillings a week in the parish where I lived. The man was not encumbered by a family, and he thankfully accepted my offer; the situation was, in point of emolument, and comfort, and station, a considerable advance; his advantages would have been doubled. In about a week he altered his mind, and declined the situation, in consequence, as I understood, of his fearing to remove from what was considered a good parish to a bad one, the parish to which it was proposed to remove him being connected with a hundred house, in which there is more strict management. I was requested by a poor man, whom I respected, to find a situation for his son in London. The son was a strong young man, working at that time at about eight shillings a week. I eventually succeeded in getting him a good situation of one guinea per week in London, where his labour would have been much less than it was in the country; but when the period arrived at which he was expected in London, he was not forthcoming. It appeared he had altered his mind, and determined not to take the place; as I understood, his reason for refusing to accept it arose from a reluctance to endanger his settlement in his parish. Such are the instances which are continually presented to my observation with respect to the operation of the present system of settlement.'

"Among our present modes of conferring a settlement," says Mr Russell, in the replies to which we have already adverted, "that by hiring and service is incomparably the most pernicious; it tells the poor man that he shall encounter a prohibitory duty in every market in which he attempts to dispose of the only commodity he must live by selling; it shuts the door against the most respectable and advantageous employment in which a servant can engage; by abridging the term, it impairs the strength of the connection between him and his master; and it not only drives the servant from his place, but often betrays him, during the interval between his being discharged from one house and hired at another, into bad company, dissipation, and vice. (Report, p. 155-6.)

[2] The following is an instance of the testimony as to the operation of the act, given in a letter from the overseer of Llanasa, in the county of Flint, in answer to an inquiry from the board, "Why the bastards in the parish are so few now? I can only observe, that, in the first place, we never force the putative father to marry the mother; and we compel the mother, as well as the father, to pay her quota towards the maintenance of the child. This was our simple mode of treating the business. One thing I must observe, and it tells well for the new poor-law act, that in our parish we have from fifteen to twenty weddings in the year, and it seldom happened that at the ceremony the bride did not think it decent and requisite (I am now speaking of the lower order of persons) to conceal her shape under a cloak. But in the eighteen marriages which we have had since last August, all the ladies, except one, retained their virgin shape, and appeared without the mantle." (First Annual Report, pp 57, 58.)

"An unmarried girl, upon leaving the workhouse after her fourth confinement, said to the master, 'Well, if I have the good luck to have another child, I shall draw a good sum from the parish; and, with what I can earn myself, shall be better off than any married woman in the parish;' and the master added, that she had met with the good luck she hoped for, as she told him, a short time before I was at Holbeach, that she was five months gone with child. I asked him what she had for each child? He answered, two commendation of the commissioners, deprived of further effect, *first*, by rendering the mother of a bastard liable for its maintenance, in the like manner as a widow for the maintenance of her legitimate children, section 71; *secondly*, by rendering it unlawful to pay to her any sums which the putative father might be compelled to contribute for the reimbursement of the parish; and *thirdly*, by rendering it necessary that evidence additional to that of the mother should be required to corroborate her charge against the person accused of being the father.

Such, in the main, were the recommendations of the commissioners, the views with which they were urged, and those with which they were adopted by the legislature. Other provisions were also adopted, necessary, indeed, to give effect to these more important purposes, but not of sufficient importance, or sufficiently characteristic of any great principle, to require remark here.

The like remark applies to a considerable bulk of subsequent legislation, enacted for the purpose mainly of giving effect in detail to the first principles of the Poor-Law Amendment Act, and of modifying the old law in many particulars, to accommodate it to the wants of the present time. Such incidental legislation must continue in almost every session, until the proper step is taken of abolishing wholly the vast mass of obsolete legislation accumulated during two centuries and a half, and of re-enacting, in one consistent whole, such portions of it as are now of practical use. The whole of the legislation subsequent to 1834 will be found described, with the occasions and motives of the several modifications, in the annual reports of the Poor-Law Commission and the Poor-Law Board.

CHAPTER V.

EFFECTS OF THE AMENDED SYSTEM.

It has been thought most desirable to set forth thus fully the history of the mischiefs of the English poor-laws, and the description of the remedies devised for their removal; for the danger of like mischiefs still lurks in the system; it has not been radically extirpated by any general change of principle, and is only kept at arm's length by an improvement in the administration of the law, which is the subject of constant attack, and in so far as one of its main points is concerned, the central board, is still only renewed by annual acts from year to year.

But the history of the operations subsequently to 1834 may be given in less detail, more especially because the whole is accessible at a very small cost in the annual reports of the Poor Law Commission.

Progress of organization.

The first important step in bringing into operation the improved system of administration was the combination of the parishes, individually too small to supply or provide a good machinery, into unions of parishes, and to place these under the management of boards of guardians, elected annually by the rate-payers of each parish, to provide for the appointment of permanent paid officers, to establish workhouses and to regulate the modes of relief and employment of the poor relieved, and to regulate the mode of accounting for all funds received or expended, and an efficient mode of periodical audit. When parishes were large and populous enough to provide separately these essentials of effective administration, they were in some cases merely placed under boards of guardians; and when under previous acts an organization existed similar to that of unions or boards of guardians under the Poor-Law Amendment Act, these have been retained.

It appears from the reports of the commissioners that the local divisions of England and Wales are now such as may be seen in the following table:—

Authority.	Description.	Number of Parishes.
Poor-Law Amendment Act	585 Unions	13,964
	20 Single parishes	20
Local acts (various)	21 Unions	320
	15 Single parishes	15
Gilbert's Act (22 Geo. III., c. 83)	12 Unions	200
	2 Single parishes	2
43 Elizabeth, cap. 2	89 Parishes (including the Scilly Islands as one parish)	89
	Total	14,610

Of these unions and parishes, organized and acting in like manner as in unions, 111 were declared and organized in the first year, 252 in the second, 205 in the third year, and 17 in the fourth year. These unions have since become the districts of administration of the act for the registration of births, deaths, and marriages. Each union is administered by a board of guardians, one guardian at least being elected for each parish or townland. This board meets in most cases weekly; but many instances exist where, by improved skill in the performance of their functions, and by diminished pauperism, they are enabled to perform their duties efficiently by meeting once a fortnight.

Within the four years succeeding 1834 as many as 328 unions had workhouses completed and in operation; and 141 had workhouses building, or in course of alteration. In subsequent years the provision has been slowly carried out in other unions and parishes; and at length nearly the whole country is provided with this requisite of good management. The whole amount expended in providing new workhouses up to the 31st December 1857 was L.4,168,759, 5s. 1d., and in altering and enlarging old workhouses, L.792,772, 14s. 2d.; in all, L.4,961,531, 19s. 3d. Besides these amounts expended in workhouses, L.137,665, 10s. 6d. has been expended in providing separate school-buildings for pauper children. Each union is provided with the following officers:—A clerk (usually a professional man), auditor, chaplain, medical officers, relieving-officers, master and matron of the workhouse, schoolmaster and schoolmistress, and porter.

These arrangements involve a large expenditure, but are indispensable to secure the advantages of an improved administration, and of the vastly preponderating saving derivable only from a better system. The first efforts of the improved administration were great and striking, and many of the most valuable of the results are still in full operation. The greatest and most demoralizing and dangerous of all abuses, the creation and maintenance of a great mass of able-bodied pauperism received at once a check which has remained in full force, and is still reducing the amount of old pauperism of this kind, and preventing a new growth which would otherwise have surely succeeded to the old. The system which demoralized employers as well as labourers, the payment of wages, in whole or in part, by the relief of people while in employment, was immediately stopped by the introduction of the new law. On the other hand, the converse abuse, which, in proportion as able-bodied pauperism was encouraged in any parish, caused the really impotent and destitute to be neglected, is in nearly as great a degree corrected. The improved conduct of the

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shillings; and that women in that neighbourhood could easily earn five shillings a week all the year through. Thus she will have fifteen shillings a week." (Ibid., p. 172.)

"At Nuneaton, the solicitor to the parish, Mr Greenaway, stated that his house looked into the churchyard; that he was in the habit purposely of watching the persons resorting to the church for marriage, and that he could confidently say, that seventeen out of every twenty of the female poor who went there to be married were far advanced in pregnancy." (Ibid., 173.)

Amended System.

labourers was in the first years very striking, and the improved morality of the women by the alteration of the bastardy law, was in the same period equally remarkable. The testimony and the instances are fully displayed in the earlier reports of the commissioners, especially in their second report, and in the reports of two committees of the House of Commons in 1836–37 and 1837–38. The exact operation in reducing able-bodied pauperism throughout the country, and in conducting the relief into its more legitimate channels, cannot be stated, the statistics of relief being at first too partial and vague to allow of any satisfactory combination; but of late years the numbers of the poor of all classes have been regularly ascertained on the 1st of January and the 1st of July in each year, and the details published in the annual reports. The general result may be seen in the following table:—

Years ended at Lady-Day.	Population of England and Wales.	The Average Number of *Paupers of all Classes* (including Children) at one time in receipt of Relief in England and Wales.			Ratio per Cent. of Paupers Relieved on the Population.	The Average Number of *Adult Able-bodied Paupers* (exclusive of vagrants) at one time in receipt of Relief in England and Wales.			Ratio per Cent. of Adult Able-bodied Paupers on the Total Number of Paupers of all Classes Relieved.	Average price of Wheat per Quarter.	
		In-door.	Out-door.	Total.		In-door.	Out-door.	Total.		*s.*	*d.*
1849	17,534,000	133,514	955,146	1,088,659	6·2	26,558	202,265	228,823	21·0	49	1
1850	17,765,000	123,004	855,696	1,008,700	5·7	24,095	167,815	191,910	19·0	42	7
1851*	17,927,609	114,367	826,948	941,315	5·3	20,876	142,248	163,124	17·3	39	11
1852	18,265,000	111,323	804,352	915,675	5·0	18,455	130,705	149,160	16·3	39	4
1853	18,402,000	110,148	875,214	886,362	4·8	17,649	121,926	139,575	15·7	42	0
1854	18,617,000	111,635	752,982	864,617	4·6	18,237	116,954	135,191	15·6	61	7
1855	18,840,000	121,400	776,286	897,686	4·8	20,669	125,962	146,631	16·3	70	0
1856	19,043,000	124,879	792,205	917,084	4·8	21,359	132,869	154,228	16·8	75	4
1857	19,207,000	122,845	762,165	885,010	4·6	19,660	120,415	140,075	15·8	65	3

* The population for 1851 is that given in the Census; that for the other years is estimated.

It appears from this table, compared with the account of expenditure in the same years, that while the cost of relief has been on the whole considerably increased, the whole number of paupers has decreased by more than one quarter, or as 62 to 46; and what is a more satisfactory result still, the proportion of the able-bodied paupers has decreased in a far larger ratio, or as 57 to 35, or nearly from 5 to 3.

Litigation.

A consequence of the extreme subdivision of the country for such purposes as that of the poor-laws, was seen in the extent to which contests were begotten between parish and parish, and between rate-payers and officers. The effect of the amended system was seen as rapidly as the system itself was brought into operation. The costs of litigation, and the expenditure in the removal of paupers, was in 1833–34, L.258,604; in 1834–35, L.202,527; in 1835–36, L.172,482; in 1836–37, L.126,951; in 1837–38, L.93,982: in the years 1856–57 it is returned as L.59,163, 14s.

General effects.

The act of 1834 was not passed without encountering a formidable opposition. The carrying of the act into execution necessarily involved a most extensive interference with old habits both in the poor and the rich, with private interests most widely diffused in the perpetuation of old abuses. It was never established that any one case of real hardship was encountered through the operation of the law; but necessarily many partial mistakes were made, and instances were not infrequent of injudicious zeal. Cases, however, were innumerable in which loud complaints were made, and those were used successfully to influence the public mind, which had never been generally well informed on the subject. About the time when the act had got into full operation, and when it might have been expected that its full effects in the extirpation of dishonest pauperism and vagrancy, and in confining relief to its proper purposes would soon be realized, the opposition was successful in checking, and almost entirely arresting, the further progress of the measure. Still the main provisions of the act had been brought into action: unions were formed, boards of guardians and paid officers and auditors appointed, and all had been abundantly instructed by the great mass of information diffused in the dangers to be avoided and the principles to be kept in view. The result has been thus far favourable, that what was already secured in good administration has been retained, the dangers of increasing pauperism kept well at bay, and the diminution by natural causes in the numbers of paupers has not been allowed to be quite filled up by a new growth. On the whole, it may be safely concluded that pauperism is on the decrease, while on occasions of general distress the relief is adequately increased and adapted to the circumstances, without the danger of the occasional relaxation becoming the permanent rule; and that a very intelligent body of administrators has been created, of which the community has found the benefit in the introduction of many measures of general utility.

The following table may be compared with that given at page 306, and will show the pecuniary effects of the first operations of the new law in the years 1834–37 inclusive, and the results of the more inert administration of subsequent years:—

Years ending at Lady-Day.	Estimated Population.	The Total expended in Relief to the Poor.	Rate per Head of Amount expended in Relief to the Poor on the estimated Population.	
		L.	*s.*	*d.*
1834	14,372,000	6,317,255	8	9½
1835	14,564,000	5,526,418	7	7
1836	14,758,000	4,717,630	6	4¾
1837	14,955,000	4,044,741	5	5
1838	15,155,000	4,123,604	5	5¼
1839	15,357,000	4,406,907	5	8¾
1840	15,562,000	4,576,965	5	10½
1841	15,911,757	4,760,929	6	0½
1842	15,981,000	4,911,498	6	1¾
1843	16,194,000	5,208,027	6	5¼
1844	16,410,000	4,976,093	6	0¾
1845	16,629,000	5,039,703	6	0¾
1846	16,851,000	4,954,204	5	10½
1847	17,076,000	5,208,787	6	2½
1848	17.304,000	6,180,764	7	1¾
1849	17,534,000	5,792,963	6	6½
1850	17,765,000	5,395,022	6	1
1851	17,927,609	4,962,704	5	6½
1852	18,205,000	4,897,685	5	4½
1853	18,402,000	4,939,064	5	4½
1854	18,617,000	5,282,853	5	8
1855	18,840,000	5,890,041	6	3
1856	19,043,000	6,004,244	6	3¾
1857	19,207,000	5,898,756	6	1¾

Average of the 24 years (1834 to 1857), 6s. 2d.

Amended System.

The whole progress of expenditure, so far as there are any authentic records of the facts, may be seen in the following table:—

Parochial Years.	Amount of Poor-Rates levied.	Amount thereof expended in Relief to the Poor.	Reference to the official Publication of the Return.
	L.	L.	
1747-48* 1748-49* 1749-50*	...	689,971 (average)	First Report of Select Committee of the House of Commons on Poor-Laws, session 1752.
1775-76*	1,720,317	1,556,804	Second Report of Select Committee of the House of Commons on Poor-Laws, session 1777.
1782-83* 1783-84* 1784-85*	2,167,750 (average)	2,004,238 (average)	Report from Select Committee of the House of Commons on certain Returns relative to the State of the Poor, session 1787.
1802-3*	5,348,205	4,077,891	Abstract of Returns relative to the Poor, House of Commons, Paper No. 175, session 1804.
1812-13*	8,646,841	6,656,106	Abstract of Returns relative to the Poor, House of Commons, Paper No. 82, session 1818.
1813-14*	8,388,974	6,294,581	
1814-15	7,457,676	5,418,846	
1815-16	6,937,425	5,724,839	Report from the Select Committee on Poor-Rate Returns, House of Commons, Paper No. 556, session 1822.
1816-17	8,128,418	6,910,925	
1817-18	3,320,440	7,870,801	
1818-19	8,932,185	7,516,704	
1819-20	8,719,655	7,330,254	
1820-21	8,411,893	6,959,251	
1821-22	7,761,441	6,358,704	Report from the Select Committee on Poor-Rate Returns, H. of Commons, Paper No. 334, session 1825.
1822-23	6,898,153	5,772,962	
1823-24	6,836,505	5,736,900	
1824-25	6,972,323	5,786,989	Poor-Rate Returns, House of Commons, Paper No. 83, session 1830.
1825-26	6,965,051	5,928,502	
1826-27	7,784,352	6,441,088	
	L.	L	
1827-28	7,715,055	6,298,000	Poor-Rate Returns, House of Commons, Paper No. 83, session 1830.
1828-29	7,642,171	6,332,410	
1829-30	8,111,422	6,829,042	Poor-Rate Returns, House of Commons, Paper No. 444, session 1835.
1830-31	8,279,218	6,798,889	
1831-32	8,622,920	7,036,969	
1832-33	8,606,501	6,790,800	
1833-34	8,338,079	6,317,255	
1834-35	7,373,807	5,526,418	2d Annual Report of the Poor-Law Commissioners, Appendix E.
1835-36	6,354,538	4,717,630	
1836-37	5,294,566	4,044,741	3d ditto, Appendix D.
1837-38	5,186,389	4,123,604	4th ditto, ditto D.
1838-39	5,613,939	4,406,907	5th ditto, ditto E.
1839-40	6,014,605	4,576,965	7th ditto, ditto F.
1840-41	6,351,828	4,760,929	8th ditto, ditto F.
1841-42	6,552,890	4,911,498	9th ditto, ditto D.
1842-43	7,085,595	5,208,027	10th ditto, ditto C.
1843-44	6,847,205	4,976,093	11th ditto, ditto C.
1844-45	6,791,006	5,039,703	12th ditto, ditto C.
1845-46	6,800,623	5,954,204	13th ditto, ditto C.
1846-47	6,964,825	5,298,787	14th ditto, ditto C.
1847-48	7,817,430	6,180,764	1st Annual Report of the Poor-Law Board, Appendix.
1848-49	7,674,146	5,792,963	2d ditto, ditto.
1849-50	7,270,493	5,395,022	3d ditto, ditto.
1850-51	6,778,914	4,962,704	4th ditto, ditto.
1851-52	6,552,298	4,897,685	5th ditto, ditto.
1852-53	6,522,412	4,939,064	6th ditto, ditto.
1853-54	6,973,220	5,282,853	7th ditto, ditto.
1854-55	7,864,149	5,890,041	8th ditto, ditto.
1855-56	8,201,348	6,004,244	9th ditto, ditto.
1856-57	8,139,003	5,898,756	10th ditto, ditto.

* The parochial year ended at Easter, up to and inclusive of the year 1813-14; since that time, it has always terminated at Lady-day.

For the present, public opinion in England appears to be satisfied with this result, in which the existing mass of pauperism is tolerated, and a permanent succession of similar pauperism is permitted; but in which, at the same time, the revival of the yet more dangerous forms of the evil prevailing and extending indefinitely up to the year 1834, appears to be effectually prevented. It is probable that if the evil does not greatly increase, its continuation in its present forms and proportions will for some time to come be regarded with contentment, or indeed with satisfaction.

Even the attempts that have been made to amend the Law of Settlement and Removal,—a law which was created for purposes now long since obsolete, and for the maintenance of which it is difficult to find any sustainable argument of any force,[1]—have met with no encouragement.[2] The consolidation of the various acts of Parliament from 1603, amounting to above 200 in number, in which the poor-laws are contained, including the most dissonant provisions, of which the great mass are wholly incapable of any possible present application, but which are the foundation of a still greater mass of equally useless judicial authority, all of which might be easily reduced into the bulk of an act of Parliament of about 120 succinct and intelligible clauses, has, although the work is represented to have been prepared by an able hand, and ready for adoption ever since 1854, met with no administrative or parliamentary or popular encouragement.[3] (G. C.)

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[1] See the Report on the Law of Removal, 1851.

[2] For instance Mr Baines' bill of 1853 or Lord Berners' still better bill of 1854.

[3] See "Proposal for a Digest of the Poor-Laws," House of Commons Papers, 1852; House of Commons Papers, 244; and House of Commons Papers, 1855 (472).

POPAYAN, a town of New Granada, capital of the department of Cauca, stands near the source of the river Cauca, at an elevation of 5824 feet above the sea, 230 miles S.W. of Bogota. It is regularly laid out and well built, consisting for the most part of brick houses one storey high. Of its many squares, one is very large and handsome. The town contains a university, a Jesuit college, a cathedral, and several other churches and convents, besides other public buildings. Popayan has declined considerably from its former condition, both in population and commercial importance. There was at one time a considerable trade in the precious metals carried on here; but since the revolution these articles have been conveyed by different channels, and there is now at Popayan only some little traffic in woollen fabrics, salt, and agricultural produce. This was the earliest town built by Europeans in this part of America, having been founded by Benalcazar in 1537. Pop. 20,000.

POPE, a name which comes from the Greek word Πάπα, and signifies *Father*. In the East this appellation is given to all Christian priests, and in the West bishops were called by it in ancient times; but since the time of Gregory VII. it has been appropriated to the Bishop of Rome, whom the Roman Catholics look upon as the common father of all Christians.

Within the last two or three centuries much has been said and written, and many warm disputes have been carried on, concerning the Pope, and the power belonging to him. All those in communion with the see of Rome unanimously hold that our Saviour Jesus Christ constituted St Peter the apostle chief pastor under himself, to watch over his whole flock here upon earth, and to preserve the unity of the church, at the same time giving him the power requisite for these ends. They also believe that our Saviour ordained that St Peter should have successors with the like authority and power to the end of time. Now, as they allege that St Peter resided for many years at Rome, and there suffered martyrdom, they consider the bishops of Rome as his successors in the dignity and office of the universal pastor of the whole Catholic church.

There have been some varieties in the manner of choosing the bishop of Rome in different ages, as alterations may be made in discipline; but still the clergy of Rome have always had the chief part in the election; and that clergy is now represented by, or in some manner consists of the cardinals, who have for several centuries been the sole electors of the Pope.

These cardinals, or principal persons of the Church of Rome, are seventy in number, when the Sacred College, as it is called, is complete. Of these, six are cardinal bishops,—viz., the bishops of Ostia, Porto, Albano, Sabino, Tusculum or Frascati, and Præneste or Palestrina, which are the six suburbicarian churches; fifty are cardinal priests, who have all titles from parish churches in Rome; and fourteen are cardinal deacons, who have their titles from churches in Rome of less note, called *diaconias* or deaconries. These cardinals are created by the Pope when there happen to be vacancies. Sometimes he names one or two only at a time; but commonly he defers the promotion until there be ten or twelve vacancies or more; and then at every second promotion, the emperor, the kings of Spain and France, and of Great Britain when Catholic, are allowed to present one each, to be made cardinal, whom the Pope always admits if there be not some very great and evident objection. These cardinals are commonly promoted from amongst such clergymen as have borne offices in the Roman court; some are assumed from religious orders; and eminent ecclesiastics of other countries are likewise often honoured with this dignity. Sons of sovereign princes have frequently been members of the sacred college. Their distinctive dress is scarlet, to signify that they ought to be ready to shed their blood for the faith and the church, when the defence and honour of either require it. They wear a scarlet cap and hat. The cap is given to them by the Pope if they are at Rome, and is sent to them if they are absent; but the hat is never given but by the Pope's own hand. These cardinals form the Pope's standing council or consistory for the management of the public affairs of church and state. They are divided into different congregations, for the more easy despatch of business; and some of them hold the principal offices in the pontifical court,—as that of cardinal-vicar penitentiary, chancellor, camerlingo or chamberlain, prefect of the signature of justice, prefect of memorials, and secretary of state. They have the title of *eminence* and *most eminent* given them. But here we consider them principally as the persons entrusted with the choice of the Pope.

On the demise of a Pope, his pontifical seal is immediately broken by the chamberlain, and all public business is interrupted that can be delayed. Messengers are despatched to all the Catholic sovereigns to acquaint them of the event, that they may take what measures they think proper, and that the cardinals in their dominions, if any there be, may hasten to the future election if they choose to attend; whilst the whole attention of the sacred college is turned to the preservation of tranquillity in the city and state, and to the necessary preparations for the future election. The cardinal chamberlain, during the vacancy of the Holy See, possesses great authority; he coins money with his own arms on it, lodges in the Pope's apartments, and is attended by bodyguards. He, and the first cardinal bishop, the first cardinal priest, and the first cardinal deacon, have during that time the government almost entirely in their hands. The body of the deceased Pope is carried to St Peter's, where funeral service is performed for him with great pomp during nine days, and the cardinals attend there every morning. In the meantime, all necessary preparations for the election are made; and the place where they assemble for that purpose, which is called the *conclave*, is fitted up in that part of the Vatican palace which is nearest St Peter's church, as this has long been thought the most convenient situation. Here is formed by partitions of wood a number of cells or chambers equal to the number of cardinals, with a small distance between every two, and a broad gallery before them. A number is put upon every cell, and small papers with corresponding numbers are put into a box. Every cardinal, or some one for him, draws out one of these papers, which determines in what cell he is to lodge. The cells are lined with cloth; and there is a part of each one separated for the conclavists or attendants, of whom two are allowed to each cardinal, and three to cardinal princes. They are persons of some rank, and generally of great confidence; but they must carry in their master's meals, serve him at table, and perform all the offices of a menial servant. Two physicians, two surgeons, an apothecary, and some other necessary officers, are chosen for the conclave by the cardinals.

On the tenth day after the Pope's death, the cardinals who are then in Rome, and in a competent state of health, meet in the chapel of St Peter's, which is called the Gregorian Chapel, where a sermon on the choice of a Pope is preached to them, and mass is said for invoking the grace of the Holy Ghost. Then the cardinals proceed to the conclave in procession two by two, and take up their abode. When all is properly settled, the conclave is shut up, having boxed wheels or places of communication in convenient quarters; and there are also strong guards placed all around. When any foreign cardinal arrives after the inclosure, the conclave is opened for his admission. In the beginning every cardinal signs a paper, containing an obligation that if he shall be raised to the papal chair he will not alienate any part of the pontifical dominion; that he will not be prodigal to his relations; and such other stipulations as may have been settled in former times or framed for the occasion.

We come now to the election itself; and that this may be effectual, two-thirds of the cardinals present must vote for the same person. As this is often not easily obtained, they sometimes remain whole months in the conclave. They meet in the chapel twice every day for giving their votes; and the election may be effected by scrutiny, accession, or acclamation. Scrutiny is the ordinary method, and consists in this: every cardinal writes his own name on the inner part of a piece of paper, and this is folded up and sealed. On a second fold of the same paper a conclavist writes the name of the person for whom his master votes. This, according to the practice observed for some centuries, must be one of the Sacred College. On the outer side of the paper is written a sentence at random, which the voter must well remember. Every cardinal, on entering into the chapel, goes to the altar and puts his paper into a large chalice.

When all are convened, two cardinals number the votes; and if they are more or less than the number of cardinals present the voting must be repeated. When that is not the case, the cardinal appointed for the purpose reads the outer sentence, and the name of the cardinal under it, so that each voter hearing his own sentence and the name joined with it, knows that there is no mistake. The names of all the cardinals that are voted for are taken down in writing, with the number of votes for each; and when it appears that any has two-thirds of the number present in his favour the election is over; but when this does not happen, the voting papers are all immediately burned without opening up the inner part. When several trials of coming to a conclusion by this method of scrutiny have been made in vain, recourse is sometimes had to what is called accession. By it, when a cardinal perceives that one or very few votes are wanting to any one for whom he had not voted at that time, he may say that he accedes to the one who has nearly the number of votes requisite; and if his one vote suffices to make up the two-thirds, or if he is followed by a sufficient number of new voters for the said cardinal, the election is accomplished. Lastly, a Pope is sometimes elected by acclamation; that is, when a cardinal, being pretty sure that he will be joined by a sufficient number, cries out in the open chapel that such a one shall be Pope. If he is supported properly, the election becomes unanimous,—those who would perhaps oppose it foreseeing that their opposition would be fruitless, and rather hurtful to themselves. It is to be observed that the emperor of Germany and the kings of France and Spain claimed a right of excluding one cardinal from being Pope at every election. Hence, when the ambassador at Rome of any of these sovereigns perceived that any cardinal disagreeable to his master was likely to be made Pope, he demanded an audience of the conclave, was admitted, and there declared his master's will, which was always attended to for the common good. But each of those sovereigns was thus allowed to exclude only one at a time, and they unwillingly and seldom put this right in execution.

When a Pope is chosen in any of the three abovementioned ways, the election is immediately announced from the balcony in the front of St Peter's; homage is paid to the new pontiff; and couriers are sent off with the news to all parts of Christendom. The Pope appoints a day for his coronation at St Peter's, and for his taking possession of the patriarchal church of St John Lateran, all which is performed with great solemnity. He is addressed by the title of Holiness, and Most Holy Father.

Let us now proceed to state what authority Roman Catholics attribute to the Pope thus chosen. They believe, then, that the Bishop of Rome is, under Christ, supreme pastor of the whole church; and, as such, is not only the first bishop in order and dignity, but has also a power and jurisdiction over all Christians, to preserve unity and purity of faith and moral doctrine, and to maintain order and regularity in all churches. Wherefore they hold, that when the Pope understands that any error has been broached against faith or manners, or that any considerable difference on such subjects has arisen in any part of Christendom, it belongs to him, after due deliberation and consultation, to issue out his pastoral decree, condemning the error, clearing up the doubt, and declaring what has been handed down, and what is to be believed. Some Catholic divines are of opinion that the Pope cannot err when he thus addresses himself to all the faithful on matters of doctrine. They well know that as a private doctor he may fall into mistakes as well as any other man; but they think that when he teaches the whole church Providence must preserve him from error: and they apprehend that this may be deduced from the promises of Christ to St Peter, and from the writings of the ancient fathers. It is to be observed, however, that this infallibility of the Pope, even when he pronounces in the most solemn manner, is only an opinion, and not an article of Roman Catholic faith. Wherefore, when he sends forth doctrinal decrees, the other bishops, who are also guardians of the faith in an inferior degree, may, with due respect, examine these decrees; and if they find them agree with what has always been taught, they either formally signify their acceptance, or they tacitly acquiesce, which, considering their duty, is equivalent to a formal approbation. When the acceptation of the generality of the bishops has been obtained, either immediately or after some mutual correspondence and explanation, the decrees of the Pope thus accepted come to be the sentence of the whole church, and are believed to be beyond the possibility of error.

Sometimes it happens that the disputes and differences may be so great and intricate that, to the end it may be seen more clearly what has really been delivered down, and to give all possible satisfaction, it may appear proper to convene all the bishops who can conveniently attend at one place, to learn from them more distinctly what has been taught and held in their respective churches. Roman Catholics believe that it belongs to the Pope to call such general councils, and to preside in them in person, or by his legates. They likewise hold, that when the Pope has approved the decrees of such councils concerning faith or manners, such decrees become final, and must be received as such by all Catholics. In all this they believe that the particular assistance of the Holy Ghost is with the pastors of the church, and that therefore "the gates of hell shall not prevail against it."

The see of Rome, according to the Roman Catholics, is the centre of Catholic unity. All their bishops communicate with the Pope, and by his means with one another, and so form one body. However distant their particular churches may be, they all meet at Rome either in person or by their delegates, or at least by their letters; and, according to the discipline of the latter ages, though they are presented to the Pope for their office from their respective countries, yet from him they must receive their bulls of consecration before they can take possession of their sees.

In matters of ecclesiastical discipline the Pope, as chief pastor, not only must take care that the canons actually in force be observed in all churches, but he may also make new canons and regulations when he sees it necessary or expedient for the spiritual benefit of the faithful, according to times and circumstances. But in doing this he must not infringe the established rights or customs to the injury of any person; which if, through mistake or wrong information, he should ever do, the persons who think themselves aggrieved may remonstrate with respect and sue for redress. He may establish new episcopal sees where there have been none before, and he may alter the limits of former dioceses; but in such alterations he always of course consults the temporal sovereign, if in communion with him. He sends pastors to preach the gospel to all countries where the Catholic religion is not by law established; and to him appeals may be made from all parts of Christendom in ecclesiastical causes of importance.

The Pope may dispense with the observation of ecclesiastical canons when there are just reasons for it; he may—as indeed any man may—also dispense with vows when they are made with the express or tacit condition that he really may dispense with them; he may also, on some occasions, declare that obligations have really ceased when that is truly the case, from a great alteration of circumstances. But he can never grant any dispensation to the injury of any third person, and can never allow any one to do what is unjust, or to say what he knows to be false, whatever advantage might be expected to accrue from it.

The reader who wishes to learn what may be urged for and against the supremacy of the Pope, and who is fitted by his knowledge of ecclesiastical history to understand the nature of the question at issue, may consult, on the one hand, the works of Bellarmine, with the chapter on Supremacy in Milner's *Letters to a Prebendary;* and on the other, Barrow's treatise *On the Pope's Supremacy*, together with Chillingworth's *Religion of Protestants.*

Appended is a general list of the Popes, with the dates of their election, from the time of Sylvester I., in 314 A.D., during whose pontificate Constantine convoked the great council of Nicæa, where it was decreed that the Bishop of Rome should be primate over the churches of those provinces which, in civil matters, were subject to the jurisdiction of the "Vicarius Urbis," or imperial vicar of Rome:—

	A.D.
Marcus, native of Rome, succeeded Sylvester	336
Julius I., a Roman	337
Liberius, a Roman, banished by Constantius	352
Damasus I., a Spaniard	366
Siricius, a Roman	384
Anastasius I., a Roman	398
Innocent I., an Albanian	401
Zosimus, a Greek	417
Boniface I., a Roman	418
Celestinus I., a Roman	422
Sixtus III., a Roman	432
Leo, called "the Great," of Rome	440
Hilarius, a Sardinian	461
Simplicius, native of Tibur	467
Felix III., of Rome	483
Gelasius I., of Rome	492
Anastasius II., of Rome	496
Symmachus, a Sardinian	498
Hormisdas, native of Frusino	514
John I., a Tuscan	523
Felix IV., a native of Beneventum	526
Boniface II., of Rome	530
John II., of Rome	532
Agapetus I., of Rome	535
Sylverius, a Campanian	536
Vigilius, a Roman	540
Pelagius I., a Roman	555
John III., a Roman	560
Benedict I., a Roman	574
Pelagius II., a Roman	578
Gregory I., called "the Great," of Rome	590
Sabinianus, a Tuscan	604
Boniface III., a Roman	607
Boniface IV., an Abruzzian	608
Deusdedit, or Deodatus I., of Rome	615
Boniface V., a Neapolitan	619
Honorius I., a Capuan	625
Severinus, a Roman	638
John IV., a Dalmatian	640
Theodorus, a Greek	641
Martin I., of Tudertum	649
Eugenius I., of Rome	654
Vitalianis, a native of Signia	657
Deusdedit II., of Rome	672
Domnus I., of Rome	676
Agathon, a Sicilian	678
Leo II., a Sicilian	682
Benedict II., of Rome	684
John V., a Syrian	685
Conon, a Thracian	686
Sergius I., a native of Palermo	687
John VI., of Greece	701
John VII., of Greece	705
Sisinius, a Syrian	708
Constantine, a Syrian	708
Gregory II., of Rome	715
Gregory III., a Syrian	731
Zacharias, a Greek	741
Stephen II., of Rome	753
Stephen III., of Rome	753
Paul I., a Roman	757
Stephen IV., a Sicilian	763
Adrian I., a Roman	772
Leo III., a Roman	795
Stephen V., a Roman	816
Paschal I., of Rome	817
Eugenius II., of Rome	824
Valentinus, a Roman	827
Gregory IV., a Roman	827
Sergius II., of Rome	843
Leo IV., of Rome	847
Benedict III., of Rome	855
Nicholas I., of Rome	858
Adrian II., of Rome	867
John VIII., of Rome	872
Martin II., or Marinus	882
Adrian III., of Rome	884
Stephen VI., of Rome	885
Formosus, Bishop of Porto	891
Stephen VII., a Roman	896
Romanus, a Tuscan	897
Theodorus II., of Rome	897
John IX., of Tibur	897
Benedict IV., of Rome	900
Leo V., an Ardean	903
Sergius III., favourite of Marozia	904
Anastasius III., of Rome	911
Lando, a Sabine	913
John X., a Roman, died in prison	914
Leo VI., a Roman	928
Stephen VIII., of Rome	929
John XI., son of Sergius III., and of Marozia	931
Leo VII., a Roman	936
Stephen IX., of Rome	939
Martin III., or Marinus	943
Agapetus II.	946
John XII.	956
Leo VIII.	963
Benedict V., of Rome	964
John XIII., of Rome	965
Benedict VI.	972
Domnus II., a Roman	973
Benedict VII.	974
John XIV.	983
John XV., a Roman	985
John XVI., a Roman	986
Gregory V., a German	996
Sylvester II., native of Auvergne	999
John XVIII., a Roman	1003
Sergius IV., of Rome	1009
Benedict VIII., of Tusculum	1012
John XIX., of Rome	1024
Benedict IX., deposed	1033
Gregory VI., of Rome	1044
Clement II., of Saxony	1047
Damasus II.	1048
Leo IX. (final separation of the Greek Church)	1049
Victor II.	1055
Stephen IX.	1057
Benedict X., abdicated	1058
Nicholas II., of Burgundy	1059
Alexander II., of Milan	1061
Gregory VII. (Hildebrand)	1073
Victor III., of Beneventum	1086
Urban II., of France	1088
Paschal II., of Tuscany	1099
Gelasius II., native of Caieta	1118
Calixtus II., of Burgundy	1119
Honorius II.	1124
Innocent II., a Roman	1130
Celestinus II., a Tuscan	1143
Lucius II., of Bologna	1144
Eugenius III., of Pisa	1145
Anastasius IV., of Rome	1153
Adrian IV. (Nicolas Breakspeare), an Englishman	1154
Alexander III.	1159
Lucius III.	1181
Urban III.	1185
Gregory VIII., of Beneventum	1187
Clement III.	1188
Celestinus III., a Roman	1191
Innocent III., of Signia	1198
Honorius III., of Rome	1216
Gregory IX., of Anagni	1227
Celestinus IV., of Milan	1241
Innocent IV., of Genoa	1242
Alexander IV., of Anagni	1254
Urban IV., a Frenchman	1261
Clement IV., a Frenchman	1265
Gregory X., of Piacenza	1272
Innocent V., of Tarentaise	1276
Adrian V., of Genoa	1276
John XXI., of Lisbon	1276
Nicholas III., of Rome	1277
Martin IV., a Frenchman	1281
Honorius IV., of Rome	1285
Nicholas IV., of Ascoli	1288
Celestinus V., of Abruzzo (abdicated)	1294
Boniface VIII., of Anagni	1295
Benedict XI., of Treviso	1303
Clement V., of Bordeaux (removed the Papal See to Avignon)	1305
John XXII. of France	1316
Benedict XII., of France	1334
Clement VI., French	1342

Pope.

Pope.

	A.D.
Innocent VI., French	1352
Urban V., French	1362
Gregory XI., French (restored the popedom to Rome)	1370
Urban VI., a Neapolitan	1378
Boniface IX., of Naples	1389
Innocent VII., of Salmona	1404
Gregory XII., of Venice (abdicated)	1406
Alexander V., of Candia	1409
John XXIII. (deposed)	1410
Martin V., a Roman	1417
Eugenius IV., of Venice	1431
Nicholas V., of Sarzana	1447
Calixtus III., of Spain	1455
Pius II., of Siena	1458
Paul II., of Venice	1464
Sixtus IV., of Genoa	1471
Innocent VIII., of Genoa	1485
Alexander VI., of Spain,	1492
Pius III.	1503
Julius II., of Genoa	1503
Leo X., son of Lorenzo the Magnificent	1513
Adrian VI., of Utrecht	1522
Clement VII., nephew of Lorenzo	1523
Paul III., of Rome	1534
Julius III., of Rome	1550
Marcellus II., of Montepulciano	1555
Paul IV., of Naples	1555
Pius IV., of Milan	1559
Pius V., of Piedmont	1566
Gregory XIII., of Bologna	1572
Sixtus V., of Ancona	1585
Urban VII., of Genoa	1590
Gregory XIV., of Milan	1590
Innocent XI., of Bologna	1591
Clement VIII., of Fano	1592
Leo XI., of Florence	1605
Paul V., of Rome	1605
Gregory XV., of Bologna	1621
Urban VIII., of Florence	1623
Innocent X., of Rome	1644
Alexander VII., of Siena	1655
Clement IX., of Pistoia	1667
Clement X., of Rome	1670
Clement IX., of Como	1676
Alexander VIII., of Venice	1689
Innocent XII., of Naples	1691
Clement XI., of Urbino	1700
Innocent XIII., of Rome	1721
Benedict XIII., of Rome	1724
Clement XII., of Florence	1730
Benedict XIV., of Bologna	1740
Clement XIII., of Venice	1758
Clement XIV., of Rimini	1769
Pius VI., of Cesena	1775
Pius VII., of Cesena	1800
Leo XII., of Romagna	1823
Pius VIII., of Cingoli	1829
Gregory XVI., of Belluno	1831
Pius IX., of Sinigaglia	1846

POPE.[1]

POPE, *Alexander*, the most brilliant of all wits who have at any time applied themselves to the poetic treatment of human manners, to the selecting from the play of human character what is picturesque, or the arresting what is fugitive, was born in the city of London on the 21st[2] day of May in the memorable year 1688; about six months, therefore, before the landing of the Prince of Orange, and the opening of that great revolution which gave the final ratification to all previous revolutions of that tempestuous century. By the "city" of London the reader is to understand us as speaking with technical accuracy of that district which lies within the ancient walls and the jurisdiction of the lord mayor. The parents of Pope, there is good reason to think, were of "gentle blood," which is the expression of the poet himself when describing them in verse. His mother was so undoubtedly; and her illustrious son, in speaking of her to Lord Hervey at a time when any exaggeration was open to an easy refutation, and writing in a spirit most likely to provoke it, does not scruple to say, with a tone of dignified haughtiness not unbecoming the situation of a filial champion on behalf of an insulted mother, that by birth and descent she was not below that young lady (one of the two beautiful Miss Lepels) whom his lordship had selected from all the choir of court beauties as the future mother of his children. Of Pope's extraction and immediate lineage for a space of two generations we know enough; beyond that we know little: of this little a part is dubious; and what we are disposed to receive as *not* dubious rests chiefly on his own authority. In the prologue to his *Satires*, having occasion to notice the lampooners of the times, who had represented his father as "a mechanic, a hatter, a farmer, nay, a bankrupt," he feels himself called upon to state the

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[1] [This interesting memoir of Pope was contributed to the previous edition of the Encyclopædia by Mr DE QUINCEY. It is retained in the present edition, as presenting a valuable critical estimate and analysis of a great English classic, by one of the most acute and scholastic writers of the age. It has been deemed necessary, however, to make a few additions (inclosed within brackets) embodying the results of some of the recent investigations into the history of Pope.]

[2] Dr Johnson, however, and Joseph Warton, for reasons not stated, have placed his birth on the 22d. To this statement, as opposed to that which comes from the personal friends of Pope, little attention is due. Ruffhead and Spence, upon such questions, must always be of higher authority than Johnson and Warton, and *à fortiori* than Bowles. But it ought not to be concealed, though hitherto unnoticed by any person, that some doubt after all remains whether *any* of the biographers is right. An anonymous writer, contemporary with Pope, and evidently familiar with his personal history, declares that he was born on the 8th of June; and he connects it with an event that, having a public and a partisan interest (the birth of that Prince of Wales who was known twenty-seven years afterwards as the Pretender), would serve to check his own recollections, and give them a collateral voucher. It is true he wrote for an ill-natured purpose; but no purpose whatever could have been promoted by falsifying this particular date. What is still more noticeable, however, Pope himself puts a most emphatic negative upon all these statements. In a pathetic letter to a friend, when his attention could not have been wandering, for he is expressly insisting upon a sentiment which will find an echo in many a human heart, viz., that a birthday, though from habit usually celebrated as a festal day, too often is secretly a memorial of disappointment, and an anniversary of sorrowful meaning, he speaks of the very day on which he is then writing as his own birthday; and indeed what else could give any propriety to the passage? Now the date of this letter is January 1, 1733. Surely Pope knew his own birthday better than those who have adopted a random rumour without investigation. [Mr De Quincey's memory has here misled him; no date is affixed by Pope to this letter. Allusion is made in it to the death of Congreve as a very recent occurrence; and as Congreve died on the 19th of January $172\frac{8}{9}$, it may be inferred that Pope's birthday was near the time of Congreve's decease, in the latter end of January or beginning of February. But in preparing his letters for the press, Pope altered and revised them; sometimes making one printed epistle out of two or more written ones, and little or no reliance can be placed on the poet's dates.]

But, whilst we are upon this subject, we must caution the readers of Pope against too much reliance upon the chronological accuracy of his editors. *All* are scandalously careless; and generally they are faithless. Many allusions are left unnoticed, which a very little research would have illustrated; many facts are omitted, even yet recoverable, which are essential to the just appreciation of Pope's satirical blows; and dates are constantly misstated. Mr Roscoe is the most careful of Pope's editors; but even he is often wrong. For instance, he has taken the trouble to write a note upon Pope's humorous report to Lord Burlington of his Oxford journey on horseback with Lintot; and this note involves a sheer impossibility. The letter is undated, except as to the month; and Mr Roscoe directs the reader to supply 1714 as the true date, which is a gross anachronism. For a ludicrous anecdote is there put into Lintot's mouth, representing some angry critic, who had been turning over Pope's *Homer* with frequent *pshaws*, as having been propitiated, by Mr Lintot's dinner, into a gentler feeling towards Pope, and finally, by the mere effect of good cheer, without an effort on the publisher's part, as coming to a confession, that what he ate and what he had been reading were equally excellent. But in the year 1714, *no part* truth about his parents; and naturally much more so at a time when the low scurrilities of these obscure libellers had been adopted, accredited, and diffused by persons so distinguished in all points of personal accomplishment and rank as Lady Mary Wortley Montagu and Lord Hervey: "*hard as thy heart,*" was one of their lines in their joint pasquinade, "*hard as thy heart, and as thy birth obscure.*" Accordingly he makes the following formal statement:—"Mr Pope's father was of a gentleman's family in Oxfordshire, the head of which was the Earl of Downe. His mother was the daughter of William Turner, Esq., of York; she had three brothers, one of whom was killed; another died in the service of King Charles [meaning Charles I.]; the eldest, following his fortunes, and becoming a general officer in Spain, left *her* what estate remained after the sequestrations and forfeitures of her family." The sequestrations here spoken of were those inflicted by the commissioners for the Parliament; and usually they levied a fifth, or even two-fifths, according to the apparent delinquency of the parties. But in such cases two great differences arose in the treatment of the royalists; first, that the report was coloured according to the interest which a man possessed, or other private means for biassing the commissioners; secondly, that often, when money could not be raised on mortgage to meet the sequestration, it became necessary to sell a family estate suddenly, and therefore in those times at great loss; so that a nominal fifth might be depressed by favour to a tenth, or raised by the necessity of selling to a half. And hence might arise the small dowry of Mrs Pope, notwithstanding the family estate in Yorkshire had centred in her person. But, by the way, we see from the fact of the eldest brother having sought service in Spain, that Mrs Pope was a Papist; not, like her husband, by conversion, but by hereditary faith. This account, as publicly thrown out in the way of challenge by Pope, was, however, sneered at by a certain Mr Pottinger of those days, who, together with his absurd name, has been safely transmitted to posterity in connection with this single feat of having contradicted Alexander Pope. We read in a diary published by the Microcosm, "*Met a large hat with a man under it.*" And so, here, we cannot so properly say that Mr Pottinger brings down the contradiction to our times, as that the contradiction brings down Mr Pottinger. "Cousin Pope," said Pottinger, "had made himself out a fine pedigree, but he wondered where he got it;" and he then goes on to plead in abatement of Pope's pretensions, "that an old maiden aunt, equally related" (that is, standing in the same relation to himself and to the poet), "a great genealogist, who was always talking of her family, never mentioned this circumstance." And again we are told, from another quarter, that the Earl of Guildford, after express investigation of this matter, "was sure that," amongst the descendants of the Earls of Downe, "there was none of the name of Pope." How it was that Lord Guildford came to have any connection with the affair, is

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of Pope's *Homer* was printed. June 1715 was the month in which even the subscribers first received the four earliest books of the *Iliad*, and the public generally not until July. This we notice by way of specimen. In itself, or as an error of mere negligence, it would be of little importance; but it is a case to which Mr Roscoe has expressly applied his own conjectural skill, and solicited the attention of his reader. We may judge, therefore, of his accuracy in other cases which he did not think worthy of examination. [The letter contains a reference to Lord Lansdowne's committal to the Tower, which serves to fix the date between September 1715 and February $171\frac{6}{7}$, when he was released.]

There is another instance, presenting itself in every page, of ignorance concurring with laziness on the part of all Pope's editors, and with the effect not so properly of misleading as of perplexing the general reader. Until Lord Macclesfield's bill for altering the style in the very middle of the eighteenth century, six years therefore after the death of Pope, there was a custom, arising from the collision between the civil and ecclesiastical year, of dating the whole period that lies between December 31st and March 25th (both days *exclusively*) as belonging indifferently to the past or the current year. This peculiarity had nothing to do with the old and new style, but was, we believe, redressed by the same act of Parliament. Now in Pope's time it was absolutely necessary that a man should use this double date, because else he was liable to be seriously misunderstood. For instance, it was then always said that Charles I. had suffered on the 30th of January $164\frac{8}{9}$; and why? Because, had the historian fixed the date to what it really was, 1649, in that case all those (a very numerous class) who supposed the year 1649 to commence on Ladyday, or March 25, would have understood him to mean that this event happened in what we *now* call 1650, for not until 1650 was there any January which *they* would have acknowledged as belonging to 1649, since *they* added to the year 1648 all the days from January 1 to March 24. On the other hand, if he had said simply that Charles suffered in 1648, he would have been truly understood by the class we have just mentioned; but by another class, who began the year from the 1st of January, he would have been understood to mean what we *now* mean by the year 1648. There would have been a sheer difference, not of one, as the reader might think at first sight, but of *two* entire years in the chronology of the two parties; which difference, and all possibility of doubt, is met and remedied by the fractional date $\frac{1648}{1649}$; for that date says in effect it was 1648 to you who do not open the new year till Ladyday; it was 1649 to you who open it from January 1. Thus much to explain the real sense of the case; and it follows from this explanation, that no part of the year ever *can* have the fractional or double date except the interval from January 1 to March 24 inclusively. And hence arises a practical inference,—viz., that the very same reason, and no other, which formerly enjoined the use of the compound or fractional date,—viz., the prevention of a capital ambiguity or dilemma, now enjoins its omission. For in our day, when the double opening of the year is abolished, what sense is there in perplexing a reader by using a fraction which offers him a choice without directing him how to choose. In fact, it is the *denominator* of the fraction, if one may so style the lower figure, which expresses to a modern eye the true year. Yet the editors of Pope, as well as many other writers, have confused their readers by this double date; and why? Simply because they were confused themselves. Many errors in literature of large extent have arisen from this confusion. Thus it was said properly enough in the contemporary accounts—for instance, in Lord Monmouth's *Memoirs*—that Queen Elizabeth died on the last day of the year 1602, for she died on the 24th of March; and by a careful writer this event would have been dated as March 24, $\frac{1602}{1603}$. But many writers, misled by the phrase above cited, have asserted that James I. was proclaimed on the 1st of January 1603. Heber, Bishop of Calcutta, again, has ruined the entire chronology of the life of Jeremy Taylor, and unconsciously vitiated the facts, by not understanding this fractional date. Mr Roscoe even too often leaves his readers to collect the true year as they can: thus, *e.g.*, at p. 500 of his Life, he quotes from Pope's letter to Warburton, in great vexation for the surreptitious publication of his letters in Ireland, under date of February 4, $174\frac{0}{1}$. But why not have printed it intelligibly as 1741? Incidents there are in most men's lives which are susceptible of a totally different moral value, according as they are dated in one year or another. That might be a kind and honourable liberality in 1740 which would be a fraud upon creditors in 1741. Exile to a distance of 10 miles from London in January 1744, might argue that a man was a turbulent citizen and suspected of treason; whilst the same exile in January 1745 would simply argue that, as a Papist, he had been included amongst his whole body in a general measure of precaution to meet the public dangers of that year. This explanation we have thought it right to make, both for its extensive application to *all* editions of Pope, and on account of the serious blunders which have arisen from the case when ill understood; and because, in a work upon education, written jointly by Messrs Lant Carpenter and Shephard, though generally men of ability and learning, this whole point is erroneously explained.

not stated by the biographers of Pope; but we have ascertained that, by marriage with a female descendant from the Earls of Downe, he had come into possession of their English estates.

Finally, though it is rather for the honour of the Earls of Downe than of Pope to make out the connection, we must observe that Lord Guildford's testimony, *if ever given at all*, is simply negative; he had found no proofs of the connection, but he had not found any proofs to destroy it; whilst, on the other hand, it ought to be mentioned, though unaccountably overlooked by all previous biographers, that one of Pope's anonymous enemies, who hated him personally, but was apparently master of his family history, and too honourable to belie his own convictions, expressly affirms, of his own authority, and without reference to any claim put forward by Pope, that he was descended from a junior branch of the Downe family; which testimony has a double value—first, as corroborating the probability of Pope's statement viewed in the light of a fact; and, secondly, as corroborating that same statement viewed in the light of a current story, true or false, and not as a disingenuous fiction put forward by Pope to confute Lord Hervey.

[Sir Thomas Pope, the founder of the Downe family, was of humble origin, the son of a yeoman at Deddington in Oxfordshire. He was enriched by the spoils of the church at the period of the Reformation, but died without issue. His brother was raised to the peerage in 1628. If, therefore, the poet's ancestors were allied to this family, it must have been long before the creation of the peerage, through the Deddington yeoman.]

It is probable to us that the Popes, who had been originally transplanted from England to Ireland, had, in the person of some cadet, been re-transplanted to England; and that having in that way been disconnected from all personal recognition, and all local memorials of the capital house, by this sort of *postliminium*, the junior branch had ceased to cherish the honour of a descent which was now divided from all direct advantage. At all events, the researches of Pope's biographers have not been able to trace him farther back in the paternal line than to the grandfather; and he (which is odd enough, considering the Popery of his descendants), was a clergyman of the Established Church in Hampshire. This grandfather had two sons: of the eldest nothing is recorded beyond the three facts, that he went to Oxford, that he died there, and that he spent the family estate.[1] The younger son, whose name was Alexander, had been sent when young, in some commercial character, to Lisbon;[2] and there it was, in that centre of bigotry, that he became a sincere and most disinterested Catholic. He returned to England; married a Catholic young widow; and became the father of a second Alexander Pope, *ultra Sauromatus notus et Antipodes.*

[The maternal ancestry of the poet has been minutely traced by the eminent archæologist Mr Joseph Hunter, and by Mr Robert Davies of York. Edith Turner was not a widow when she married Alexander Pope. She was born at Worsborough Dale, Yorkshire, and baptized June 18, 1642. She would thus seem to have been of the same age as her husband, both being in their forty-sixth year at the date of the poet's birth. The Turners were a family of long standing and good consideration in the county of York. The poet's grandfather, William Turner, inherited from his uncle the manor of Towthorpe, lands in Ruston, with a rent-charge of L.70 on the manor of Ruston, and houses in the city of York. The rent-charge of L.70 formed part of the dowry of Edith Turner, the last survivor of the family of fourteen children; and on the death of both his parents, it descended to the poet. William Turner died at York in 1665, his widow in 1681. "When upon the death of Mrs Turner," says Mr Davies, "the daughters who had remained under the maternal roof at York had to seek a home with married sisters in other parts of the kingdom, in was Edith's lot to remove to London, where she became the wife of Alexander Pope, and the mother of the poet." One of the sisters was married to Samuel Cooper, the celebrated miniature portrait-painter. Mrs Cooper was the poet's godmother, and by her will she left her godson, then only five years of age, her "painted china dish with a silver foot and a dish to set it in;" and after her sister Elizabeth Turner's decease, all her books, pictures, and medals. Of the "sequestration and forfeitures of the family," mentioned by Pope, no trace has been found; and of three brothers, one, William, was the sole survivor in 1665. The antiquaries have not been so successful with the poet's paternal ancestry. It has been found, however, that at the proper period, from 1631 to 1645, there was a Hampshire clergyman of the name of Alexander Pope. He had the rectory of Thruxton, and two other livings; but as there is no memorial of him in the church, and no entry in the register of his having had children, it is still doubtful whether this rector of Thruxton was the poet's grandfather. The name was by no means an uncommon one.]

By his own account to Spence, Pope learned "very early to read;" and writing he taught himself "by copying from printed books;" all which seems to argue that, as an only child, with an indolent father and a most indulgent mother, he was not molested with much schooling in his infancy. Only one adventure is recorded of his childhood,—viz., that he was attacked by a cow, thrown down, and wounded in the throat.

Pope escaped this disagreeable kind of vaccination without serious injury, and was not farther tormented by cows or schoolmasters until he was about eight years old, when the family priest,—that is, we presume, the confessor of his parents,—taught him, agreeably to the Jesuit system, the rudiments of Greek and Latin concurrently. This priest was named Banister; and his name is frequently employed, together with other fictitious names, by way of signature to the notes in the *Dunciad*, an artifice which was adopted for the sake of giving a characteristic variety to the notes, according to the tone required for the illustration of the text. From his tuition Pope was at length dismissed to a Catholic school at Twyford, near Winchester. The selection of a school in this neighbourhood, though certainly the choice of a Catholic family was much limited, points apparently to the old Hampshire connection of his father. Here an incident occurred which most powerfully illustrates the original and constitutional determination to satire of this irritable poet. He knew himself so accurately that, in after times, half by way of boast, half of confession, he says,—

> "But touch me, and no Minister so sore:
> Whoe'er offends, at some unlucky time
> Slides into verse, and hitches in a rhyme,
> Sacred to ridicule his whole life long,
> And the sad burthen of some merry song."

Already, it seems, in childhood he had the same irresistible instinct, victorious over the strongest sense of personal danger. He wrote a bitter satire upon the presiding pedagogue, was brutally punished for this youthful indiscretion, and indignantly removed by his parents from the school. Mr Roscoe speaks of Pope's personal experience as necessarily unfavourable to public schools; but in reality he knew nothing of public schools. All the establishments for Papists were narrow, and suited to their political depression; and his parents were too sincerely anxious for their son's religious principles to risk the contagion of Protestant association by sending him elsewhere.

From the scene[3] of his disgrace and illiberal punishment, he passed, according to the received accounts, under the tuition of several other masters in rapid succession. But it is the less necessary to trouble the reader with their names, as Pope himself assures us that he learned nothing from any of them. To Banister he had been indebted for such trivial elements of a schoolboy's learning as he possessed at all, excepting those which he had taught himself. And upon himself it was, and his own admirable faculties, that he was now finally thrown for the rest of his education, at his age so immature that many boys are then first entering their academic career. Pope is supposed to have been scarcely twelve years old when he assumed the office of self-tuition, and bade farewell for ever to schools and tutors.

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[1] It is apparently with allusion to this part of his history, which he would often have heard from the lips of his own father, that Pope glances at his uncle's memory somewhat disrespectfully in his prose letter to Lord Hervey.

[2] Some accounts, however, say to Flanders, in which case, perhaps, Antwerp or Brussels would have the honour of his conversion.

[3] This however was not Twyford, according to an anonymous pamphleteer of the times, but a Catholic seminary in Devonshire Street,—

Such a phenomenon is at any rate striking; it is the more so under the circumstances which attended the plan, and under the results which justified its execution. It seems, as regards the plan, hardly less strange that prudent parents should have acquiesced in a scheme of so much peril to his intellectual interests, than that the son, as regards the execution, should have justified their confidence by his final success. More especially this confidence surprises us in the father. A doating mother might shut her eyes to all remote evils in the present gratification to her affections; but Pope's father was a man of sense and principle; he must have weighed the risks besetting a boy left to his own intellectual guidance; and to these risks he would allow the more weight from his own conscious defect of scholarship and inability to guide or even to accompany his son's studies. He could neither direct the proper choice of studies, nor in any one study taken separately could he suggest the proper choice of books.

The case we apprehend to have been this: Alexander Pope the elder was a man of philosophical desires and unambitious character. Quiet and seclusion and innocence of life,—these were what he affected for himself; and that which had been found available for his own happiness, he might reasonably wish for his son. The two hinges upon which his plans may be supposed to have turned were, first, the political degradation of his sect; and, secondly, the fact that his son was an only child. Had he been a Protestant, or had he, though a Papist, been burdened with a large family of children, he would doubtless have pursued a different course. But to him, and, as he sincerely hoped, to his son, the strife after civil honours was sternly barred. Apostacy only could lay it open. And, as the sentiments of honour and duty in this point fell in with the vices of his temperament, high principle concurring with his constitutional love of ease, we need not wonder that he should early retire from commerce with a very moderate competence, or that he should suppose the same fortune sufficient for one who was to stand in the same position. The son was from his birth deformed. That made it probable that he might not marry. If he should, and happened to have children, a small family would find an adequate provision in the patrimonial funds; and a large one at the worst could only throw him upon the same commercial exertions to which he had been obliged himself. The Roman Catholics, indeed, were just then situated as our modern Quakers are: law to the one, as conscience to the other, closed all modes of active employment except that of commercial industry. Either his son, therefore, would be a rustic recluse, or, like himself, he would be a merchant.

With such prospects, what need of an elaborate education? And where was such an education to be sought? At the petty establishments of the suffering Catholics, the instruction, as he had found experimentally, was poor. At the great national establishments his son would be a degraded person; one who was permanently repelled from every arena of honour, and sometimes, as in cases of public danger, was banished from the capital, deprived of his house, left defenceless against common ruffians, and rendered liable to the control of every village magistrate. To one in these circumstances solitude was the wisest position; and the best qualification for that was an education that would furnish aids to solitary thought. No need for brilliant accomplishments to him who must never display them; forensic arts, pulpit erudition, senatorial eloquence, academical accomplishments,—these would be lost to one against whom the courts, the pulpit, the senate, the universities, were closed. Nay, by possibility worse than lost; they might prove so many snares or positive bribes to apostacy. Plain English, therefore, and the high thinking of his compatriot authors, might prove the best provision for the mind of an English Papist destined to seclusion.

Such are the considerations under which we read and

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that is, in the Bloomsbury district of London; and the same author asserts that the scene of his disgrace, as indeed seems probable beforehand, was not the first but the last of his arenas as a schoolboy. Which indeed was first, and which last, is very unimportant; but with a view to another point, which is not without interest, namely, as to the motive of Pope for so bitter a lampoon as we must suppose it to have been, as well as with regard to the topics which he used to season it, this anonymous letter throws the only light which has been offered; and strange it is that no biographer of Pope should have hunted upon the traces indicated by him. Any solution of Pope's virulence, and of the master's bitter retaliation, even *as* a solution, is so far entitled to attention; apart from which the mere straightforwardness of this man's story, and its minute circumstantiality, weigh greatly in its favour. To our thinking he unfolds the whole affair in the simple explanation, nowhere else to be found, that the master of the school, the mean avenger of a childish insult by a bestial punishment, was a Mr Bromley, one of James II.'s Popish apostates; whilst the particular statements which he makes with respect to himself and the young Duke of Norfolk of 1700, as two schoolfellows of Pope at that time and place, together with his voluntary promise to come forward in person and verify his account if it should happen to be challenged;—are all, we repeat, so many presumptions in favour of his veracity. "Mr Alexander Pope," says he, "before he had been four months at this school, or was able to construe Tully's *Offices*, employed his muse in satirizing his master. It was a libel of at least one hundred verses, which (a fellow-student having given information of it) was found in his pocket; and the young satirist was soundly whipped, and kept a prisoner to his room for seven days; whereupon his father fetched him away, and I have been told he never went to school more." This Bromley, it has been ascertained, was the son of a country gentleman in Worcestershire, and must have had considerable prospects at one time, since it appears that he had been a gentleman-commoner at Christ's Church, Oxford. There is an error in the punctuation of the letter we have just quoted which affects the sense in a way very important to the question before us. Bromley is described as "one of King James's converts in Oxford, some years *after* that prince's abdication;" but if this were really so, he must have been a conscientious convert. The latter clause should be connected with what follows:—"*Some years after that prince's abdication he kept a little seminary;*" that is, when his mercenary views in quitting his religion were effectually defeated, when the Boyne had sealed his despair, he humbled himself into a petty schoolmaster. These facts are interesting, because they suggest at once the motive for the merciless punishment inflicted upon Pope. His own father was a Papist like Bromley, but a sincere and honest Papist, who had borne double taxes, legal stigmas, and public hatred for conscience sake. His contempt was habitually pointed at those who tampered with religion for interested purposes. His son inherited these upright feelings. And we may easily guess what would be the bitter sting of any satire he would write on Bromley. Such a topic was too true to be forgiven, and too keenly barbed by Bromley's conscience. By the way, this writer, like ourselves, reads in this juvenile adventure a prefiguration of Pope's satirical destiny. [The statement referred to (signed "E. P.," and published by Curll) is likely to have been one of Pope's stratagems to mislead Curll, and keep up the public interest in his own personal history.]

interpret the conduct of Pope's parents; and they lead us to regard as wise and conscientious a scheme which, under ordinary circumstances, would have been pitiably foolish. And be it remembered, that to these considerations, derived exclusively from the civil circumstances of the family, were superadded others derived from the astonishing prematurity of the individual. That boy who could write at twelve years of age the beautiful and touching stanzas on Solitude, might well be trusted with the superintendence of his own studies. And the stripling of sixteen, who could so far transcend in good sense the accomplished statesmen or men of the world with whom he afterwards corresponded, might challenge confidence for such a choice of books as would best promote the development of his own faculties.

In reality, one so finely endowed as Alexander Pope could not easily lose his way in the most extensive or ill-digested library. And though he tells Atterbury that at one time he abused his opportunities by reading controversial divinity, we may be sure that his own native activities, and the elasticity of his mind, would speedily recoil into a just equilibrium of study, under wider and happier opportunities. Reading, indeed, for a person like Pope, is rather valuable as a means of exciting his own energies, and of feeding his own sensibilities, than for any direct acquisitions of knowledge, or for any trains of systematic research. All men are destined to devour much rubbish between the cradle and the grave; and doubtless the man who is wisest in the choice of his books will have read many a page before he dies, that a thoughtful review would pronounce worthless. This is the fate of all men. But the reading of Pope, as a general result or measure of his judicious choice, is best justified in his writings. They show him well furnished with whatsoever he wanted for matter or for embellishment, or argument or illustration, for example and model, or for direct and explicit imitation.

Possibly, as we have already suggested, within the range of English literature Pope might have found all that he wanted. But variety the widest has its uses; and, for the extension of his influence with the polished classes amongst whom he lived, he did wisely to add other languages; and a question has thus arisen with regard to the extent of Pope's attainments as a self-taught linguist. A man, or even a boy, of great originality, may happen to succeed best in working his own native mines of thought, by his unassisted energies; here it is granted that a tutor, a guide, or even a companion, may be dispensed with, and even beneficially. But in the case of foreign languages, in attaining this machinery of literature, though anomalies even here do arise, and men there are, like Joseph Scaliger, who form their own dictionaries and grammars in the mere process of reading an unknown language, by far the major part of students will lose their time by rejecting the aid of tutors. As there has been much difference of opinion with regard to Pope's skill in languages, we shall briefly collate and bring into one focus the stray notices.

As to the French, Voltaire, who knew Pope personally, declared that he "could hardly *read* it, and spoke not one syllable of the language." But perhaps Voltaire might dislike Pope? On the contrary, he was acquainted with his works, and admired them to the very level of their merits. Speaking of him *after death* to Frederick of Prussia, he prefers him to Horace and Boileau, asserting that, by comparison with *them*,

> "Pope *approfondis* ce qu'ils ont *effleuré*.
> D'un esprit plus hardi, d'un pas plus assuré,
> Il porta le flambeau dans l'abîme de l'être;
> Et l'homme *avec lui seul* apprit à se connoître.
> L'art quelquefois, frivole, et quelquefois divine,
> L'art des vers est dans Pope utile au genre humain."

This is not a wise account of Pope, for it does not abstract the characteristic feature of his power; but it is a very kind one. And of course Voltaire could not have meant any unkindness in denying his knowledge of French. But he was certainly wrong. Pope, in *his* presence, would decline to speak or to read a language of which the pronunciation was confessedly beyond him. Or, if he did, the impression left would be still worse. In fact, no man ever will pronounce or talk a language which he does not use, for some part of every day, in the real intercourse of life. But that Pope read French of an ordinary cast with fluency enough, is evident from the extensive use which he made of Madame Dacier's labours on the *Iliad*, and still more of La Valterie's prose translation of the *Iliad*. Already in the year 1718, and long before his personal knowledge of Voltaire, Pope had shown his accurate acquaintance with some voluminous French authors in a way which, we suspect, was equally surprising and offensive to his noble correspondent. The Duke of Buckingham[1] had addressed to Pope a letter containing some account of the controversy about Homer which had then been recently carried on in France between La Motie and Madame Dacier. This account was delivered with an air of teaching which was very little in harmony with its excessive shallowness. Pope, who sustained the part of pupil in this interlude, replied in a manner that exhibited a knowledge of the parties concerned in the controversy much superior to that of the duke. In particular, he characterized the excellent notes upon Horace of M. Dacier the husband in very just terms, as distinguished from those of his conceited and half-learned wife; and the whole reply of Pope seems very much as though he had been playing off a mystification on his grace. Undoubtedly the pompous duke felt that he had caught a Tartar. Now, M. Dacier's *Horace*, which, with the text, fills nine volumes, Pope could not have read *except* in French; for they are not even yet translated into English. Besides, Pope read critically the French translation of his own *Essay on Man*, *Essay on Criticism*, *Rape of the Lock*, &c. He spoke of them as a critic; and it was at no time a fault of Pope's to make false pretensions. All readers of Pope's *Satires* must also recollect numerous proofs that he had read Boileau with so much feeling of his peculiar merit that he has appropriated and naturalized in English some of his best passages. Voltaire was therefore certainly wrong.

Of Italian literature, meantime, Pope knew little or nothing; and simply because he knew nothing of the language. Tasso, indeed, he admired; and, which is singular, more than Ariosto. But we believe that he had read him only in English; and it is certain that he could not take up an Italian author, either in prose or verse, for the unaffected amusement of his leisure.

Greek, we all know, has been denied to Pope, ever since he translated Homer, and chiefly in consequence of that translation. This seems at first sight unfair, because criticism has not succeeded in fixing upon Pope any errors of ignorance. His deviations from Homer were uniformly the result of imperfect sympathy with the naked simplicity of the antique, and therefore wilful deviations, not (like those of his more pretending competitors, Addison and Tickell) pure blunders of misapprehension. But yet it is not inconsistent with this concession to Pope's merits, that we must avow our belief in his thorough ignorance of Greek when he first commenced his task. And to us it seems astonishing that nobody should have adverted to that fact as a sufficient solution, and in fact the only plausible solution, of Pope's excessive depression of spirits in the earliest stage of his labours. This depression, after he had once pledged himself to his subscribers for the fulfilment of his task, arose from, and could have arisen from nothing else, than his conscious ignorance of Greek in connection with the solemn responsibilities he had assumed in the face of a great nation. Nay, even countries as presumptuously disdainful of tramontane literature as Italy took an interest in this memorable undertaking. Bishop Berkeley found Salvini reading it at Florence; and Madame Dacier even, who read little but Greek, and certainly no English until then, condescended to study it. Pope's dejection, therefore, or rather agitation (for it impressed by sympathy a tumultuous character upon his dreams which lasted for years after the cause had ceased to operate) was perfectly natural under the explanation we have given, but not otherwise. And how did he surmount this unhappy self-distrust? Paradoxical as it may sound, we will venture to say that, with the innumerable aids for interpreting Homer which even then existed, a man sufficiently acquainted with Latin might make a translation even critically exact. This Pope was not long in discovering. Other alleviations of his labour concurred, and in a ratio daily increasing.

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[1] That is, Sheffield, and legally speaking, of Buckingham-*shire*. For he would not take the title of Buckingham, under a fear that there was lurking somewhere or other a claim to that title amongst the connections of the Villiers family. He was a pompous grandee, who lived in uneasy splendour, and, as a writer, most extravagantly overrated; accordingly he is now forgotten. Such was his vanity, and his ridiculous mania for allying himself with royalty, that he first of all had the presumption to court the Princess (afterwards Queen) Anne. Being rejected, he then offered himself to the illegitimate daughter of James II. by the daughter of Sir Charles Sedley. She was as ostentatious as himself, and accepted him.

The same formulæ were continually recurring, such as,

> "*But him answering, thus addressed the swift-footed Achilles;*"

Or,

> "*But him sternly beholding, thus spoke Agamemnon the king of men.*"

Then, again, universally the Homeric Greek, from many causes, is easy; and especially from these two: 1*st*, The simplicity of the thought, which never gathers into those perplexed knots of rhetorical condensation which we find in the dramatic poets of a higher civilization; 2*dly*, From the constant bounds set to the expansion of the thought by the form of the metre; an advantage of verse which makes the poets so much easier to a beginner in the German language than the illimitable weavers of prose. The line or the stanza reins up the poet tightly to his theme, and will not suffer him to expatiate. Gradually, therefore, Pope came to read the Homeric Greek, but never accurately; nor did he ever read Eustathius without aid from Latin. As to any knowledge of the Attic Greek, of the Greek of the dramatists, the Greek of Plato, the Greek of Demosthenes, Pope neither had it nor affected to have it. Indeed it was no foible of Pope's, as we will repeat, to make claims which he had not, or even to dwell ostentatiously upon those which he had. And with respect to Greek in particular, there is a manuscript letter in existence from Pope to a Mr Bridges at Falham which, speaking of the original Homer, distinctly records the knowledge which he had of his own "imperfectness in the language." Chapman, a most spirited translator of Homer, probably had no very critical skill in Greek; and Hobbes was, beyond all question, as poor a Grecian as he was a doggerel translator; yet in this letter Pope professes his willing submission to the "authority" of Chapman and Hobbes as superior to his own.

Finally, in *Latin* Pope was a "considerable proficient," even by the cautious testimony of Dr Johnson; and in this language only the doctor was an accomplished critic. If Pope had really the proficiency here ascribed to him, he must have had it already in his boyish years; for the translation from Statius, which is the principal monument of his skill, was executed *before* he was fourteen. We have taken the trouble to throw a hasty glance over it; and whilst we readily admit the extraordinary talent which it shows, as do all the juvenile essays of Pope, we cannot allow that it argues any accurate skill in Latin. The word Malĕa, as we have seen noticed by some editor, he makes Malēa; which in itself, as the name was not of common occurrence, would not have been an error worth noticing; but, taken in connection with the certainty that Pope had the original line before him—

> "Arripit ex templo Maleæ de valle resurgens,"

when not merely the scanning theoretically, but the whole rhythmus practically, to the most obtuse ear, would be annihilated by Pope's false quantity, is a blunder which serves to show his utter ignorance of prosody. But, even as a version of the sense, with every allowance for a poet's license of compression and expansion, Pope's translation is defective, and argues an occasional inability to construe the text. For instance, at the council summoned by Jupiter, it is said that he at his first entrance seats himself upon his starry throne, but not so the inferior gods:

> "Nec protinus ausi
> Cœlicolæ, veniam donec pater ipse sedendi
> Tranquilla jubet esse manu."

In which passage there is a slight obscurity, from the ellipsis of the word *sedere*, or *sese locare;* but the meaning is evidently that the other gods did not presume to sit down *protinus*, that is, in immediate succession to Jupiter, and interpreting his example as a tacit license to do so, until, by a gentle wave of his hand, the supreme father signifies his express permission to take their seats. But Pope, manifestly unable to extract any sense from the passage, translates thus:

> "At Jove's assent the deities around,
> In solemn state, the consistory *crown'd;*"

where at once the whole picturesque solemnity of the celestial ritual melts into the vaguest generalities. Again, at v. 178, *ruptæque vices* is translated "*and all the ties of nature broke;*" but by *vices* is indicated the alternate reign of the two brothers, as ratified by mutual oaths, and subsequently violated by Eteocles. Other mistakes might be cited, which seem to prove that Pope, like most self-taught linguists, was a very imperfect one.[1] Pope, in

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[1] Meantime, the felicities of this translation are at times perfectly astonishing; and it would be scarcely possible to express more nervously or amply the words,

> "*Jurisque secundi*
> *Ambitus impatiens*, et summo dulcius unum
> Stare loco,"

than this child of fourteen has done in the following couplet, which, most judiciously, by reversing the two clauses, gains the power of fusing them into connection:

> "And impotent desire to reign alone,
> *That scorns the dull reversion of a throne.*"

But the passage for which, beyond all others, we must make room, is a series of eight lines, corresponding to six in the original, and this for two reasons: first, because Dr Joseph Warton has deliberately asserted, that in our whole literature "we have scarcely eight more beautiful lines than these;" and though few readers will subscribe to so sweeping a judgment, yet certainly these must be wonderful lines for a boy which could challenge such commendation from an experienced *polyhistor* of infinite reading. Secondly, because short, never rose to such a point in classical literature as to read either Greek or Latin authors without effort, and for his private amusement.

The result, therefore, of Pope's self-tuition appears to us, considered in the light of an attempt to acquire certain accomplishments of knowledge, a most complete failure. As a linguist, he read no language with ease; none with pleasure to himself; and none with so much accuracy as could have carried him through the most popular author with a general independence on interpreters. But, considered with a view to his particular faculties and slumbering originality of power, which required perhaps the stimulation of accident to arouse them effectually, we are very much disposed to think that the very failure of his education as an artificial training was a great advantage finally for inclining his mind to throw itself, by way of indemnification, upon its native powers. Had he attained, as with better tuition he would have attained, distinguished excellence as a scholar, or as a student of science, the chances are many that he would have settled down into such studies as thousands could pursue not less successfully than he; whilst as it was, the very dissatisfaction which he could not but feel with his slender attainments must have given him a strong motive for cultivating those impulses of original power which he felt continually stirring within him, and which were vivified into trials of competition as often as any distinguished excellence was introduced to his knowledge.

Pope's father, at the time of his birth, lived in Lombard Street;[1] a street still familiar to the public eye, from its adjacency to some of the chief metropolitan establishments, and to the English ear possessing a degree of historical importance; first, as the residence of those Lombards, or Milanese, who affiliated our infant commerce to the matron splendours of the Adriatic and the Mediterranean; next, as the central resort of those jewellers, or "goldsmiths," as they were styled, who performed all the functions of modern bankers from the period of the parliamentary war to the rise of the Bank of England, that is, for six years after the birth of Pope; and, lastly, as the seat, until lately, of that vast post-office through which, for so long a period, has passed the correspondence of all nations and languages, upon a scale unknown to any other country. In this street Alexander Pope the elder had a house, and a warehouse, we presume, annexed, in which he conducted the wholesale business of a linen merchant. As soon as he had made a moderate fortune he retired from business, first to Kensington, and afterwards to Binfield, in Windsor Forest. The period of this migration is not assigned by any writer. It is probable that a prudent man would not adopt it with any prospect of having more children. But this chance might be considered as already extinguished at the birth of Pope; for though his father had then only attained his forty-fourth year, Mrs Pope had completed her forty-eighth. It is probable, from the interval of seven days which is said to have elapsed between Pope's punishment and his removal from the school, that his parents were then living at such a distance from him as to prevent his ready communication with them, else we may be sure that Mrs Pope would have flown on the wings of love and wrath to the rescue of her darling. Supposing, therefore, as we *do* suppose, that Mr Bromley's school in London was the scene of his disgrace, it would appear on this argument that his parents were then living in Windsor Forest. And this hypothesis falls in with another anecdote in Pope's life, which we know partly upon his own authority. He tells Wycherly that he had seen Dryden, and barely seen him. *Virgilium vidi tantum.* This is presumed to have been in Will's coffee-house, whither any person in search of Dryden would of course resort; and it must have been before Pope was twelve years old, for Dryden died in 1700. Now there is a letter of Sir Charles Wogan's, stating that he first took Pope to Will's, and his words are, "from our forest." Consequently, at that period, when he had not completed his twelfth year, Pope was already living in the forest.

[Sir Charles Wogan says he had the honour of bringing Mr Pope from his retreat in the forest, to "dress *à la mode*, and introduce at Will's coffee-house." This cannot apply to a boy under twelve years of age, but must refer to a subsequent period.]

From this period, and so long as the genial spirits of youth lasted, Pope's life must have been one dream of pleasure. He tells Lord Hervey that his mother did not spoil him; but that was no doubt because there was no room for wilfulness or waywardness on either side, when all was one placid scene of parental obedience and gentle filial authority. We feel persuaded that, if not in words, in spirit and inclination they would, in any note they might have occasion to write, subscribe themselves "your dutiful parents." And of what consequence in whose hands were the reins which were never needed? Every reader must be pleased to know that these idolizing parents lived to see their son at the very summit of his public elevation; even his father lived two years and a half after the publication of his *Homer* had commenced, and when his fortune was made; and his mother lived for nearly eighteen years more. What a felicity for her, how rare and how perfect, to find that he, who to her maternal eyes was naturally the most perfect of human beings, and the idol of her heart, had already been the idol of the nation before he had completed his youth. She had also another blessing not always commanded by the most devoted love; many sons there are who think it essential to manliness that they should treat their mother's doating anxiety with levity, or even

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the lines contain a night-scene. Now it must be well known to many readers, that the famous night-scene in the *Iliad*, so familiar to every school-boy, has been made the subject, for the last thirty years, of severe, and in many respects, of just criticism. This description will therefore have a double interest by comparison; whilst, whatever may be thought of either taken separately for itself, considered as a translation, this which we now quote is as true to Statius as the other is undoubtedly faithless to Homer:—

"*Jamque per emeriti surgens confinia Phœbi*
Titanis, late mundo subvecta silenti
Rorifera gelidum tenuaverat æra biga.
Jam pecudes volucresque tacent: jam somnus avaris
Inserpit curis, pronusque per æra nutat,
Grata laboratæ referens oblivia vitæ."
Theb. i. 336–341.

"'Twas now the time when Phœbus yields to night,
And rising Cynthia sheds her silver light;
Wide o'er the world in solemn pomp she drew
Her airy chariot hung with pearly dew.
All birds and beasts lie hushed. Sleep steals away
The wild desires of men and toils of day;
And brings, descending through the silent air,
A sweet forgetfulness of human care."

[1] One writer of that age says, in Cheapside; but probably this difference arose from contemplating Lombard Street as a prolongation of Cheapside. [He is first found residing in Broad Street. Mr Hotten, bookseller, Piccadilly, has published an extract from a London Directory of 1677, showing that in the list of merchants for that year was "Alexand. Pope, Broad-street." The *Athenæum* followed this up by a citation from the register of St Bennet-Fink, in which part of Broad Street is situated: "1679, 12 Aug. Buried, Magdalen, the wife of Alexander Pope." There can be no doubt that this Magdalen Pope was the wife of the poet's father, who had, previous to his removal to Lombard Street, resided in Broad Street during the period 1677–1679. The *Athenæum* further published an extract from the inedited correspondence of Pope with Mr Caryll, in which the poet writes—"My sister Rackett was my own father's daughter by a former wife." Of this first wife no information has been found.]

ridicule. But Pope, who was the model of a good son, never swerved in words, manners, or conduct, from the most respectful tenderness, or intermitted the piety of his attentions. And so far did he carry this regard for his mother's comfort, that, well knowing how she lived upon his presence or by his image, he denied himself for many years all excursions which could not be fully accomplished within the revolution of a week. And to this cause, combined with the excessive length of his mother's life, must be ascribed the fact that Pope never went abroad; not to Italy with Thomson or with Berkeley, or any of his diplomatic friends; not to Ireland, where his presence would have been hailed as a national honour; not even to France, on a visit to his admiring and admired friend Lord Bolingbroke. For as to the fear of sea-sickness *that* did not arise until a late period of his life; and at any period would not have operated to prevent his crossing from Dover to Calais. It is possible that, in his earlier and more sanguine years, all the perfection of his filial love may not have availed to prevent him from now and then breathing a secret murmur at confinement so constant. But it is certain that, long before he passed the meridian of his life, Pope had come to view this confinement with far other thoughts. Experience had then taught him that to no man is the privilege granted of possessing more than one or two friends who are such in extremity. By that time he had come to view his mother's death with fear and anguish. She, he knew by many a sign, would have been happy to lay down her life for his sake; but for others, even those who were the most friendly and the most constant in their attentions, he felt but too certainly that his death, or his heavy affliction, might cost them a few sighs, but would not materially disturb their peace of mind. "It is but in a very narrow circle," says he, in a confidential letter, "that friendship walks in this world, and I care not to tread out of it more than I needs must; knowing well it is but to two or three (if quite so many) that any man's welfare or memory can be of consequence." After such acknowledgments, we are not surprised to find him writing thus of his mother, and his fearful struggles to fight off the shock of his mother's death, at a time when it was rapidly approaching. After having said of a friend's death, "the subject is beyond writing upon, beyond cure or ease by reason or reflection, beyond all but one thought that it is the will of God," he goes on thus, "So will the death of my mother be, which now I tremble at, now resign to, now bring close to me, now set farther off; every day alters, turns me about, confuses my whole frame of mind." There is no pleasure, he adds, which the world can give, "equivalent to countervail either the death of one I have so long lived with, or of one I have so long lived for." How will he comfort himself after her death? "I have nothing left but to turn my thoughts to one comfort, the last we usually think of, though the only one we should in wisdom depend upon. I sit in her room, and she is always present before me but when I sleep. I wonder I am so well. I have shed many tears; but now I weep at nothing."

A man, therefore, happier than Pope in his domestic relations cannot easily have lived. It is true these relations were circumscribed; had they been wider they could not have been so happy. But Pope was equally fortunate in his social relations. What, indeed, most of all surprises us is the courteous, flattering, and even brilliant reception which Pope found from his earliest boyhood amongst the most accomplished men of the world. Wits, courtiers, statesmen, grandees the most dignified, and men of fashion the most brilliant, all alike treated him not only with pointed kindness, but with a respect that seemed to acknowledge him as their intellectual superior. Without rank, high birth, fortune, without even a literary name, and in defiance of a deformed person. Pope, whilst yet only sixteen years of age, was caressed, and even honoured; and all this with no one recommendation but simply the knowledge of his dedication to letters, and the premature expectations which he raised of future excellence. Sir William Trumbull, a veteran statesman, who had held the highest stations, both diplomatic and ministerial, made him his daily companion. Wycherley, the old *roué* of the town, a second-rate wit, but not the less jealous on that account, showed the utmost deference to one whom, as a man of fashion, he must have regarded with contempt, and between whom and himself there were nearly "fifty good years of fair and foul weather." Cromwell,[1] a fox-hunting country gentleman, but uniting with that character the pretensions of a wit, and affecting also the reputation of a rake, cultivated his regard with zeal and conscious inferiority. Nay, which never in any other instance happened to the most fortunate poet, his very inaugural essays in verse were treated, not as prelusive efforts of auspicious promise, but as finished works of art, entitled to take their station amongst the literature of the land; and in the most worthless of all his poems, Walsh, an established authority, and whom Dryden pronounced the ablest critic of the age, found proofs of equality with Virgil.

The literary correspondence with these gentlemen is interesting, as a model of what once passed for fine letter-writing. Every nerve was strained to outdo each other in carving all thoughts into a filigree work of rhetoric; and the amobean contest was like that between two village-cocks from neighbouring farms endeavouring to overcrow each other. To us, in this age of purer and more masculine taste, the whole scene takes the ludicrous air of old and young fops dancing a minuet with each other, practising the most elaborate grimaces, sinkings and risings the most awful, bows the most overshadowing, until plain walking, running, or the motions of natural dancing, are thought too insipid for endurance. In this instance the taste had perhaps really been borrowed from France though often enough we impute to France what is the native growth of all minds placed in similar circumstances. Madame de Sevigné's *Letters* were really models of grace. But Balzac, whose letters, however, are not without interest, had in some measure formed himself upon the truly magnificent rhetoric of Pliny and Seneca. Pope and his correspondents, meantime, degraded the dignity of rhetoric by applying it to trivial commonplaces of compliment; whereas Seneca applied it to the grandest themes which life or contemplation can supply. Lady Mary Wortley Montagu, on first coming amongst the wits of the day, naturally adopted their style. She found this sort of *euphuism* established;

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[1] Dr Johnson said, that all he could discover about Mr Cromwell was the fact of his going a hunting in a tie-wig; but Gay has added another fact to Dr Johnson's, by calling him "honest *hatless* Cromwell with red breeches." This epithet has puzzled the commentators, but its import is obvious enough. Cromwell, as we learn from more than one person, was anxious to be considered a fine gentleman, and devoted to women. Now it was long the custom in that age for such persons, when walking with ladies, to carry their hats in their hand. Louis XV. used to ride by the side of Madame de Pompadour hat in hand. [Henry Cromwell was the son of a person of the same name resident in Ramsay, Huntingdonshire. He was related to the family of the Protector, the common ancestor of both being Sir Henry Cromwell of Hinchingbrook, the "Golden Knight" in Queen Elizabeth's days. The poet's friend had a small estate, Beesby in Lincolnshire. He died in London in 1728, aged 69. By his will he left his estate of Beesby to a second cousin, the Rev. Henry Greene, and L.40 a year to his "ancient and faithful servant" Isabel Perez, the "Lady Isabella" of Pope's letters. He directed also that his body should be decently interred, *suitable to his birth*, in the church of St Clement Danes, "which church," he adds, "I have most frequented."]

and it was not for a very young woman to oppose it. But her masculine understanding and powerful good sense, shaken free, besides, from all local follies by travels and extensive commerce with the world, first threw off these glittering chains of affectation. Dean Swift, by the very constitution of his mind, plain, sinewy, nervous, and courting only the strength that allies itself with homeliness, was always indisposed to this mode of correspondence. And, finally, Pope himself, as his earlier friends died off, and his own understanding acquired strength, laid it aside altogether. One reason doubtless was, that he found it too fatiguing; since in this way of letter-writing he was put to as much expense of wit in amusing an individual correspondent as would for an equal extent have sufficed to delight the whole world. A funambulist may harass his muscles and risk his neck on the tight-rope, but hardly to entertain his own family. Pope, however, had another reason for declining this showy system of fencing; and strange it is that he had not discovered this reason from the very first. As life advanced, it happened unavoidably that real business advanced; the careless condition of youth prompted no topics, or at least prescribed none, but such as were agreeable to the taste, and allowed of an ornamental colouring. But when downright business occurred, exchequer bills to be sold, meetings to be arranged, negotiations confided, difficulties to be explained, here and there by possibility a jest or two might be scattered, a witty allusion thrown in, or a sentiment interwoven; but for the main body of the case, it neither could receive any ornamental treatment, nor if, by any effort of ingenuity, it *had*, could it look otherwise than silly and unreasonable:—

> "Ornari res ipsa negat, contenta doceri."

Pope's idleness, therefore, on the one hand, concurring with good sense and the necessities of business on the other, drove him to quit his gay rhetoric in letter-writing. But there are passages surviving in his correspondence which indicate that, after all, had leisure and the coarse perplexities of life permitted it, he still looked with partiality upon his youthful style, and cherished it as a first love. But in this harsh world, as the course of true love, so that of rhetoric, never did run smooth; and thus it happened that, with a lingering farewell, he felt himself forced to bid it adieu. Strange that any man should think his own sincere and confidential overflowings of thought, and feeling upon books, men, and public affairs, less valuable in a literary view than the legerdemain of throwing up bubbles into the air for the sake of watching their prismatic hues, like an Indian juggler with his cups and balls. We of this age, who have formed our notions of epistolary excellence from the chastity of Gray's, the brilliancy of Lady Mary Wortley Montagu's during her later life, and the mingled good sense and fine feeling of Cowper's, value only those letters of Pope which he himself thought of inferior value. And even with regard to these, we may say that there is a great mistake made; the best of those later letters between Pope and Swift, &c., are not in themselves at all superior to the letters of sensible and accomplished women, such as leave every town in the island by every post. Their chief interest is a derivative one; we are pleased with any letter, good or bad, which relates to men of such eminent talent; and sometimes the subjects discussed have a separate interest for themselves. But as to the quality of the discussion, apart from the person discussing and the thing discussed, so trivial is the value of these letters in a large proportion, that we cannot but wonder at the preposterous value which was set upon them by the writers.[1] Pope especially ought not to have his ethereal works loaded by the mass of trivial prose which is usually attached to them.

This correspondence, meantime, with the wits of the time, though one mode by which, in the absence of reviews, the reputation of an author was spread, did not perhaps serve the interests of Pope so effectually as the poems which in this way he circulated in those classes of English society whose favour he chiefly courted. One of his friends, the truly kind and accomplished Sir William Trumbull, served him in that way, and perhaps in another eventually even more important. The library of Pope's father was composed exclusively of polemical divinity; a proof, by the way, that he was not a blind convert to the Roman Catholic faith, or, if he was so originally, had reviewed the grounds of it, and adhered to it after strenuous study. In this dearth of books at his own home, and until he was able to influence his father in buying more extensively, Pope had benefited by the loans of his friends; amongst whom it is probable that Sir William, as one of the best scholars of the whole, might assist him most. He certainly offered him the most touching compliment, as it was also the wisest and most paternal counsel, when he besought him, as one *goddess-born*, to quit the convivial society of deep-drinkers:

> "Heu, fuge nate dea, teque his, ait, eripe malis."

With these aids from friends of rank, and his way thus laid open to public favour, in the year 1709 Pope first came forward upon the stage of literature. The same year which terminated his legal minority introduced him to the public. *Miscellanies* in those days were almost periodical repositories of fugitive verse. Tonson happened at this time to be publishing one of some extent, the sixth volume of which offered a sort of ambush to the young aspirant of Windsor Forest, from which he might watch the public feeling. The volume was opened by Mr Ambrose Philips, in the character of pastoral poet; and in the same character, but stationed at the end of the volume, and thus covered by his bucolic leader, as a soldier to the rear by the file in advance, appeared Pope; so that he might win a little public notice, without too much seeming to challenge it. This half-clandestine emersion upon the stage of authorship, and his furtive position, are both mentioned by Pope as accidents, but as accidents in which he rejoiced, and not improbably accidents which Tonson had arranged with a view to his satisfaction. It must appear strange that Pope at twenty-one should choose to come forward for the first time with a work composed at sixteen. A difference of five years at that stage of life is of more effect than of twenty at a later; and his own expanding judgment could hardly fail to inform him that his *Pastorals* were by far the worst of his works. In reality, let us not deny, that had Pope never written anything else, his name would not have been known as a name even of promise, but would probably have been redeemed from oblivion by some satirist or writer of a *Dunciad*. Were a man to meet with such a nondescript monster as the following, viz.—"*Love out of Mount Ætna by a Whirlwind*," he would suppose himself reading the "Racing Calendar." Yet this hybrid creature is one of the many zoological monsters to whom the *Pastorals* introduce us:—

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[1] It is strange indeed to find, not only that Pope had so frequently kept rough copies of his own letters, and that he thought so well of them as to repeat the same letter to different persons, as in the case of the two lovers killed by lightning, or even to two sisters, Martha and Therese Blount (who were sure to communicate their letters), but that even Swift had retained copies of *his*. [There is no instance of Pope repeating the same letter to the two sisters, Teresa (so she and all her friends wrote the name) and Martha Blount. For many years he wrote indifferently to either, but latterly he became estranged from Teresa (whom he accused of being too gay and fond of society), and his affection was concentrated on Martha, to whom he left the bulk of his fortune. She was of the same age as the poet, but survived till 1763. The connection was, as Mr De Quincey subsequently argues, of a purely innocent nature, although the poet's letters to the young ladies are occasionally stained by the grossness and pruriency of that licentious age.]

> "I know thee, love! on foreign mountains born,
> Wolves gave thee suck, and savage tigers fed.
> Thou wert from Ætna's burning entrails torn,
> Got by fierce whirlwinds, and in thunder born."

But the very names "Damon" and "Strephon," "Phillis" and "Delia," are rank with childishness. Arcadian life is at the best a feeble conception, and rests upon the false principle of crowding together all the luscious sweets of rural life, undignified by the danger which attends pastoral life in our climate, and unrelieved by shades, either moral or physical. And the Arcadia of Pope's age was the spurious Arcadia of the opera theatre, and, what is worse, of the French opera.

The hostilities which followed between these rival wooers of the pastoral muse are well known. Pope, irritated at what he conceived the partiality shown to Philips in the *Guardian*, pursued the review ironically; and, whilst affecting to load his antagonist with praises, draws into pointed relief some of his most flagrant faults. The result, however, we cannot believe. That all the wits, except Addison, were duped by the irony, is quite impossible. Could any man of sense mistake for praise the remark that Philips had imitated "*every* line of Strada;" that he had introduced wolves into England, and proved himself the first of gardeners by making his flowers "blow all in the same season?" Or, suppose those passages unnoticed, could the broad sneer escape him where Pope taxes the other writer (viz., himself) with having deviated "into downright poetry;" or the outrageous ridicule of Philips' style, as setting up for the ideal type of the pastoral style the quotation from Gay, beginning,

> "Rager, go vetch tha kee, or else tha zun
> Will quite bego before ch' 'avs half a don!"

Philips is said to have resented this treatment by threats of personal chastisement to Pope, and even hanging up a rod at Button's coffee-house. We may be certain that Philips never disgraced himself by such ignoble conduct.

[There is, however, good contemporary evidence for the fact. It is mentioned in a pamphlet, *Pope Alexander's Supremacy*, 1728; and in Cibber's Letter to Pope, 1742; and it is confirmed, Mr Peter Cunningham says, by an unpublished letter from Broome to Fenton, of 3d May 1729.]

If the public, indeed, were universally duped by the paper, what motive had Philips for resentment? Or, in any case, what plea had he for attacking Pope, who had not come forward as the author of the Essay? But, from Pope's confidential account of the matter, we know that Philips saw him daily, and never offered him "any indecorum;" though, for some cause or other, Pope pursued Philips with virulence through life.

In the year 1711 Pope published his *Essay on Criticism*, which some people have very unreasonably fancied his best performance; and in the same year his *Rape of the Lock*, the most exquisite monument of playful fancy that universal literature offers. It wanted, however, as yet, the principle of its vitality, in wanting the machinery of sylphs and gnomes, with which addition it was first published in 1714.

In the year 1712 (1715) Pope appeared again before the public as the author of the *Temple of Fame*, and the *Elegy to the Memory of an Unfortunate Lady*. Much speculation has arisen on the question concerning the name of this lady, and the more interesting question concerning the nature of the persecutions and misfortunes which she suffered. Pope appears purposely to decline answering the questions of his friends upon that point; at least the questions have reached us, and the answers have not. Joseph Warton supposed himself to have ascertained four facts about her: that her name was Wainsbury; that she was deformed in person; that she retired into a convent from some circumstances connected with an attachment to a young man of inferior rank; and that she killed herself, not by a sword, as the poet insinuates, but by a halter. As to the latter statement, it may very possibly be true; such a change would be a very slight exercise of the poet's privileges. As to the rest, there are scarcely grounds enough for an opinion. Pope certainly speaks of her under the name of Mrs (*i.e.*, Miss) W——, which at least argues a poetical exaggeration in describing her as a being "that once had *titles*, honour, wealth, and fame;" and he may as much have exaggerated her pretensions to beauty. It is indeed noticeable that he speaks simply of her *decent* limbs, which, in any English use of the word, does not imply much enthusiasm of praise. She appears to have been the niece of a Lady A——; and Mr Craggs, afterwards secretary of state [in reality Mr Caryll, not Craggs], wrote to Lady A—— on her behalf, and otherwise took an interest in her fate. As to her being a relative of the Duke of Buckingham's, that rests upon a mere conjectural interpretation applied to a letter of that nobleman's. But all things about this unhappy lady are as yet enveloped in mystery.

[The obscurity and confusion connected with Pope's *Elegy* had its origin primarily in a deceptive note in Warburton's edition of the poet's works, 1751. Appended to the Elegy we read:—"See the Duke of Buckingham's verses to a lady designing to retire into a monastery, compared with Mr Pope's 'Letters to several Ladies,' page 206. *She seems to be the same person whose unfortunate death is the subject of the poem.*—P." Turning to the "Letters to several Ladies" referred to, we find one of Pope's letters to Lady Mary Wortley Montagu. "We never meet," writes the poet, "but we lament over you. The Duke of B——m is sometimes the high priest of your praises." The name of Lady Mary was suppressed, and the reference to the Duke of B——m had misled Warburton, or was made by Pope for the purpose of mystification, in which he so much delighted. The duke's verses to a lady designing to retire into a monastery were first published in Tonson's *Miscellany* for 1709, when he was in his sixtieth year. They were most likely a much earlier production, and this renders it in the highest degree improbable that the same lady should have been commemorated by Pope, who was thirty-seven years younger than his friend. We are still without any positive information as to the name and history of the lady forming the subject of the Elegy. Walpole had learned it from Lady Hervey, but refused to communicate it; but from the intimacy that subsisted between Walpole and Warton, it has been conjectured that the latter had at length obtained from his friend the name Wainsbury, and the circumstances related above. Of this, however, we have no proof. The Elegy was first published, not in 1712, but in 1717. The "Mrs W." of the poet's printed correspondence was a Mrs Weston of Sutton, county of Surrey, niece of Lord Aston. She had separated from her husband, and Pope took a warm interest in her affairs. She survived till 1724, and died, not by the "visionary sword," or in a foreign land, but at her husband's residence of Sutton Place. See *Athenæum* for 1854, and Carruthers's *Life of Pope*, Bohn's "Illustrated Library."]

And not the least part of the mystery is a letter of Pope's to a Mr C——, bearing date 1732, that is, just twenty years after the publication of the poem, in which Pope, in a manly tone, justifies himself for his estrangement, and presses against his unknown correspondent the very blame which he had applied generally to the kinsman of the poor victim in 1712. Now, unless there is some mistake in the date, how are we to explain this gentleman's long lethargy, and his sudden sensibility to Pope's anathema, with which the world had resounded for twenty years?

[This refers to a totally different affair—to the case of a Mrs Cope, a distressed lady to whom Pope allowed L.20 a year. She was a relation of "Mr C.," or Caryll (who suggested the poem of the *Rape of the Lock*); and Pope, though generous to the lady, was unjust towards her relative Mr Caryll, by the manner in which he garbled the correspondence in his printed letters.]

Pope had now established his reputation with the public as the legitimate successor and heir to the poetical supremacy of Dryden. His *Rape of the Lock* was unrivalled in ancient or modern literature, and the time had now arrived when, instead of seeking to extend his fame, he might count upon a pretty general support in applying what he had already established to the promotion of his own interest. Accordingly, in the autumn of 1713, he formed a final resolution of undertaking a new translation of the *Iliad.* It must be observed that already in 1709, concurrently with his Pastorals, he had published specimens of such a translation; and these had been communicated to his friends some time before. In particular, Sir William Trumbull, on the 9th of April 1708, urged upon Pope a complete translation of both *Iliad* and *Odyssey.* Defective skill in the Greek language, exaggeration of the difficulties, and the timidity of a writer as yet unknown, and not quite twenty years old, restrained Pope for five years and more. What he had practised as a sort of *bravura*, for a single effort of display, he recoiled from as a daily task to be pursued through much toil, and a considerable section of his life. However, he dallied with the purpose, starting difficulties in the temper of one who wishes to hear them undervalued; until at length Sir Richard Steele determined him to the undertaking, a fact overlooked by the biographers, but which is ascertained by Ayre's account of that interview between Pope and Addison, probably in 1716, which sealed the rupture between them. [This supposed interview is now believed to be apocryphal.] In the autumn of 1713, he made his design known amongst his friends. Accordingly, on the 21st of October, we have Lord Landsdowne's letter, expressing his great pleasure at the communication; on the 26th, we have Addison's letter encouraging him to the task; and in November of the same year occurs the amusing scene so graphically described by Bishop Kennet, when Dean Swift presided in the conversation, and, amongst other indications of his conscious authority, "instructed a young nobleman that the best poet in England was Mr Pope, who had *begun* a translation of Homer into English verse, for which he must have them all subscribe; for," says he, "*the author shall not begin to print until I have a thousand guineas for him.*"

If this were the extent of what Swift anticipated from the work, he fell miserably below the result. But, perhaps, he spoke only of a cautionary *arrha* or earnest. As this was unquestionably the greatest literary labour, as to profit, ever executed, not excepting the most lucrative of Sir Walter Scott's, if due allowance be made for the altered value of money, and if we consider the *Odyssey* as forming part of the labour, it may be right to state the particulars of Pope's contract with Lintot.

The number of subscribers to the *Iliad* was 575, and the number of copies subscribed for was 654. The work was to be printed in six quarto volumes, and the subscription was a guinea a volume. Consequently by the subscription Pope obtained six times 654 guineas, or L.4218, 6s. (for the guinea then passed for 21s. 6d.); and for the copyright of each volume Lintot offered L.200, consequently L.1200 for the whole six; so that from the *Iliad* the profit exactly amounted to L.5310, 16s. Of the *Odyssey*, 574 copies were subscribed for. It was to be printed in five quarto volumes, and the subscription was a guinea a volume. Consequently by the subscription Pope obtained five times 574 guineas, or L.3085, 5s.; and for the copyright Lintot offered L.600. The total sum received therefore by Pope, on account of the *Odyssey*, was L.3685, 5s. But in this instance he had two coadjutors, Broome and Fenton; between them they translated twelve books, leaving twelve to Pope. The notes also were compiled by Broome; but the postscript to the notes was written by Pope. Fenton received L.300, Broome L.500. Such, at least, is Warton's account, and more probable than that of Ruffhead, who not only varies the proportions, but increases the whole sum given to the assistants by L.100. Thus far we had followed the guidance of mere probabilities, as they lie upon the face of the transaction. But we have since detected a written statement of Pope's, unaccountably overlooked by the biographers, and serving of itself to show how negligently they have read the works of their illustrious subject. The statement is entitled to the fullest attention and confidence, not being a hasty or casual notice of the transaction, but pointedly shaped to meet a calumnious rumour against Pope in his character of paymaster; as if he who had found so much liberality from publishers in his own person, were niggardly or unjust as soon as he assumed those relations to others. Broome, it was alleged, had expressed himself dissatisfied with Pope's remuneration. Perhaps he had; for he would be likely to frame his estimate for his own services from the scale of Pope's reputed gains; and those gains would, at any rate, be enormously exaggerated, as uniformly happens where there is a basis of the marvellous to begin with. And, secondly, it would be natural enough to assume the previous result from the *Iliad* as a fair standard for computation; but in this, as we know, all parties found themselves disappointed, and Broome had the less right to murmur at this, since the arrangement with himself as chief journeyman in the job was one main cause of the disappointment. There was also another reason why Broome should be less satisfied than Fenton. Verse for verse, any one thousand lines of a translation so purely mechanical might stand against any other thousand; and so far the equation of claims was easy. A book-keeper, with a pen behind his ear, and Cocker's *Golden Rule* open before him, could do full justice to Mr Broome *as a poet* every Saturday night. But Broome had a separate account-current for pure prose against Pope. One he had in conjunction with Fenton for verses delivered on the premises at so much per hundred, on which there could be no demur, except as to the allowance for tare and tret as a discount in favour of Pope. But the prose account, the account for notes, requiring very various degrees of reading and research, allowed of no such easy equation. *There* it was, we conceive, that Broome's discontent arose. Pope, however, declares that he had given him L.500, thus confirming the proportions of Warton against Ruffhead (that is, in effect, Warburton), and some other advantages which were not in money, nor deductions at all from his own money profits, but which may have been worth so much money to Broome as to give some colourable truth to Ruffhead's allegation of an additional L.100. In direct money, it remains certain that Fenton had three and Broome five hundred pounds.

[Spence says Fenton received L.240. Broome, in an inedited letter quoted by Mr P. Cunningham in his edition of Johnson's *Lives*, writes to Pope, Oct. 29, 1735:—"You paid me L.500; that is, L.100 for the notes and L.400 for eight books of the prose translation, and Mr Fenton in proportion for his four books." Broome was probably also dissatisfied with the manner in which Pope referred to his coadjutors at the conclusion of the notes to the *Odyssey*. *Five* books only are mentioned as the work of Broome and Fenton, while in reality they translated *twelve* books. Warburton told Johnson, "in his warm language," that "he thought the relation given in the note a lie;" and such it appears to have been.]

It follows, therefore, that for the *Iliad* and *Odyssey* jointly he received a sum of L.8996, 1s., and paid for assistance L.800, which leaves to himself a clear sum of L.8196, 1s. And, in fact, his profits ought to be calculated without deduction, since it was his own choice, from indolence, to purchase assistance.

The *Iliad* was commenced about October 1713. In the summer of the following year he was so far advanced as to begin making arrangements with Lintot for the printing; and the first two books, in manuscript, were put into the hands of Lord Halifax. In June 1715, between the 10th and 28th, the subscribers received their copies of the first volume; and in July Lintot began to publish that volume generally. Some readers will inquire, who paid for the printing and paper, &c.? All this expense fell upon Lintot, for whom Pope was superfluously anxious. The sagacious bookseller understood what he was about; and, when a pirated edition was published in Holland, he counteracted the injury by printing a cheap edition, of which 7500 copies were sold in a few weeks; an extraordinary proof of the extended interest in literature. The second, third, and fourth volumes of the *Iliad*, each containing, like the first, four books, were published successively in 1716, 1717, 1718; and in 1720 Pope completed the work by publishing the fifth volume, containing five books, and the sixth, containing the last three, with the requisite supplementary apparatus.

The *Odyssey* was commenced in 1723 (not 1722, as Mr Roscoe virtually asserts at p. 259), and the publication of it was finished in 1725. The sale, however, was much inferior to that of the *Iliad*, for which more reasons than one might be assigned. But there can be no doubt that Pope himself depreciated the work, by his undignified arrangements for working by subordinate hands. Such a process may answer in sculpture, because there a quantity of rough-hewing occurs, which can no more be improved by committing it to a Phidias, than a common shop-bill could be improved in its arithmetic by Sir Isaac Newton. But in literature such arrangements are degrading; and, above all, in a work which was but too much exposed already to the presumption of being a mere effort of mechanic skill, or (as Curll said to the House of Lords) "*a knack*;" it was deliberately helping forward that idea to let off parts of the labour. Only think of Milton letting off by contract to the lowest offer, and to be delivered by such a day (for which good security to be found), six books of *Paradise Lost*. It is true, the great dramatic authors were often *collaborateurs*, but their case was essentially different. The loss, however, fell not upon Pope, but upon Lintot, who, on this occasion, was out of temper, and talked rather broadly of prosecution. But that was out of the question. Pope had acted indiscreetly, but nothing could be alleged against his honour; for he had expressly warned the public that he did not, as in the other case, profess to translate, but to *undertake*[1] a translation of the *Odyssey*. Lintot, however, was no loser absolutely, though he might be so in relation to his expectations; on the contrary, he grew rich, bought land, and became sheriff of the county in which his estates lay.

We have pursued the Homeric labours uninterruptedly from their commencement in 1713 till their final termination in 1725, a period of twelve years or nearly; because this was the task to which Pope owed the dignity, if not the comforts, of his life, since it was this which enabled him to decline a pension from all administrations, and even from his friend Craggs, the secretary, to decline the express offer of L.300 per annum. Indeed, Pope is always proud to own his obligations to Homer. In the interval, however, between the *Iliad* and the *Odyssey*, Pope listened to proposals made by Jacob Tonson that he should revise an edition of Shakspeare. For this, which was in fact the first attempt at establishing the text of the mighty poet, Pope obtained but little money, and still less reputation. He received, according to tradition, only L.217, 12s. for his trouble of collation, which must have been considerable, and some other trifling editorial labour. And the opinion of all judges, from the first so unfavourable as to have depreciated the money value of the book enormously, perhaps from a prepossession of the public mind against the fitness of Pope for executing the dull labours of revision, has ever since pronounced this work the very worst edition in existence. For the edition we have little to plead; but for the editor it is but just to make three apologies. In the *first* place, he wrote a brilliant preface, which, although (like other works of the same class) too much occupied in displaying his own ability, and too often, for the sake of an effective antithesis, doing deep injustice to Shakspeare, yet undoubtedly, as a whole, extended his fame, by giving the sanction and countersign of a great wit to the national admiration. *Secondly*, as Dr Johnson admits, Pope's failure pointed out the right road to his successors. *Thirdly*, even in this failure it is but fair to say, that in a graduated scale of merit, as distributed amongst the long succession of editors through that century, Pope holds a rank proportionable to his age. For the year 1720, he is no otherwise below Theobald, Hanmer, Capell, Warburton, or even Johnson, than as they are successively below each other, and all of them as to accuracy below Steevens, as he again was below Malone and Read.

The gains from Shakspeare would hardly counterbalance the loss which Pope sustained this year from the South Sea bubble. One thing, by the way, is still unaccountably neglected by writers on this question: how it was that the great Mississippi bubble, during the Orleans regency in Paris, should have happened to coincide with that of London. If this were accident, how marvellous that the same insanity should possess the two great capitals of Christendom in the same year? If, again, it were not accident, but due to some common cause, why is not that cause explained? Pope to his nearest friends never stated the amount of his loss. The biographers report that at one time his stock was worth from twenty to thirty thousand pounds. But that is quite impossible. It is true that, as the stock rose at one time a thousand per cent., this would not imply on Pope's part an original purchase beyond twenty-five hundred pounds or thereabouts. But Pope has furnished an argument against *that*, which we shall improve. He quotes more than once, as applicable to his own case, the old proverbial riddle of Hesiod, πλεον ἥμισυ παντος (*the half is more than the whole*). What did he mean by that? We understand it thus: that between the selling and buying, the variations had been such as to sink his shares to one-half of the price they had once reached, but, even at that depreciation, to leave him richer on selling out than he had been at first. But the half of L.25,000 would be a far larger sum than Pope could have ventured to risk upon a fund confessedly liable to daily fluctuation. L.3000 would be the utmost he could risk; in which case the half of L.25,000 would have left him so very much richer that he would have proclaimed his good fortune as an evidence of his skill and prudence. Yet, on the contrary, he wished his friends to understand at times that he had lost. But his friends forgot to ask one important question: Was the word *loss* to be understood in relation to the imaginary and nominal wealth which he once possessed, or in relation to the absolute sum invested in the South Sea fund? The truth is, Pope practised on this, as on other occasions, a little finessing, which is the chief foible in his character. His object was that, according to circumstances, he might vindicate his own freedom from the common mania, in case his enemies should take that handle for attacking him; or might have it in his power to plead poverty, and to account for it, in case he should ever accept that pension which had been so often tendered, but never sternly rejected.

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[1] The word *undertake* had not yet lost the meaning of Shakspeare's age, in which it was understood to describe those cases where, the labour being of a miscellaneous kind, some person in chief offered to overlook and conduct the whole, whether with or without personal labour. The modern *undertaker*, limited to the care of funerals. was then but one of numerous cases to which the term was applied.

In 1723 Pope lost one of his dearest friends, Bishop Atterbury, by banishment; a sentence most justly incurred, and mercifully mitigated by the hostile Whig government. On the bishop's trial, a circumstance occurred to Pope which flagrantly corroborated his own belief in his natural disqualification for public life. He was summoned as an evidence on his friend's behalf. He had but a dozen words to say, simply explaining the general tenor of his lordship's behaviour at Bromley; and yet, under this trivial task, though supported by the enthusiasm of his friendship, he broke down. Lord Bolingbroke, returning from exile, met the bishop at the sea-side; upon which it was wittily remarked that they were "exchanged." Lord Bolingbroke supplied to Pope the place, or perhaps more than supplied the place, of the friend he had lost; for Bolingbroke was a freethinker, and so far more entertaining to Pope, even whilst partially dissenting, than Atterbury, whose clerical profession laid him under restraints of decorum, and latterly, there is reason to think, of conscience.

In 1725, on closing the *Odyssey*, Pope announces his intention to Swift of quitting the labours of a translator, and thenceforwards applying himself to original composition. This resolution led to the *Essay on Man*, which appeared soon afterwards; and, with the exception of two labours, which occupied Pope in the interval between 1726 and 1729, the rest of his life may properly be described as dedicated to the further extension of that Essay. The two works which he interposed were a collection of the fugitive papers, whether prose or verse, which he and Dean Swift had scattered amongst their friends at different periods of life. The avowed motive for this publication, and in fact the secret motive, as disclosed in Pope's confidential letters, was to make it impossible thenceforwards for piratical publishers like Curll. Both Pope and Swift dreaded the malice of Curll in case they should die before him. It was one of Curll's regular artifices to publish a heap of trash on the death of any eminent man, under the title of his *Remains;* and in allusion to that practice it was that Arbuthnot most wittily called Curll "one of the new terrors of death." By publishing *all*, Pope would have disarmed Curll beforehand; and *that* was in fact the purpose; and that plea only could be offered by two grave authors, one forty, the other sixty years old, for reprinting *jeux d'esprit* that never had any other apology than the youth of their authors. Yet, strange to say, after all, some were omitted; and the omission of one opened the door to Curll as well as that of a score. Let Curll have once inserted the narrow end of the wedge, he would soon have driven it home.

This *Miscellany*, however, in three volumes (published in 1727, but afterwards increased by a fourth in 1732), though in itself a trifling work, had one vast consequence. It drew after it swarms of libels and lampoons, levelled almost exclusively at Pope, although the cipher of the joint authors stood entwined upon the title-page. These libels in *their* turn produced a second re-action; and, by stimulating Pope to effectual anger, eventually drew forth, for the everlasting admiration of posterity, the very greatest of Pope's works,—a monument of satirical power the greatest which man has produced, not excepting the *MacFleckno* of Dryden, namely, the immortal *Dunciad*.

In October of the year 1727 this poem, in its original form, was completed. Many editions, not spurious altogether, nor surreptitious, but with some connivance, not yet explained, from Pope, were printed in Dublin and in London. But the first quarto and acknowledged edition was published in London early in "1728–9," as the editors choose to write it, that is (without perplexing the reader), in 1729; on March 12 of which year it was presented by the prime minister, Sir Robert Walpole, to the king and queen at St James's.

[The "War of the Dunces" was one of the grand topics of the day. It commenced with the publication of the *Miscellanies*, in which Gay and Arbuthnot, as well as Pope and Swift, were joint authors. The two first volumes of the *Miscellanies* were published in June 1727, the third volume in March 1728. In this last volume appeared Pope's treatise on the Bathos, in which a host of minor poets (including Broome, Aaron Hill, Dennis, Gildon, James Moore Smythe, Welsted, &c.) were satirized. Some of the parties assailed made a feeble attempt at retaliation; but Pope was ready and eager for the strife. Within three months (May 1728) he issued the first edition of the *Dunciad;* and in other ten days appeared *A Key to the Dunciad*, ludicrously fathered upon Sir Richard Blackmore, but evidently the production of the poet. He wrote, also anonymously, various letters in the newspapers, keeping up the public attention to his work. In the preface to the first imperfect *Dunciad*, Pope had hinted at a complete copy of the poem; and accordingly, in April 1729, the enlarged edition, with Notes Variorum, Prolegomena, &c., was published. He wrote a humorous account of the reception of his satire, to which the name of Savage was affixed, and also a clever sarcastic production entitled *An Author to Let*, which also appeared with the name of Savage as author. About the same time Pope contributed a series of epigrams, letters, and criticisms to the *Grub Street Journal*, though he strenuously denied all connection with the paper. It is probable we are only yet half informed of the poet's underground labours, but it is certain that, if one of the most irritable of the tribe of authors, he was no less one of the most indefatigable and unscrupulous.]

Like a hornet, who is said to leave his sting in the wound, and afterwards to languish away, Pope felt so greatly exhausted by the efforts connected with the *Dunciad* (which are far greater, in fact, than all his Homeric labours put together), that he prepared his friends to expect for the future only an indolent companion and a hermit. Events rapidly succeeded which tended to strengthen the impression he had conceived of his own decay, and certainly to increase his disgust with the world. In 1732 died his friend Atterbury; and on December the 7th of the same year Gay, the most unpretending of all the wits whom he knew, and the one with whom he had at one time been domesticated, expired, after an illness of three days, which Dr Arbuthnot declares to have been "the most precipitate" he ever knew. But in fact Gay had long been decaying from the ignoble vice of too much and too luxurious eating. Six months after this loss, which greatly affected Pope, came the last deadly wound which this life could inflict, in the death of his mother. She had for some time been in her dotage, and recognised no face but that of her son, so that her death was not unexpected; but that circumstance did not soften the blow of separation to Pope. She died on the 7th of June 1733, being then ninety-three years old [more probably ninety-one]. Three days after, writing to Richardson the painter, for the purpose of urging him to come down and take her portrait before the coffin was closed, he says, "I thank God her death was as easy as her life was innocent; and as it cost her not a groan nor even a sigh, there is yet upon her countenance such an expression of tranquillity" that "it would afford the finest image of a saint expired that ever painting drew. Adieu, may you die as happily." The funeral took place on the 11th; Pope then quitted the house, unable to support the silence of her chamber, and did not return for months, nor in fact ever reconciled himself to the sight of her vacant apartment.

Swift also he had virtually lost for ever. In April 1727 this unhappy man had visited Pope for the last time. During this visit occurred the death of George I. Great expectations arose from that event amongst the Tories, in which, of course, Swift shared. It was reckoned upon as a thing of course that Walpole would be dismissed. But this bright gleam of hope proved as treacherous as all before; and the anguish of this final disappointment perhaps it was which brought on a violent attack of Swift's constitutional malady. On the last of August he quitted Pope's house abruptly; concealed himself in London; and finally quitted it, as stealthily as he had before quitted Twickenham, for

Ireland, never more to return. He left a most affectionate letter for Pope; but his affliction, and his gloomy anticipations of insanity, were too oppressive to allow of his seeking a personal interview.

Pope might now describe himself pretty nearly as *ultimus suorum;* and if he would have friends in future, he must seek them, as he complains bitterly, almost amongst strangers and another generation. This sense of desolation may account for the acrimony which too much disfigures his writings henceforward. Between 1732 and 1740 he was chiefly engaged in satires, which uniformly speak a high moral tone in the midst of personal invective; or in poems directly philosophical, which almost as uniformly speak the bitter tone of satire in the midst of dispassionate ethics. His *Essay on Man* was but one link in a general course which he had projected of moral philosophy, here and there pursuing his themes into the fields of metaphysics, but no farther in either field of morals or metaphysics than he could make compatible with a poetical treatment. These works, however, naturally entangled him in feuds of various complexions with people of very various pretensions; and to admirers of Pope so fervent as we profess ourselves, it is painful to acknowledge that the dignity of his latter years, and the becoming tranquillity of increasing age, are sadly disturbed by the petulance and the tone of irritation which, alike to those in the wrong and in the right, inevitably besiege all personal disputes. He was agitated besides by a piratical publication of his correspondence. This emanated of course from the den of Curll, the universal robber and "*blatant beast*" of those days; and besides the injury offered to his feelings by exposing some youthful sallies which he wished to have suppressed, it drew upon him a far more disgraceful imputation, most assuredly unfounded, but accredited by Dr Johnson, and consequently in full currency to this day, of having acted collusively with Curll, or at least through Curll, for the publication of what he wished the world to see, but could not else have devised any decent pretext for exhibiting.

[This opinion, clearly and emphatically stated by Johnson, has now obtained almost universal assent. We must refer to Johnson's *Life of Pope* for an account of the dramatic incidents connected with the sale and delivery of the printed correspondence to Curll. Pope denounced the letters so published as surreptitious, incorrect, and interpolated; and he felt himself under the necessity, he said, of issuing a genuine edition. This genuine edition, however, is substantially the same as the so-called surreptitious copy, and both differ widely from the original letters as existing in manuscript. Names and dates were omitted, or imperfectly and confusedly indicated. Mr Caryll is in one place "The Hon. J. C., Esq.," in another "The Hon. ——," and in a third "Mr C——." Events are placed under wrong dates, and incidents are transposed, added, or left out, at the caprice or pleasure of the editor. The language is in most of them revised and re-touched. Now this is the case equally in Curll's and in Pope's own edition; and the conclusion is irresistible, that both were prepared by Pope. Amanuenses, he said, were employed in making copies of his letters for Lord Oxford's library, and he hinted at stolen copies, but no amanuensis was brought forward, and no evidence adduced in support of the improbable charge. It has lately (*Athenæum*, 1854) been proved that Pope carried the manufacture of correspondence much farther than Johnson supposed. He printed letters as addressed to Addison, Arbuthnot, and Trumbull, which had previously been written and sent to his friend Caryll; thus dressing up the copies of his early epistles as a mere literary manufacture. He evidently regarded the whole as part of his literature; part of his works; the same as his poetry, with which he could deal at pleasure. To some letters he affixed great names, that he might render the correspondence attractive, and elevate his own social importance; while others were framed to suit some personal object, to carry out enmities or commemorate friendships. In all of them the poet himself was seen to advantage. This double dealing, as it must be termed, and the unreal character of the correspondence, render it almost impossible to judge between Pope and Addison in the quarrel or misunderstanding that divided them (of which we know nothing but from Pope), and from the same cause many circumstances in the poet's early career are doubtful. As literary productions, we should be inclined to value Pope's letters more highly than Mr De Quincey estimates them. They have exquisite passages of description, humour, and sentiment. The genuine correspondence of Swift and Bolingbroke came afterwards (it was fortunate that Swift did not deliver up to Pope the letters in his possession), and thus the collection was made an important and delightful—indeed inimitable—addition to our literature.]

The disturbance of his mind on this occasion led to a circular request, dispersed amongst his friends, that they would return his letters. All complied except Swift. He only delayed, and in fact shuffled. But it is easy to read in his evasions, and Pope, in spite of his vexation, read the same tale, viz., that in consequence of his recurring attacks and increasing misery, he was himself the victim of artifices amongst those who surrounded him. What Pope apprehended happened. The letters were all published in Dublin and in London, the originals being then only returned when they had done their work of exposure.

Such a tenor of life, so constantly fretted by petty wrongs or by leaden insults, to which only the celebrity of their object lent force or wings, allowed little opportunity to Pope for recalling his powers from angry themes, and converging them upon others of more catholic philosophy. To the last he continued to conceal vipers beneath his flowers; or rather, speaking proportionately to the case, he continued to sheath amongst the gleaming but innocuous lightnings of his departing splendours the thunderbolts which blasted for ever. His last appearance was his greatest. In 1742 he published the fourth book of the *Dunciad;* to which it has with much reason been objected, that it stands in no obvious relation to the other three, but which, taken as a separate whole, is by far the most brilliant and the weightiest of his works. Pope was aware of the *hiatus* between this last book and the rest, on which account he sometimes called it the greater *Dunciad;* and it would have been easy for him, with a shallow Warburtonian ingenuity, to invent links that might have satisfied a mere *verbal* sense of connection. But he disdained this puerile expedient. The fact was, and could not be disguised from any penetrating eye, that the poem was not a pursuit of the former subjects; it had arisen spontaneously at various times, by looking at the same general theme of dulness (which, in Pope's sense, includes all aberrations of the intellect, nay, even any defective equilibrium amongst the faculties) under a different angle of observation, and from a different centre. In this closing book, not only bad authors, as in the other three, but all abuses of science or antiquarian knowledge, or connoisseurship in the arts, are attacked: virtuosi, medalists, butterfly-hunters, florists, erring metaphysicians, &c., are all pierced through and through as with the shafts of Apollo. But the imperfect plan of the work as to its internal economy, no less than its exterior relations, is evident in many places; and in particular the whole catastrophe of the poem, if it can be so called, is linked to the rest by a most insufficient incident. To give a closing grandeur to his work, Pope had conceived the idea of representing the earth as lying universally under the incubation of one mighty spirit of dulness; a sort of millenium, as we may call it, for ignorance, error, and stupidity. This would take leave of the reader with effect; but how was it to be introduced? at what era? under what exciting cause? As to the eras, Pope could not settle that; unless it were a *future* era, the description of it could not be delivered as a prophecy; and not being prophetic, it would want much of its grandeur. Yet, *as* a part of futurity, how is it connected with our present times? Do they and their pursuits lead to it as a possibility, or as a contingency upon certain habits which we have it in our power to eradicate (in which case this vision of dulness has a *practical* warning), or is it a mere necessity, one amongst the many changes attached to the cycles of human destiny, or which chance brings round with the revolutions of its wheel? All this Pope could not determine; but the exciting cause he *has* determined, and it is preposterously below the effect. The goddess of dulness yawns; and her yawn, which, after all, should rather express the fact and state of universal dulness than its cause, produces a change over all nations tantamount to a long eclipse. Meantime, with all its defects of plan, the poem, as to execution, is superior to all which Pope has done; the composition is much superior to that of the *Essay on Man*, and more profoundly poetic: the parodies drawn from Milton, as also in the former books, have a beauty and effect which cannot be expressed; and if a young lady wished to cull for her album a passage from all Pope's writings, which, without a trace of irritation or acrimony, should yet present an exquisite gem of independent beauty, she could not find another passage equal to the little story of the florist and the butterfly-hunter. They plead their cause separately before the throne of dulness, the florist telling how he had reared a superb carnation, which, in honour of the queen, he called Caroline, when his enemy, pursuing a butterfly which settled on the carnation, in securing his own object, had destroyed that of the plaintiff. The defendant replies with equal beauty; and it may certainly be affirmed, that for brilliancy of colouring and the art of poetical narration, the tale is not surpassed by any in the language.

This was the last effort of Pope worthy of separate notice. He was now decaying rapidly, and sensible of his own decay. His complaint was a dropsy of the chest, and he knew it to be incurable. Under these circumstances, his behaviour was admirably philosophical. He employed himself in revising and burnishing all his later works, as those upon which he wisely relied for his reputation with future generations. In this task he was assisted by Dr Warburton, a new literary friend, who had introduced himself to the favourable notice of Pope about four years before, by a defence of the *Essay on Man* which Crousaz had attacked, but in general indirectly and ineffectually, by attacking it through the blunders of a very faulty translation. This poem, however, still labours, to religious readers, under two capital defects. If man, according to Pope, is now so admirably placed in the universal system of things, that evil only could result from any change, then it seems to follow either that a fall of man is inadmissible, or at least that, by placing him in his true centre, it had been a blessing universally. The other objection lies in this, that if all is right already, and in this earthly station, then one argument for a future state, as the scene in which evil is to be redressed, seems weakened or undermined.

As the weakness of Pope increased, his nearest friends, Lord Bolingbroke and a few others, gathered around him. The last scenes were passed almost with ease and tranquillity. He dined in company two days before he died; and on the very day preceding his death he took an airing on Blackheath. A few mornings before he died, he was found very early in his library writing on the immortality of the soul. This was an effort of delirium; and he suffered otherwise from this affection of the brain, and from inability to think in his closing hours. But his humanity and goodness, it was remarked, had survived his intellectual faculties. He died on the 30th of May 1744, and so quietly, that the attendants could not distinguish the exact moment of his dissolution.

We had prepared an account of Pope's quarrels, in which we had shown that, generally, he was not the aggressor; and often was atrociously ill-used before he retorted. This service to Pope's memory we had judged important, because it is upon these quarrels chiefly that the erroneous opinion has built itself of Pope's fretfulness and irritability. And this unamiable feature of his nature, together with a proneness to petty manœuvring, are the main foibles that malice has been able to charge upon Pope's moral character. Yet, with no better foundation for their malignity than these doubtful propensities, of which the first perhaps was a constitutional defect, a defect of his temperament rather than his will—and the second has been much exaggerated—many writers have taken upon themselves to treat Pope as a man if not absolutely unprincipled, and without moral sensibility, yet as mean, little-minded, indirect, splenetic, vindictive, and morose. Now the difference between ourselves and these writers is fundamental. They fancy that in Pope's character a basis of ignoble qualities was here and there slightly relieved by a few shining spots; we, on the contrary, believe that in Pope lay a disposition radically noble and generous, clouded and overshadowed by superficial foibles, or, to adopt the distinction of Shakspeare, they see nothing but "dust a little gilt," and we "gold a little dusted." A very rapid glance we will throw over the general outline of his character.

As a friend, it is noticed emphatically by Martha Blount and other contemporaries, who must have had the best means of judging, that no man was so warm-hearted, or so much sacrificed himself for others, as Pope; and in fact many of his quarrels grew out of this trait in his character. For once that he levelled his spear in his own quarrel, at least twice he did so on behalf of his insulted parents or his friends. Pope was also noticeable for the duration of his friendships;[1] some dropped him, but he never any throughout his life. And let it be remembered that amongst Pope's friends were the men of most eminent talents in those days; so that envy at least, or jealousy of rival power, was assuredly no foible of his. In that respect how different from Addison, whose petty manœuvring against Pope proceeded entirely from malignant jealousy. That Addison was more in the wrong even than has generally been supposed, and Pope more thoroughly innocent as well as more generous, we have the means, at a proper opportunity, of showing decisively. As a son, we need not insist on Pope's pre-eminent goodness. Dean Swift, who had lived for months together at Twickenham, declares that he had not only never witnessed, but had never heard of anything like it. As a Christian, Pope appears in a truly estimable light. He found himself a Roman Catholic by accident of birth; so was his mother; but his father was so upon personal conviction and conversion, yet not without extensive study of the questions at issue. It would have laid open the road to preferment, and preferment was otherwise abundantly before him, if Pope would have gone over to the Protestant faith. And in his conscience he found no obstacle to that change; he was a philosophical Christian, intolerant of nothing but intolerance, a bigot only against bigots. But he remained true to his baptismal profession, partly on a general principle of honour in adhering to a distressed and dishonoured party, but chiefly out of reverence and affection to his mother. In his relation to women, Pope was amiable and gentlemanly; and, accordingly was the object of affectionate regard and admiration to many of the most accomplished in that sex.

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[1] We may illustrate this feature in the behaviour of Pope to Savage. When all else forsook him, when all beside pleaded the insults of Savage for withdrawing their subscriptions, Pope sent his in advance. And when Savage had insulted *him* also, arrogantly commanding him never "to presume to interfere or meddle in his affairs," dignity and self-respect made Pope obedient to these orders, except when there was an occasion of serving Savage. On his second visit to Bristol (when he returned from Glamorganshire), Savage had been thrown into the jail of the city. One person only interested himself for this hopeless profligate, and was causing an inquiry to be made about his debts at the time Savage died. So much Dr Johnson admits; but he *forgets* to mention the name of this long-suffering friend. *It was Pope.* Meantime, let us not be supposed to believe the lying legend of Savage; he was doubtless no son of Lady Macclesfield's, but an impostor, who would now be sent to the tread-mill.

This we mention especially, because we would wish to express our full assent to the manly scorn with which Mr Roscoe repels the libellous insinuations against Pope and Miss Martha Blount. A more innocent connection we do not believe ever existed. As an author, Warburton has recorded that no man ever displayed more candour or more docility to criticisms offered in a friendly spirit. Finally, we sum up all in saying that Pope retained to the last a true and diffusive benignity; that this was the quality which survived all others, notwithstanding the bitter trial which his benignity must have stood through life, and the excitement to a spiteful re-action of feeling which was continually pressed upon him by the scorn and insult which his deformity drew upon him from the unworthy.

But the moral character of Pope is of secondary interest: we are concerned with it only as connected with his great intellectual power. There are three errors which seem current upon this subject: *First*, that Pope drew his impulses from French literature; *secondly*, that he was a poet of inferior rank; *thirdly*, that his merit lies in superior "correctness." With respect to the first notion, it has prevailed by turns in every literature. One stage of society, in every nation, brings men of impassioned minds to the contemplation of manners, and of the social affections of man as exhibited in manners. With this propensity co-operates no doubt some degree of despondency when looking at the great models of the literature who have usually pre-occupied the grander passions, and displayed their movements in the earlier periods of literature. Now it happens that the French, from an extraordinary defect in the higher qualities of passion, have attracted the notice of foreign nations chiefly to that field of their literature in which the taste and the unimpassioned understanding preside. But in all nations such literature is a natural growth of the mind, and would arise equally if the French literature had never existed. The wits of Queen Anne's reign, or even of Charles II.'s, were not French by their taste or their imitation. Butler and Dryden were surely not French; and of Milton we need not speak; as little was Pope French, either by his institution or by his models. Boileau he certainly admired too much; and, for the sake of a poor parallelism with a passage about Greece in Horace, he has falsified history in the most ludicrous manner, without a shadow of countenance from facts, in order to make out that we, like the Romans, received laws of taste from those whom we had conquered. But these are insulated cases and accidents, not to insist on his known and most profound admiration, often expressed, for both Chaucer and Shakspeare and Milton. Secondly, that Pope is to be classed as an inferior poet, has arisen purely from a confusion between the departments of poetry which he cultivated and the merit of his culture. The first place must undoubtedly be given for ever,—it cannot be refused,—to the impassioned movements of the tragic, and to the majestic movements of the epic muse. We cannot alter the relations of things out of favour to an individual. But in his own department, whether higher or lower, that man is supreme who has not yet been surpassed; and such a man is Pope. As to the final notion, first started by Walsh, and propagated by Warton, it is the most absurd of all the three; it is not from superior correctness that Pope is esteemed more correct, but because the compass and sweep of his performances lies more within the range of ordinary judgments. Many questions that have been raised upon Milton or Shakspeare, questions relating to so subtle a subject as the flux and reflux of human passion, lie far above the region of ordinary capacities; and the indeterminateness or even carelessness of the judgment is transferred by a common confusion to its objects. But waiving this, let us ask what is meant by "correctness?" Correctness in what? In developing the thought? In connecting it, or effecting the transitions? In the use of words? In the grammar? In the metre? Under every one of these limitations of the idea, we maintain that Pope is *not* distinguished by correctness; nay, that, as compared with Shakspeare, he is eminently incorrect. Produce us from any drama of Shakspeare one of those leading passages that all men have by heart, and show us any eminent defect in the very sinews of the thought. It is impossible; defects there may be, but they will always be found irrelevant to the main central thought, or to its expression. Now turn to Pope; the first striking passage which offers itself to our memory is the famous character of Addison, ending thus:—

> Who would not laugh, if such a man there be,
> Who but must weep if Atticus were he?

Why must we laugh? Because we find a grotesque assembly of noble and ignoble qualities. Very well; but why, then, must we weep? Because this assemblage is found actually existing in an eminent man of genius. Well, that is a good reason for weeping; we weep for the degradation of human nature. But then revolves the question, why must we laugh? Because, if the belonging to a man of genius were a sufficient reason for weeping, so much we know from the very first. The very first line says, "Peace to all such. But were there one whose fires *true genius kindles* and fair fame inspires." Thus falls to the ground the whole antithesis of this famous character. We are to change our mood from laughter to tears upon a sudden discovery that the character belonged to a man of genius; and this we had already known from the beginning. Match us this prodigious oversight in Shakspeare. Again, take the *Essay on Criticism:* it is a collection of independent maxims, tied together into a fasciculus by the printer, but having no natural order or logical dependency; generally so vague as to mean nothing: like the general rules of justice, &c., in ethics, to which every man assents; but when the question comes about any practical case, *is* it just? The opinions fly asunder far as the poles. And, what is remarkable, many of the rules are violated by no man so often as by Pope, and by Pope nowhere so often as in this very poem. As a single instance, he proscribes monosyllabic lines; and in no English poem of any pretensions are there so many lines of that class as in this. We have counted above a score, and the last line of all is monosyllabic.

Not, therefore, for superior correctness, but for qualities the very same as belong to his most distinguished brethren, is Pope to be considered a great poet; for impassioned thinking, powerful description, pathetic reflection, brilliant narration. His characteristic difference is simply that he carried these powers into a different field, and moved chiefly amongst the social paths of men, and viewed their characters as operating through their manners. And our obligations to him arise chiefly on this ground, that having already, in the persons of earlier poets, carried off the palm in all the grander trials of intellectual strength, for the majesty of the epopee and the impassioned vehemence of the tragic drama, to Pope we owe it that we can now claim an equal pre-eminence in the sportive and aërial graces of the mock heroic and satiric muse; that in the *Dunciad* we possess a peculiar form of satire, in which (according to a plan unattempted by any other nation) we see alternatively her festive smile and her gloomiest scowl; that the grave good sense of the nation has here found its brightest mirror; and, finally, that through Pope the cycle of our poetry is perfected and made orbicular, that from that day we might claim the laurel equally, whether for dignity or grace.

POPERINGHE, a town of Belgium, in the province of W. Flanders, on the Shipvaer Canal, near the French frontier, 26 miles S. by W. of Ostend. It is pretty well built, and surrounded by walls; and contains several churches and convents, a fine town-hall, a college, hospital, orphan asylum, and several schools. There are here woollen factories, tanneries, soap-works, potteries, oil-mills, dye-works, and other manufacturing establishments. Hops are extensively raised in the vicinity; and these, together with corn and cattle, form the chief articles of trade. Pop. 10,849.

POPERY, in ecclesiastical history is regarded by Roman Catholics as a term of reproach, but having been generally received amongst Protestants, now comprehends the religious doctrines and practices adopted and maintained by the Church of Rome. The following summary, extracted chiefly from the decrees of the Council of Trent, continued under Paul III., Julius III., and Pius IV., by successive sessions, from the year 1545 to 1563, and the creed of Pope Pius IV. subjoined to it, and bearing date November 1564, may not be unacceptable to the reader. One of the fundamental tenets strenuously maintained by Catholic writers is the infallibility of the Church of Rome; and though they are not agreed whether this privilege belongs to the Pope or a general council, or to both united, yet they pretend that an infallible living judge is absolutely necessary to determine controversies, and to secure peace, in the Christian Church. Protestants, however, allege that the claim of infallibility in any church is not justified by the authority of Scripture, much less does it appertain to the Church of Rome; that it is inconsistent with the nature of religion, and the personal obligations of its professors; and that it has proved ineffectual to the end for which it is supposed to have been granted, since popes and councils have disagreed in matters of importance, and, with the advantage of this pretended infallibility, have been incapable of maintaining union and peace. Another essential article of the Catholic creed is the supremacy of the Pope, or his sovereign power over the universal church.

Further, the doctrine of the seven sacraments is a peculiar and distinguishing doctrine of the Church of Rome. These are baptism, confirmation, the eucharist, penance, extreme unction, holy orders, and matrimony The Council of Trent (sess. vii., can. 1) pronounces an anathema upon those who say that the sacraments are more or fewer than seven, or that any one of the above number is not truly and properly a sacrament. And yet it does not appear that they amounted to this number before the twelfth century, when Hugo de St Victor and Peter Lombard, about the year 1144, taught that there were seven sacraments. The council of Florence, held in the year 1438, was the first council which determined this number. These sacraments confer grace, according to the decree of the Council of Trent (sess. vii., can. 8) *ex opere operato*, that is, by the mere administration of them; three of them, viz., baptism, confirmation, and holy orders, are said (can. 9) to impress an indelible character, so that they cannot be repeated without sacrilege; and the efficacy of every sacrament depends upon the intention of the priest by whom it is administered (can. 11). Pope Pius expressly enjoins that all these sacraments should be administered according to the received and approved rites of the Catholic Church. With regard to the eucharist in particular, we may here observe, that the Church of Rome holds the doctrine of transubstantiation; the necessity of paying divine worship to Christ under the form of the consecrated bread or host; and the propitiatory sacrifice of the mass, according to the Catholic ideas of which Christ is truly and properly offered as a sacrifice of propitiation as often as the priest says mass. It likewise practises solitary mass, in which the priest alone consecrates, communicates, and allows communion only in one kind, namely, the bread, to the laity. (Sess. xiv.)

The doctrine of merits is another distinguishing tenet of Popery, with regard to which the Council of Trent has expressly decreed (sess. vi., can. 32) that the good works of justified persons are truly meritorious, deserving not only an increase of grace, but eternal life, and an increase of glory; and it has anathematized all who deny this doctrine. Of the same kind is the doctrine of satisfaction, which supposes that penitents may truly satisfy by the afflictions they endure under the dispensations of Providence, or by voluntary penances to which they submit for the temporary penalties of sin, to which they are subject even after the remission of their eternal punishment. (Sess. vi., can. 30; and sess. xiv., can. 8 and 9.) In this connection we may mention the distinction of venial and mortal sins. The greatest evils arising from the former are the temporary pains of purgatory; but no man, it is said, can obtain the pardon of the latter without confessing to a priest, and performing the penances which he imposes.

The Council of Trent (sess. xiv., can. 1) has expressly decreed that every one is accursed who shall affirm that penance is not truly and properly a sacrament instituted by Christ in the universal church, for reconciling those Christians to the divine majesty who have fallen into sin after baptism. And this sacrament, it is declared, consists of two parts, the matter and the form; the matter being the act of the penitent, including contrition, confession, and satisfaction; the form, the act of absolution on the part of the priest. Accordingly it is enjoined, that it is the duty of every man who has fallen after baptism to confess his sins, once a year at least, to a priest; that this confession is to be secret, for public confession is neither commanded nor expedient; and that it must be exact and particular, including every kind and act of sin, with all the circumstances attending it. When the penitent has so done, the priest pronounces an absolution, which is not conditional or declarative only, but absolute and judicial. This secret or auricular confession was first decreed and established in the fourth council of Lateran, under Pope Innocent III., in 1215 (cap. 21); and the decree of this council was afterwards confirmed and enlarged in the Council of Florence and in that of Trent, which ordains that confession was instituted by Christ, that by the law of God it is necessary to salvation, and that it has always been practised in the Christian Church. As for the penances imposed on the penitent by way of satisfaction, they have been commonly the repetition of certain forms of devotion, as paternosters or ave-marias, the payment of stipulated sums, pilgrimages, fasts, or various species of corporal discipline. But the most formidable penance, in the estimation of those who belong to the communion of the Church of Rome, is the temporary pains of purgatory. Yet under all the penalties which are inflicted or threatened in that church, it has provided relief by its indulgences, and by its prayers or masses for the dead, performed professedly for relieving and rescuing the souls that are detained in purgatory.

Another article which has long been authoritatively enjoined and observed in the Church of Rome is the celibacy of her clergy. This was first enjoined at Rome by Gregory VII. about the year 1074, and established in England by Anselm, Archbishop of Canterbury, about the year 1175; though his predecessor Lanfranc had imposed it upon the prebendaries and clergy who lived in towns. And though the Council of Trent was repeatedly petitioned by several princes and states to abolish this restraint, yet the obligation of celibacy was rather established than relaxed by this council; for they decreed that marriage contracted after a vow of continence is neither lawful nor valid, and thus deprived the church of the possibility of ever restoring marriage to the clergy. If marriage, after a vow, be in itself unlawful, the greatest authority upon earth cannot dispense with it, nor permit marriage to the clergy, who have already vowed continence.

To the doctrines and practices above recited may further be added the worship of images, of which Protestants accuse the Papists. The Papist replies, that he is taught to use them so as to cast his eyes upon the pictures or images, and thence to raise his heart to the things represented, and there to employ it in meditation, love, thanksgiving, and desire of imitation, as the object requires. Hence he finds a convenience in saying his prayers with some devout pictures before him, the sight of which recalls his wandering thoughts to the right object, and as certainly brings something good into his mind, as an immodest picture disturbs his heart.

The Council of Trent likewise decreed that all bishops and pastors who have the cure of souls, do diligently instruct their flocks that it is good and profitable to desire the intercession of saints reigning with Christ in heaven. The Papists confess that we have but one Mediator of redemption, but affirm that it is acceptable to God that we should have many mediators of intercession. Moses, say they, was such a mediator for the Israelites; Job for his three friends; Stephen for his persecutors. The Romans were thus desired by St Paul to be his mediators; so were the Corinthians and the Ephesians, so almost every sick man desires the congregation to be his mediators, by remembering him in their prayers. And so, too, the Papist desires the blessed in heaven to be his mediators, that is, that they would pray to God for him. But between these living and dead mediators there is no similarity. Besides, as omnipresence in a creature is contrary to one of the first principles of natural religion, so it receives no countenance from Scripture, or any Christian writer of the first three centuries. Other practices peculiar to the Papists are the religious honour and respect that they pay to sacred relics, by which they understand not only the bodies and parts of the bodies of the saints, but any of those things that appertained to them, and which they had touched; and the celebration of divine service in an unknown tongue, in regard to which the Council of Trent has denounced an anathema on any one who shall say that mass ought to be celebrated only in the vulgar tongue (sess. xxv. and sess. xxii., can. 9). Though the Council of Lateran, under Innocent III. in 1215, had (can. 9) expressly decreed, that as in several parts within the same city and diocese there are many people of different manners and rites mixed together, but of one faith, so the bishops of such cities or dioceses should provide fit men for celebrating divine offices, according to the diversity of tongues and rites, and for administering the sacrament.

We shall only add further, that the Church of Rome maintains that unwritten traditions ought to be added to the holy Scriptures, in order to supply their defect, and should be regarded as of equal authority; that the books of the Apocrypha are canonical Scripture; that the vulgate edition of the Bible is to be deemed authentic; and that the Scriptures are to be received and interpreted according to that sense which the holy mother church, to whom it belongs to judge of the true sense, has held, and does hold, and according to the unanimous consent of the Fathers.

Such are the principal and distinguishing doctrines of Catholicism or Popery, most of which have received the sanction of the Council of Trent, and that of the creed of Pope Pius IV., which is received, professed, and sworn to by every one who enters into holy orders in the Church of Rome, as well as by all proselytes or converts. At the close of this creed we are told that the faith contained in it is so absolutely and indispensably necessary that no man can be saved without it.

POPHAM, Sir John, chief justice of the King's Bench, was born of gentle blood in 1531 at Wellington, in the county of Somerset. While still a child he was stolen by a band of gipsies, who kept him some months, branded his arm with a cabalistic mark, and so invigorated a constitution that had been previously sickly, that from that period he grew up to be a man of extraordinary stature and activity. He was sent to Baliol College, Oxford, in 1547, where he amassed a good stock of classical learning and of dogmatic divinity. On becoming a Middle Templar in 1551 he got into bad company, and utterly neglected his juridical studies. He preferred theatres and gaming-houses; he was given to drinking, and took to the roads. Nor did he leave off when he was called to the bar. "In his youthful days," says Fuller (*Worthies*, vol. ii. 284), "he was as stout and skilful a man at sword and buckler as any in that age, and wild enough in his recreations." An unhappy wife, and the birth of a child for whom he felt attachment, put a check upon his extraordinary life. He accordingly, at the age of thirty, prepared "a very good entertainment for his camerades," took a final leave of them, and took to study. "He was a strong, stout man," says Aubrey (iii. 492), "and could endure to sit at it day and night." He became a consummate lawyer, according to Coke, and, despite the stories which were circulated regarding his previous career, he was made Serjeant Popham in 1571. He was chosen solicitor-general at her Majesty's Queen Elizabeth's) express wish in 1579, and speaker of the House of Commons in 1581. He succeeded Sir Gilbert Gerrard as attorney-general in 1585; and was present at the court of Fotheringay during the trial of the Queen of Scots. On the 8th of June 1592 he received his writ as chief justice of England, was knighted by the Queen at Greenwich, and was sworn of the Privy Council. He was supposed to conduct himself in it very creditably, but was charged with extreme severity. In ordinary larcenies, and, strange to say, in highway robberies, there was little chance of an acquittal. In short, he was notorious as a "hanging judge." When the young Earl of Essex planned an insurrection in the city in 1641, Popham conducted himself with very great courage. On the death of his royal mistress he did not allow the sword of justice to rust in its scabbard. Sir Walter Raleigh was tried before him for being concerned in the plot to place the Lady Arabella Stuart on the throne, and found guilty; Guy Fawkes and his associates were tried and found guilty; Garnet, superior of the Jesuits, was tried and found guilty, when Popham was struck with a mortal disease, of which he died on the 1st of June 1607, in the seventy-second year of his age. This "huge, heavy, ugly man" left behind him the greatest estate ever amassed by lawyer; some say as much as L.10,000 a year, which was in due measure squandered by his son John. Littlecote House, the family residence, and about which hangs a tale, is said to have become the property of Sir John Popham as the price of legal corruption. He compiled a volume of wretchedly ill-done Reports of his Decisions while he was chief justice of the King's Bench. (See Lord Campbell's *Lives of the Chief Justices of England.*)

POPLAR, a parish of England in the county of Middlesex, forming a suburb of London, and washed on the E., S., and W. by the Thames, 4 miles E.S.E. of St Paul's. It contains numerous churches belonging to various denominations, some of them handsome buildings, a town-hall, East India Hospital, several schools, and a literary and scientific institution. The manufacture of plate-glass, machinery, iron and brass castings, &c., is carried on here. In this parish are situated the West India Docks. (See London.) Area of the parish 2918 acres. Pop. (1851) 47,162.

POPO, Great and Little, two towns of Africa in the kingdom of Dahomey, on the Guinea coast, the former 15 miles W. of Whydah, and the latter about as far farther W. The inhabitants are employed in raising indigo and cotton, making cotton cloth, working metals, manufacturing salt by evaporation and lime from oyster-shells, and trading in slaves. Pop. of each town about 5000.

POPOCATEPETL, or the *Smoking Mountain*, as its name imports in Mexican, an active volcano of Mexico, in the state of La Puebla, 35 miles S.W. of the town of that name. It is cone-shaped, and rises to the height of 17,793 feet above the sea. From its base up to the height of 12,700 feet, it is covered with forests; but above that the mountain is quite bare, its sides being strewn with pumice, sand, and ashes, from the crater, and generally covered with snow. The crater is about a mile in diameter, and 1000 feet deep. Good sulphur may be obtained from it.

POPPÆA, SABINA, a Roman matron, daughter of Titus Ollius, and grand-daughter of Poppæus Sabinus, who had been consul in A.D. 9. She was married and had a son to Rufius Crispinus, a Roman knight. Her beauty captivated Otho, one of Nero's favourites, who carried her off and married her; but he was not long permitted to retain her, for Nero, having heard her extolled for her accomplishments, sent Otho out of Italy under pretence of presiding over one of the Roman provinces, shortly after which Nero murdered his mother, and subsequently his wife Octavia, and married Poppæa; but she did not long enjoy the imperial dignity, for Nero soon began to despise her, and treat her with great barbarity. She bore him a son; and when she was again far advanced in pregnancy, he is said to have kicked her, of which she died, about 65 A.D. It is said she was so anxious to preserve her beauty that 500 she-asses were milked, in which she used daily to bathe.

POPPI, a town of Tuscany, in the province of Florence, on the right bank of the Arno, 26 miles E. of Florence. It contains a palace, court-house, several churches, convents, and schools, a public library, theatre, and hospital. Vines are cultivated in the vicinity. Pop. 5654.

POPULATION.[1]

Object of the article.

THE population of the principal states, of which an account has been given in the course of this work, will be found under their proper heads. The object of this article is to explain the general laws which regulate the increase or decrease of population, and the manner in which they affect the state and condition of human society.

Tendency of all plants and animals to increase in a geometrical progression.

In taking a view of animated nature, we cannot fail to be struck with a prodigious power of increase in plants and animals. Their capacity in this respect is indeed almost infinitely various, according with the endless variety of the works of nature, and the different purposes which they seem appointed to fulfil. But whether they increase slowly or rapidly, if they increase by seed or generation, their natural tendency must be to increase in a geometrical ratio, that is, by multiplication; and at whatever rate they are increasing during any one period, if no further obstacles be opposed to them, they must proceed in a geometrical progression.

In the growth of wheat a vast quantity of seed is unavoidably lost. When it is dibbled instead of being sown in the common way, two pecks of seed wheat will yield as large a crop as two bushels, and thus quadruple the proportion of the return to the quantity of seed put into the ground. In the *Philosophical Transactions* for 1768 an account is given of an experiment in which, by separating the roots obtained from a single grain of wheat, and transplanting them in a favourable soil, a return was obtained of above 500,000 grains. But without referring to peculiar instances or peculiar modes of cultivation, it is known that calculations have often been made, founded on positive experience, of the produce of wheat in different soils and countries, cultivated in an ordinary way, and making allowance for all ordinary destruction of seed.

Humboldt has collected some estimates of this kind, from which it appears that France, the north of Germany, Poland, and Sweden, taken generally, produce from five to six grains for one; some fertile lands in France produce fifteen for one; and the good lands in Picardy and the Isle of France from eight to ten grains for one. Hungary, Croatia, and Sclavonia yield from eight to ten grains for one. In the Regno de la Plata, twelve grains for one are produced; near the city of Buenos Ayres, sixteen for one; in the northern part of Mexico, seventeen; and in the equinoctial regions of Mexico, twenty-four for one.[2]

Now, supposing that in any one country during a certain period, and under the ordinary cultivation, the return of wheat was six grains for one, it would be strictly correct to say that wheat had the capacity of increasing in a geometrical ratio, of such a nature as to sextuple itself every year. And it might safely be calculated hypothetically, that if, setting out from the produce of one acre, land of the same quality could be prepared with sufficient rapidity, and no wheat were consumed, the rate of increase would be such as completely to cover the whole earthy surface of our globe in fourteen years.

In the same manner, if it be found by experience that on land of a certain quality, and making allowance for the ordinary mortality and accidents, sheep will increase on an average so as to double their numbers every two years, it would be strictly correct to say that sheep have the natural capacity of increasing in a geometrical progression, of which the common multiple is two, and the term two years; and it might safely be said, that if land of the same quality could be provided with sufficient rapidity, and no sheep were consumed, the rate of increase would be such, that if we were to begin with the full number which could be supported on an acre of land, the whole earthy part of the globe might be completely covered with sheep in less than seventy-six years.

If, out of this prodigious increase of food, the full support of mankind were deducted, supposing them to increase as fast as they have ever yet increased in any country, the deduction would be comparatively inconsiderable; and the rate of increase would still be enormous, till it was checked, either by the natural want of will on the part of mankind to make efforts for the increase of food beyond what they could possibly consume, or, after a certain period, by their absolute want of power to prepare land of the same quality, so as to allow of the same rate of progress.

Owing to these two causes combined, we see that, notwithstanding this prodigious power of increase in vegetables and animals, their actual increase is extremely slow; and it is obvious, that, owing to the latter cause alone, and long before a final stop was put to all further progress, their actual rate of increase must of necessity be very greatly retarded; as it would be impossible for the most enlightened human efforts to make all the soil of the earth equal in fertility to the average quality of land now in use; while the practicable approaches towards it would require so much time as to occasion, at a very early period, a constant and great check upon what their increase would be if they could exert their natural powers.

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[1] The present article on POPULATION, written for the last edition of this work by the late Mr Malthus, has been permitted to stand in its entirety in the present edition. The Editor has been persuaded to adopt this course, more perhaps from the acknowledged excellence of the article itself, than from a strict regard to the perfect justness of all its sentiments. No one will doubt the writer's fundamental principle—that the amount of the human race must be in a proportion to the amount of food procurable for their support. But instead of drawing from this an injunction to mankind to throw their energies into productiveness, his argument seems to lead to the necessity of preventing increase, from a dread that it might outdo the production of food. Malthus omitted the influence of free trade, which puts all the world at the command of an increasing and producing people.

[2] *Nouvelle Espagne*, liv. iv., c. ix., p. 98.

Elevated as man is above all other animals by his intellectual faculties, it is not to be supposed that the physical laws to which he is subjected should be essentially different from those which are observed to prevail in other parts of animated nature. He may increase slower than most other animals, but food is equally necessary to his support; and if his natural capacity of increase be greater than can be permanently supplied with food from a limited territory, his increase must be constantly retarded by the difficulty of procuring the means of subsistence.

The power of producing food limited by the quantity and nature of the soil.

The main peculiarity which distinguishes man from other animals, in the means of his support, is the power which he possesses of very greatly increasing these means. But this power is obviously limited by the scarcity of land, by the great natural barrenness of a very large part of the surface of the earth, and by the decreasing proportion of produce which must necessarily be obtained from the continual additions of labour and capital applied to land already in cultivation.

It is, however, specifically with this diminishing and limited power of increasing the produce of the soil, that we must compare the natural power of mankind to increase, in order to ascertain whether, in the progress to the full cultivation and peopling of the globe, the natural power of mankind to increase must not of absolute necessity be constantly retarded by the difficulty of procuring the means of subsistence, and if so, what are likely to be the effects of such a state of things.

The natural rate of increase applicable to mankind.

In an endeavour to determine the natural power of mankind to increase, as well as their power of increasing the produce of the soil, we can have no other guide than past experience.

The great check to the increase of plants and animals, we know from experience, is the want of room and nourishment; and this experience would direct us to look for the greatest actual increase of them in those situations where room and nourishment were the most abundant.

On the same principle, we should expect to find the greatest actual increase of population in those situations where, from the abundance of good land, and the manner in which its produce is distributed, the largest portion of the necessaries of life is actually awarded to the mass of the society.

Of the countries with which we are acquainted, the United States of America, formerly the North American colonies of Great Britain, answer most nearly to this description. In the United States not only is there an abundance of good land, but, from the manner in which it has been distributed, and the market which has been opened for its produce, there has been a greater and more constant demand for labour, and a larger portion of necessaries has been awarded to the labourer, than in any of those other countries which possess an equal or greater abundance of land and fertility of soil.

Here, then, we should expect to find that the natural power of mankind to increase, whatever it may be, would be most distinctly marked; and here, in consequence, it appears that the actual rate of the increase of population has been more rapid than in any known country, although, independently of the abundance of good land, and the great demand for labour, it is distinguished by no other circumstances which appear to be peculiarly favourable to the increase of numbers.

It has been stated that all animals, according to the known laws by which they are produced, must have a capacity of increasing in a geometrical progression. And the question with regard to man is, what is the rate of this geometrical progression?

Fortunately, in the country to which we should naturally turn our eyes for an exemplification of the most rapid rate of increase, there have been four enumerations of the people, each at the distance of ten years; and though the estimates of the increase of population in the North American colonies at earlier periods were of sufficient authority, in the absence of more certain documents, to warrant most important inferences, yet as we now possess such documents, and as the period they involve is of sufficient length to establish the point in question, it is no longer necessary to refer to earlier times.

Increase of population in the United States of America.

According to a regular census made by order of Congress in 1790, which there is every reason to think is essentially correct, the white population of the United States was found to be 3,164,148. By a similar census in 1800, it was found to have increased to 4,312,841. It had increased, then, during the ten years from 1790 to 1800, at a rate equal to 36·3 per cent., a rate which, if continued, would double the population in twenty-two years and about four months and a half.

According to a third census, in 1810, the white population was found to be 5,862,092,[1] which, compared with the population of 1800, gives an increase in the second ten years at the rate of nearly thirty-six per cent., which, if continued, would double the population in about twenty-two years and a half.

According to the fourth census, in 1820, the white population was found to be 7,861,710,[2] which, compared with the population of 1810, gives an increase in the third ten years at a rate per cent. of 34·1, which, if continued, would double the population in twenty-three years and seven months.

If we compare the period of doubling according to the rate of increase in the most unfavourable ten years of this series, with twenty-five years, we shall find the difference such as fully to cover all the increase of population which would have taken place from emigration.

Amount of emigration.

It appears from a reference to the most authentic documents which can be collected on both sides of the Atlantic, that the emigration to the United States, during the last twenty-five years, falls decidedly short of an average of 10,000 a year. Dr Seybert, the best authority on the other side of the water, states that, from 1790 to 1810, it could not have been so much as 6000 a year. Our official accounts of the number of emigrants to the United States from England, Ireland, and Scotland, during the ten years from 1812 to 1821 inclusive, give an average of less than 7000, although the period includes the extraordinary years 1817 and 1818, in which the emigrations to the United States were much greater than they were ever known to be before or since. The official American accounts, as far as they go, which is only for two years from the 30th September 1819, tend to confirm this average;[1] and, allowing fully for the emigrants from other European countries, the general average will still be under the ten thousand.

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[1] These numbers are taken from Dr Seybert's Statistical Annals, p. 23.

[2] This number is taken from the American National Calendar for 1822, and has since been compared with the original census as published for the use of the members of Congress.

A new mode was, however, some time ago suggested of estimating the amount of increase in any country derived from emigration.[2] It has been justly stated, that when a census is taken every ten years, and the population is distinguished into those above and those below ten years of age, all above ten years of age, exclusive of emigrants, must have existed in the census immediately preceding, and, consequently, after having made a proper allowance for the mortality during these ten years, the excess above the remaining number must be attributed to emigration. If we had the means of estimating with accuracy the loss which would be sustained in America in ten years by a population not increased by additional births, this mode of estimating the amount of emigration would be unobjectionable, and often very useful.

But unfortunately the means are deficient. Even the annual mortality in the United States is not known. It was supposed by Dr Price (vol. ii. p. 50, 7th edit.) to be one in fifty; by Mr Barton, in the Transactions of the Society at Philadelphia (vol. iii. No. 7), one in forty-five; and it is stated by Mr Bristed, in his work on America and her Resources (p. 20), that the annual deaths average throughout the United States one in forty, in the healthiest districts one in fifty-six, and in the most unhealthy one in thirty-five.

If, however, we could ascertain accurately the average annual mortality, we should still be unable to ascertain the amount of the loss in question; as, under any given law of mortality, it would depend so very much upon the rate at which the population was increasing. The truth of this observation will be placed in a striking light by the following short table, with which we have been favoured by a very able calculator, Mr Milne, author of a well-known Treatise on Annuities and Assurances. It is constructed on the supposition that the population, in each case, is always subject to the same law of mortality as that which prevailed in all Sweden and Finland during the five years ended with 1805, and that the number of births in the present year living in each case is 10,000.

	The Population constantly the same.	The Population increasing in geometrical progression for more than a hundred years, so as to double itself every	
		Fifty Years.	Twenty-five Years.
Total population ten years since..........	393,848	230,005	144,358
Total above ten years of age now..........	320,495	195,566	126,176
Died during the term of ten years, out of those living at its commencement......	73,353	34,439	18,182
Being one of...............	5·3692	6·6786	7·9396

We see from this table, that under the same law of mortality, the difference of loss sustained in ten years, by a people not increased by fresh births, would in the three cases supposed, of a stationary population, a population doubling in fifty years, and a population doubling in twenty-five years, be as one in 5·3692, one in 6·6786, and one in 7·9396; and that when the population is doubling itself in twenty-five years, the loss would be very little more than one eighth.

But the censuses must be allowed to form a *prima facie* evidence that the population of the United States has, for a considerable time, been going on doubling itself in twenty-five years; and assuming this evidence to be true, which we are warranted in doing till better evidence is produced on the other side, it will appear that the amount of immigration, deduced from the rule here referred to, is less than 10,000 a year.

Thus the white population of the United States in 1800 was 4,312,841.[3] This population, without further accession of births, would in 1810 be diminished one eighth, or reduced to 3,773,736. In 1810 the population above ten years of age was 3,845,389; and, subtracting the former number from the latter, the difference, or amount of emigration, will be 71,653, or 7165 a year.

Again, the white population of 1810 was 5,862,092, which, diminished by one eighth in ten years, would be 5,129,331. The population above ten years of age in 1820 was 5,235,940.[4] Subtracting the former from the latter, the difference, or amount of emigration, is 106,608, or 10,660 a year; showing, as we should expect, a greater amount of emigration from 1810 to 1820 than from 1800 to 1810, but, even in the latter ten years, and including emigrations from Canada, as well as all other countries, little exceeding 10,000.

Altogether, then, we can hardly err in defect, if we allow 10,000 a year for the average increase from emigration during the twenty-five years from 1795 to 1820; and applying this number to the slowest period of increase, when the rate was such as to double the population in twenty-three years and seven months, it may be easily calculated, that in the additional year and five months a population of 5,862,000 would have increased to an amount much more than sufficient to cover an annual emigration of 10,000 persons, with the increase from them at the same rate.

Such an increase from them, however, would not take place. It appears from an account in the National Calendar of the United States for the year 1821, that of the 7001 persons who had arrived in America from the 30th of September 1819 to the 30th of September 1820, 1959 only were females, and the rest, 5042, were males; a proportion which, if it approaches towards representing the average, must very greatly reduce the number from which any increase ought to be calculated.

If, however, we omit these considerations; if we suppose a yearly emigration from Europe to America of 10,000 persons for the twenty-five years from 1795 to 1820, the greatest part of which time Europe was involved in a most extensive scene of warfare, requiring all its population; and further, if we allow for an increase of all the emigrants during the *whole period*, at the fullest rate; the remaining numbers will still be sufficient to show a doubling of the population in less than twenty-five years.

The white population of 1790 was 3,164,148. This population, according to the rate at which it was increasing, would have amounted to about 3,694,100 in 1795; and supposing it to have just doubled itself in the twenty-five years from 1795 to 1820, the population in 1820 would have been 7,388,200. But the actual white population of 1820 appears, by the census then taken, to be 7,861,710, showing an excess of 473,510; whereas an emigration of 10,000 persons annually, with the increase from them at three per cent., a rate which would double a population in less than twenty-four years, would only amount to 364,592.

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[1] American National Calendar for 1821, p. 237; and North American Review for October 1822, p. 304.

[2] This mode was suggested by Mr Booth, in Mr Godwin's Answer to Mr Malthus.

[3] Seybert's Statistical Annals, p. 23.

[4] American National Calendar for 1822, p. 246.

But the most striking confirmation of the censuses of the United States, and the most remarkable proof of the rate of increase being occasioned almost exclusively by procreation, have been furnished to us by Mr Milne. In his work on Annuities and Assurances, which contains much valuable and interesting information on the subject of population, he had noticed the effects of the frequent pressure of want on the labouring classes of Sweden, which, by increasing the proportion of deaths, rendered the law of mortality so accurately observed in that country by Professors Wargentin and Nicander inapplicable to other countries more favourably circumstanced. But the law of mortality was observed to be gradually improving from the time that Dr Price constructed his Swedish table; and the period from 1800 to the end of 1805 was so free from scarcities and epidemics, and the healthiness of the country had been further so much improved by the introduction of vaccination, that he justly thought the law of mortality, as observed during these five years, might suit countries where the condition of the people was known to be much better than it had generally been in Sweden. On these grounds he applied the Swedish law of mortality, during the term mentioned, to the hypothesis of a population which had been increasing by procreation, in geometrical progression, for more than a hundred years, so as to double every twenty-five years. Assuming this population to be one million, he distributed it, by a process well known to persons conversant with these subjects, into the different ages referred to in the American censuses, and then compared them with the same number of persons distributed according to the actual returns of the ages in the American censuses for the three periods of 1800, 1810, and 1820. The results are as follows:

Distribution of a Population of 1,000,000 *Persons in the under-mentioned intervals of Age.*

Between the Ages of	According to			
	The Hypothesis.	United States. Census of 1800.	Census of 1810.	Census of 1820.
0 and 10	337,592	334,556	344,024	333,995
10 and 16	145,583	154,898	156,345	154,913
16 and 26	186,222	185,046	189,227	198,114
26 and 45	213,013	205,289	190,461	191,139
45 and 100	117,590	120,211	119,943	121,839
0 and 100	1,000,000	1,000,000	1,000,000	1,000,000
Under 16	483,175	489,454	500,369	488,908
Above 16	516,825	510,546	499,631	511,092

The general resemblance in the distribution of the ages in the three different censuses to each other, and to the hypothesis, clearly proves,

1*st*, That the distribution of the ages in the different enumerations must be made with some care, and may, therefore, be relied on as in the main correct.

2*dly*, That the law of mortality assumed in the hypothesis cannot deviate essentially from the law of mortality which prevails in the United States; and,

3*dly*, That the actual structure of the American population differs very little from what it would be if it were increasing regularly from procreation only, in geometrical progression, so as to double itself every twenty-five years; and that we may, therefore, safely infer that it has been very little disturbed by immigration.

If to these proofs of the rapid increase of population which has actually taken place, we add the consideration that this rate of increase is an average applying to a most extensive territory, some parts of which are known to be unhealthy; that some of the towns of the United States are now large; that many of the inhabitants must be engaged in unwholesome occupations, and exposed to many of those checks to increase which prevail in other countries; and further, that in the western territories, where these checks do not occur, the rate of increase is beyond comparison more rapid than the general average, after making the fullest allowance for immigration; it must appear certain, that the rate at which the population of the whole of the United States has actually increased for the last thirty years must fall very decidedly short of the actual capacity of mankind to increase under the most favourable circumstances.

The rate of increase in the United States confirmed by that of other countries.

The best proof that can be obtained of the capacity of mankind to increase at a certain rate, is their having really increased at that rate. At the same time, if any peculiarly rapid increase which had appeared to take place in a particular country were quite unsupported by other evidence, we might be disposed to attribute it to error or accident, and might scarcely be justified in founding important conclusions upon it. But this is far from being the case in the present instance. The rate of increase which has at times taken place in other countries, under the operation of great and obvious checks to the progress of population, sufficiently shows what might be expected if these checks were removed.

Increase of population in New Spain.

The countries most resembling the United States of America are those territories of the new world which lately belonged to Spain. In abundance and fertility of soil they are indeed superior; but almost all the vices in the government of the mother country were introduced into her colonial possessions, and particularly that very unequal distribution of landed property which takes place under the feudal system. These evils, and the circumstance of a very large part of the population being Indians in a depressed state, and inferior in industry and energy to Europeans, necessarily prevent that rapid increase of numbers which the abundance and fertility of the land would admit of. But it appears, from the instructive and interesting account of New Spain which M. Humboldt has not long since given to the public, that for the last half of the eighteenth century the excess of the births above the deaths, and the progress of the population, have been very great. The following are the proportions of burials to baptisms in the registers of eleven villages, the details of which were communicated to M. Humboldt by the curates.

	Burials.	Baptisms.
At Dolores	100	253
Singuilucan	100	234
Calymaya	100	202
Guanaxuato	100	201
St Anne	100	195
Marsil	100	194
Queretaro	100	188
Axapuzco	100	157
Yguala	100	140
Malacatepec	100	130
Panuco	100	123

The mean proportion is 100 to 183

But the proportion which M. Humboldt considers as best suited to the whole of the population is 100 to 170.

In some of the villages above mentioned, the proportion of the births to the population is extraordinarily great, and the proportion of deaths very considerable; showing, in a striking point of view, the early marriages and early deaths of a tropical climate, and the more rapid passing away of each generation.[1]

At Queretaro, it appears that the baptisms were to the population as one to fourteen, and the burials as one to twenty-six.

At Guanaxuato, including the neighbouring mines of St Anne and of Marsil, the baptisms were to the population as one to fifteen, and the burials as one to twenty-nine.

The general result from all the information which could be collected was, that the proportion of births to the population, for the whole of the kingdom of New Spain, was as one to seventeen, and of the deaths as one to thirty. These proportions of births to deaths, if they were continued, would double the population in twenty-seven and a half years.

M. Humboldt further observes, that the information which he had collected respecting the proportions of the births to the deaths, and of these to the whole population, proves, that if the order of nature were not interrupted by some extraordinary and disturbing causes, the population of New Spain ought to double itself every nineteen years.[2]

It is known, however, that these causes do occur in the actual state of things; consequently we cannot consider the actual rate of the increase of population in New Spain as greater than according to the former calculation. But a rate of increase such as to double the population in twenty-seven and a half years, in spite of all the obstacles enumerated by M. Humboldt, is very extraordinary. It is next to the increase of the United States, and greatly superior to any that can be found in Europe.

Yet in Europe, the tendency to increase is always very strongly marked, and the actual increase for periods of some length is sometimes much greater than could be expected beforehand, considering the obstacles to be overcome.

It appears from Sussmilch,[3] that the population of Prussia and Lithuania, after the great plague in 1709 and 1710, doubled itself in about forty-four years, from the excess of the births above the deaths enumerated in the registers.

In Russia, the whole population in 1763 was estimated, by enumeration and calculation, at twenty millions, and in 1796 at thirty-six millions.[4] This is a rate of increase which would occasion a doubling in less than forty-two years.

In 1695, the population of Ireland was estimated at 1,034,000. According to the returns in 1821, it had increased to the prodigious amount of 6,846,949;[5] and it is thought that when the deficiencies have been supplied by the final returns of the enumerators, it will be upwards of seven millions. This is an example of an actual increase for 125 years together, at a rate which would double the population in about forty-five years; and this has taken place under the frequent pressure of great distress among the labouring classes of society, and the practice of frequent and considerable emigration.

But for the proof of the power of population to increase under great obstacles of the preventive, as well as of the positive kind, we need not go out of Great Britain. The rate of increase since our enumerations have commenced has been very remarkable for a country which was considered as well peopled before, and some of the details accompanying the returns tend strikingly to illustrate the principle of population.

Increase of population in Great Britain from 1800 to 18

The population of Great Britain, according to the enumerations of 1821 and 1811, was, respectively, 10,942,646 and 12,596,803.[6] This is a rate of increase, during the ten years, of rather above fifteen per cent., a rate which, if continued, would double the population in between forty-nine and fifty years.

By the enumeration of 1821, it appears that the population was 14,391,631,[7] which, compared with the population of 1811, gives a rate of increase during the ten years of 14·25 per cent., a rate which would double the population in about fifty-two years.

According to these numbers, the rate of increase during the last ten years was slower than that of the first; but it appears, from the excess of the number of males above females in the enumeration of 1811, so opposite to the state of the population in 1801 and 1821, when the females exceeded the males, particularly at the latter period, that of the large number added to the population for the army, navy, and registered merchant ships in 1811, a considerable proportion must have been foreigners. On this account, and on account of the further difficulty of knowing what part of this number might properly belong to Ireland, it has been proposed to estimate the rate per cent. at which the population has increased in each of the ten years by the females only; and, according to this mode of computation, the population increased during the first period at the rate of 14·02 per cent., and during the second at the rate of 15·82. (Preliminary Observations, p. 8.) This last rate of increase would double the population in less than forty-eight years.

The only objection to this mode of computation is, that it does not take into consideration the greater destruction of the males during the war. In 1801, the females exceeded the half of the population by 21,031, and in 1821 by 63,890, while, at the intermediate period, owing to the causes above mentioned, the females fell short of the half of the males by 35,685.

When, however, a proper distribution has been made of the army and navy among the resident population, and taking England and Wales alone, it appears that from 1801 to 1811 the population increased at the rate of fourteen and a half per cent., and from 1811 to 1821, at the rate of sixteen and one third per cent. (Preliminary Observations, p. 32.) At the former of these rates, the period of doubling would be rather above fifty years; at the latter, under forty-six years; and, taking the whole period, the time of doubling would be about forty-eight years. Yet in Great Britain there is a much larger proportion of the population living in towns, and engaged in occupations considered as unhealthy, than in any other known country of the same extent. There are also the best reasons for believing that in no other country of the same extent is there to be found so great a proportion of late marriages, or so great a proportion of persons remaining unmarried, as in Great Britain. It is further known that the number of emigrants from Great Britain greatly exceed those who come into the country. And if, under these circumstances, a demand for labour and an increase of the funds for its maintenance could for twenty years together occasion such a rate of increase as, if continued, would double the population in forty-eight years, and quadruple it in ninety-six years, it is in the highest degree probable, that if the encouragements to marriage and the means of supporting a family were as great as in America, the period of doubling in Great Britain would not be more than twenty-five years, even in spite of her great towns and manufactories; and would be decidedly less if these obstacles were removed.

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[1] The details which M. Humboldt has given of the population of New Spain are highly interesting, as they are the first of any consequence which the public has yet received of a tropical climate. The peculiarities which mark them are exactly of the kind which might have been expected, though the proportion of births is still greater than we could have ventured to suppose.

[2] *Essai Politique sur le Royaume de la Nouvelle Espagne*, liv. ii. chap. iv. pp. 330 *et seq.* vol. i. Oct.

[3] *Gottliche Ordnung*, vol. i. table xxi.

[4] Malthus on Population, vol. i. p 439, 5th edit.

[5] Report of the Preliminary Proceedings under Population Act, 58th Geo. III. p. 28.

[6] Population Abstract, 1821; Preliminary Observations, p. 8.

[7] Ibid.

The lowest rate of increase that can be assumed for the natural progress of population.

Taking therefore into consideration the actual rate of increase which appears from the best documents to have taken place over a very large extent of country in the United States of America, very variously circumstanced as to healthiness and rapidity of progress; considering, further, the rate of increase which has taken place in New Spain, and also in many countries of Europe, where the means of supporting a family, and other circumstances favourable to increase, bear no comparison with those of the United States; and adverting particularly to the great increase of population which has taken place in this country during the last twenty years, under the formidable obstacles to its progress which must press themselves upon the attention of the most careless observer; it must appear, that the assumption of a rate of increase such as would double the population in twenty-five years, as representing the natural progress of population, when not checked by the difficulty of procuring the means of subsistence, or other peculiar causes of premature mortality, must be very decidedly within the truth.

It may be safely asserted, therefore, that population, when unchecked, increases in a geometrical progression of such a nature as to double itself every twenty-five years.

Different character of the rate of increase in the food of a limited territory.

It would be unquestionably desirable to have the means of comparing the natural rate of the increase of population when unchecked, with the possible rate of the increase of food, in a limited territory, such as that in which man is actually placed; but the latter estimate is much more difficult and uncertain than the former. If the rate of the increase of population at a particular period of some little extent can be ascertained with tolerable exactness, we have only to suppose the continuance of the same encouragements to marriage, the same facility of supporting a family, the same moral habits, with the same rate of mortality; and the increase of the population at the same rate, after it had reached a thousand millions, would be just as probable as at any intermediate and earlier period; but it is quite obvious that the increase of food in a limited space must proceed upon a principle totally different. It has been already stated, that while land of good quality is in great abundance, the rate at which food might be made to increase would far exceed what is necessary to keep pace with the most rapid increase of population which the laws of nature in relation to human kind permit. But if society were so constituted as to give the fullest scope possible to the progress of cultivation and population, all such lands, and all lands of moderate quality, would soon be occupied; and when the future increase of the supply of food came to depend upon the taking of very poor land into cultivation, and the gradual and laborious improvement of the land already cultivated, the rate of the increase of food would certainly have a greater resemblance to a decreasing geometrical ratio than an increasing one. The yearly increment of food would, at any rate, have a constant tendency to diminish, and the amount of the increase of each successive ten years would probably be less than that of the preceding.

Practically, however, great uncertainty must take place. An unfavourable distribution of produce, by prematurely diminishing the demand for labour, might retard the increase of food at an early period, in the same manner as if cultivation and population had been further advanced; while improvements in agriculture, accompanied by a great demand for labour and produce, might for some time occasion a rapid increase of food and population at a later period, in the same manner as if cultivation and population had been in an earlier stage of their progress. These variations, however, obviously arise from causes which do not impeach the general tendency of a continued increase of produce in a limited territory to diminish the power of its increase in future.

Supposition respecting the power of increasing food.

Under this certainty with regard to the general tendency, and uncertainty in reference to particular periods, it must be allowable, if it throws light on the subject, to make a supposition respecting the increase of food in a limited territory, which, without pretending to accuracy, is clearly more favourable to the power of the soil to produce the means of subsistence for an increasing population, than any experience which we have of its qualities will warrant.

If, setting out from a tolerably well-peopled country, such as England, France, Italy, or Germany, we were to suppose that, by great attention to agriculture, its produce could be permanently increased every twenty-five years by a quantity equal to that which it at present produces, it would be allowing a rate of increase decidedly beyond any probability of realization. The most sanguine cultivators could hardly expect that, in the course of the next two hundred years, each farm in this country on an average would produce eight times as much food as it produces at present, and still less that this rate of increase could continue, so that each farm would produce twenty times as much as at present in five hundred years, and forty times as much in a thousand years. Yet this would be but an arithmetical progression, and would fall short, beyond all comparison, of the natural increase of population in a geometrical progression, according to which the inhabitants of any country, in five hundred years, instead of increasing to twenty times, would increase to above a million times their present numbers.

It will be said, perhaps, that many parts of the earth are as yet very thinly peopled, and, under proper management, would allow of a much more rapid increase of food than would be possible in the more fully inhabited states of Europe. This is unquestionably true. Some parts of the earth would no doubt be capable of producing food at such a rate as to keep pace for a few periods with an unrestricted increase of population. But to put this capacity fully into action, is of all things the most difficult. If it is to be accomplished by the improvement of the actual inhabitants of the different parts of the earth in knowledge, in government, in industry, in arts, and in morals, it is scarcely possible to say how it ought to be commenced with the best prospect of success, or to form a conjecture as to the time in which it could be effected.

Insufficiency of emigration.

If it is to be accomplished by emigration from the more improved parts of the world, it is obvious that it must involve much war and extermination; besides all the difficulties usually attendant upon new settlements in uncivilized countries; and these alone are so formidable, and for a long time so destructive, that, combined with the unwillingness which people must always naturally feel to quit their own country, much distress would be suffered at home before relief would be sought for in emigration.

But, supposing for a moment that the object could be fully accomplished, that is, supposing that the capacity of the earth to produce the necessaries of life could be put fully into action, and that they were distributed in the proportions most favourable for the growth of capital and the effective demand for labour, the increase of population, whether arising from the increase of the inhabitants of each country, or from emigrants issuing from all those countries which were more advanced in cultivation, would be so rapid, that, in a period comparatively quite short, all the good lands would be occupied, and the rate of the possible increase of food would be reduced much below the arithmetical ratio above supposed.

If, merely during the short period which has elapsed since our Revolution of 1688, the population of the earth had increased at its natural rate when unchecked, supposing the number of people at that time to have been only eight hundred millions, all the land of the globe, without making allowance for deserts, forests, rocks, and lakes, would on an average be equally populous with England and Wales at present. This would be accomplished in five doublings, or a hundred and twenty-five years; and one or two doublings more, or a period less than that which has elapsed since the beginning of the reign of James I., would produce the same effect from the overflowings of the inhabitants of those countries where, owing to the further progress of cultivation, the soil had not the capacity of producing food so as to keep pace with the increase of an unrestricted population.

Whatever temporary and partial relief, therefore, may be derived from emigration by particular countries in the actual state of things, it is quite obvious, that, considering the subject generally and largely, emigration may be fairly said not in any degree to touch the difficulty. And, whether we exclude or include emigration, whether we refer to particular countries, or to the whole earth, the supposition of a future capacity in the soil to increase the necessaries of life every twenty-five years by a quantity equal to that which is at present produced, must be decidedly beyond the truth.

Effect of the two different rates of increase when brought together.

But if the natural increase of population, when unchecked by the difficulty of procuring the means of subsistence, or other peculiar causes, be such as to continue doubling its numbers in twenty-five years; and the greatest increase of food, which, for a continuance, could possibly take place on a limited territory like our earth in its present state, be at the most only such as would add every twenty-five years an amount equal to its present produce; it is quite clear that a powerful check on the increase of population must be almost constantly in action.

By the laws of nature man cannot live without food. Whatever may be the rate at which population would increase if unchecked, it never can actually increase in any country beyond the food necessary to support it. But, by the laws of nature in respect to the powers of a limited territory, the additions which can be made in equal periods to the food which it produces must, after a short time, either be constantly decreasing, which is what would really take place; or, at the very most, must remain stationary, so as to increase the means of subsistence only in an arithmetical progression. Consequently, it follows necessarily that the average rate of the *actual* increase of population over the greatest part of the globe, obeying the same laws as the increase of food, must be totally of a different character from the rate at which it would increase if *unchecked.*

The great question, then, which remains to be considered, is the manner in which this constant and necessary check upon population practically operates.

General character of the checks to population.

If the soil of any extensive well-peopled country were equally divided amongst its inhabitants, the check would assume its most obvious and simple form. Perhaps each farm in the well-peopled countries of Europe might allow of one, or even two doublings, without much distress, but the absolute impossibility of going on at the same rate is too glaring to escape the most careless thinker. When, by extraordinary efforts, provision had been made for four times the number of persons which the land can support at present, what possible hope could there be of doubling the provision in the next twenty-five years?

Yet there is no reason whatever to suppose that any thing besides the difficulty of procuring in adequate plenty the necessaries of life, should either indispose this greater number of persons to marry early, or disable them from rearing in health the largest families. But this difficulty would of necessity occur, and its effect would be either to discourage early marriages, which would check the rate of increase by preventing the same proportion of births; or to render the children unhealthy from bad and insufficient nourishment, which would check the rate of increase by occasioning a greater proportion of deaths; or, what is most likely to happen, the rate of increase would be checked, partly by the diminution of births, and partly by the increase of mortality.

The first of these checks may, with propriety, be called the *preventive check* to population; the second, the *positive check;* and the absolute necessity of their operation in the case supposed is as certain and obvious as that man cannot live without food.

Taking a single farm only into consideration, no man would have the hardihood to assert that its produce could be made permanently to keep pace with a population increasing at such a rate as it is observed to do for twenty or thirty years together at particular times and in particular countries. He would, indeed, be compelled to acknowledge, that if, with a view to allow for the most sanguine speculations, it has been supposed that the additions made to the necessaries produced by the soil in given times might remain constant, yet that this rate of the increase of produce could not possibly be realized; and that, if the capacity of the soil were at all times put properly into action, the additions to the produce would, after a short time, and independently of new inventions, be constantly decreasing, till, in no very long period, the exertions of an additional labourer would not produce his own subsistence.

But what is true in this respect in reference to a single farm, must necessarily be true of the whole earth, from which the necessaries of life for the actual population are derived. And what would be true in respect to the checks to population if the soil of the earth were equally divided among the different families which inhabit it, must be true under the present unequal division of property and variety of occupations. Nothing but the confusion and indistinctness arising from the largeness of the subject, and the vague and false notions which prevail respecting the efficacy of emigration, could make persons deny in the case of an extensive territory or the whole earth, what they could not fail to acknowledge in the case of a single farm, which may be said fairly to represent it.

It may be expected, indeed, that in civilized and improved countries the accumulation of capital, the division of labour, and the invention of machinery, will extend the bounds of production; but we know from experience that the effects of these causes, which are quite astonishing in reference to some of the conveniences and luxuries of life, are very much less efficient in producing an increase of food; and although the saving of labour and an improved system of husbandry may be the means of pushing cultivation upon much poorer lands than could otherwise be worked, yet the increased quantity of the necessaries of life so obtained can never be such as to supersede, for any length of time, the operation of the preventive and positive checks to population. And not only are these checks as absolutely necessary in civilized and improved countries, as they would be if each family had a certain portion of land allotted to it, but they operate almost exactly in the same way. The distress which would obviously arise in the most simple state of society, from the natural tendency of population to increase faster than the means of subsistence in a limited territory, is brought home to the higher classes of an improved and populous country, in the difficulty which they find in supporting their families in the same rank of life with themselves; and to the labouring classes, which form the great mass of society, in the insufficiency of the real wages of common labour to bring up a large family.

If in any country the yearly earnings of the commonest labourers, determined, as they always will be, by the state of the demand and the supply of necessaries compared with labour, be not sufficient to bring up in health the largest families, one of the three things before stated must happen; either the prospect of this difficulty will prevent some and delay other marriages; or the diseases arising from bad nourishment will be introduced, and the mortality be increased; or the progress of population will be retarded, partly by one cause and partly by the other.

Of the effect of private property on the progress of population.

According to all past experience, and the best observations which can be made on the motives which operate upon the human mind, there can be no well-founded hope of obtaining a large produce from the soil, but under a system of private property. It seems perfectly visionary to suppose that any stimulus short of that which is excited in man by the desire of providing for himself and family, and of bettering his condition in life, should operate on the mass of society with sufficient force and constancy to overcome the natural indolence of mankind. All the attempts which have been made since the commencement of authentic history to proceed upon a principle of common property, have either been so insignificant that no inference can be drawn from them, or have been marked by the most signal failures; and the changes which have been effected in modern times by education do not seem to advance a single step towards making such a state of things more probable in future. We may therefore safely conclude, that while man retains the same physical and moral constitution which he is observed to possess at present, no other than a system of private property stands the least chance of providing for such a large and increasing population as that which is to be found in many countries at present.

But though there is scarcely any conclusion which seems more completely established by experience than this, yet it is unquestionably true that the laws of private property, which are the grand stimulants to production, do themselves so limit it, as always to make the actual produce of the earth fall very considerably short of the *power* of production. On a system of private property no adequate motive to the extension of cultivation can exist, unless the returns are sufficient, not only to pay the wages necessary to keep up the population, which, at the least, must include the support of a wife and two or three children, but also afford a profit on the capital which has been employed. This necessarily excludes from cultivation a considerable portion of land, which might be made to bear corn. If it were possible to suppose that man might be adequately stimulated to labour under a system of common property, such land might be cultivated, and the production of food and the increase of population might go on, till the soil absolutely refused to grow a single additional quarter, and the whole of the society was exclusively engaged in procuring the necessaries of life. But it is quite obvious that such a state of things would inevitably lead to the greatest degree of distress and degradation. And if a system of private property secures mankind from such evils, which it certainly does in a great degree, by securing to a portion of the society the leisure necessary for the progress of the arts and sciences, it must be allowed that such a check to the increase of cultivation confers on society a most signal benefit.

But it must perhaps also be allowed, that, under a system of private property, cultivation is sometimes checked in a degree and at a period not required by the interest of society. And this is particularly likely to happen when the original divisions of land have been extremely unequal, and the laws have not given sufficient facility to a better distribution of them. Under a system of private property, the only effectual demand for produce must come from the owners of property; and though it be true that the effectual demand of the society, whatever it may be, is best supplied under the most perfect system of liberty, yet it is not true that the tastes and wants of the effective demanders are always, and necessarily, the most favourable to the progress of national wealth. A taste for hunting and the preservation of game among the owners of the soil will, without fail, be supplied, if things be allowed to take their natural course; but such a supply, from the manner in which it must be effected, would inevitably be most unfavourable to the increase of produce and population. In the same manner, the want of an adequate taste for the consumption of manufactured commodities among the possessors of surplus produce, if not fully compensated by a great desire for personal attendance, which it never is, would infallibly occasion a premature slackness in the demand for labour and produce, a premature fall of profits, and a check to cultivation.

It makes little difference in the actual rate of the increase of population, or the necessary existence of checks to it, whether that state of demand and supply which occasions an insufficiency of wages to the whole of the labouring classes be produced prematurely by a bad structure of society and an unfavourable distribution of wealth, or necessarily by the comparative exhaustion of the soil. The labourer feels the difficulty nearly in the same degree, and it must have nearly the same results, from whatever cause it arises; consequently, in every country with which we are acquainted, where the yearly earnings of the labouring classes are not sufficient to bring up in health the largest families, it may be safely said that population is actually checked by the difficulty of procuring the means of subsistence. And, as we well know that ample wages, combined with full employment for all who choose to work, are extremely rare, and scarcely ever occur, except for a certain time, when the knowledge and industry of an old country is applied, under favourable circumstances, to a new one; it follows that the pressure arising from the difficulty of procuring subsistence is not to be considered as a remote one, which will be felt only when the earth refuses to produce any more, but as one which not only actually exists at present over the greatest part of the globe, but, with few exceptions, has been almost constantly acting upon all the countries of which we have any account.

It is unquestionably true, that, in no country of the globe have the government, the distribution of property, and the habits of the people, been such as to call forth, in the most effective manner, the resources of the soil. Consequently, if the most advantageous possible change in all these respects could be supposed at once to take place, it is certain that the demand for labour and the encouragement to production might be such as for a short time in some countries, and for rather a longer in others, to lessen the operation of the checks to population which have been described. It is specifically this truth constantly obtruding itself upon our attention which is the great source of delusion on this subject, and creates the belief that man could always produce from the soil much more than sufficient to support himself and family. In the actual state of things this power has perhaps always been possessed. But for it we are indebted wholly to the ignorance and bad government of our ancestors. If they had properly called forth the resources of the soil, it is quite certain that we should now have but scanty means left of further increasing our food. If merely since the time of William the Conqueror all the nations of the earth had been well governed, and if the distribution of property, and the habits both of the rich and the poor, had been the most favourable to the demand for produce and labour, though the amount of food and population would have been prodigiously greater than at present, the means of diminishing the checks to population would unquestionably be less. That difficulty in procuring the necessaries of life which is now felt in the comparatively low wages of labour almost all over the world, and is occasioned partly by the necessary state of the soil, and partly by a premature check to the demand for produce and labour, would then be felt in a greater degree, and would less admit of any relaxation in the checks to population, because it would be occasioned wholly and necessarily by the state of the soil.

The laws of nature responsible for the necessity of checks to population.

It appears, then, that what may be called the proportionate amount of the necessary checks to population depends very little upon the efforts of man in the cultivation of the soil. If these efforts had been directed from the first in the most enlightened and efficient manner, the checks necessary to keep the population on a level with the means of subsistence, so far from being lightened, would in all probability be operating with greater force; and the condition of the labouring classes, so far as it depends on the facility of procuring the means of subsistence, instead of being improved, would in all probability be deteriorated.

It is to the laws of nature, therefore, and not to the conduct and institutions of man, that we are to attribute the necessity of a strong check on the natural increase of population.

Man responsible for the prevailing character of these checks.

But though the laws of nature which determine the rate at which population would increase if unchecked, and the very different rate at which the food required to support population could be made to increase in a limited territory, are undoubtedly the causes which render necessary the existence of some great and constant check to population, yet a vast mass of responsibility remains behind on man and the institutions of society.

In the first place, they are certainly responsible for the present scanty population of the earth. There are few large countries, however advanced in improvement, the population of which might not have been doubled or tripled, and there are many which might be ten, or even a hundred times as populous, and yet all the inhabitants be as well provided for as they are now, if the institutions of society and the moral habits of the people had been for some hundred years the most favourable to the increase of capital, and the demand for produce and labour.

Secondly, though man has but a trifling and temporary influence in altering the proportionate amount of the checks to population, or the degree in which they press upon the actual numbers, yet he has a great and most extensive influence on their character and mode of operation.

It is not in superseding the necessity of checks to population, in the progress of mankind to the full peopling of the earth (which may with truth be said to be a physical impossibility), but in directing these checks in such a way as to be the least prejudicial to the virtue and happiness of society, that government and human institutions produce their great effect. Here we know, from constant experience, that they have great power. Yet even here it must be allowed that the power of government is rather indirect than direct, as the object to be attained depends mainly upon such a conduct on the part of individuals as can seldom be directly enforced by laws, though it may be powerfully influenced by them.

This will appear if we consider more particularly the nature of those checks which have been classed under the general heads of Preventive and Positive.

It will be found that they are all resolvable into *moral restraint*, *vice*, and *misery*. And if, from the laws of nature, some check to the increase of population be absolutely inevitable, and human institutions have any influence upon the extent to which each of these checks operates, a heavy responsibility will be incurred, if all that influence, whether direct or indirect, be not exerted to diminish the amount of vice and misery.

These checks resolvable into moral restraint, vice, and misery.

Moral restraint, in application to the present subject, may be defined to be, abstinence from marriage, either for a time or permanently, from prudential considerations, with a strictly moral conduct towards the sex in the interval. And this is the only mode of keeping population on a level with the means of subsistence, which is perfectly consistent with virtue and happiness. All other checks, whether of the preventive or the positive kind, though they may greatly vary in degree, resolve themselves into some form of vice or misery.

The remaining checks of the preventive kind, are the sort of intercourse which renders some of the women of large towns unprolific; a general corruption of morals with regard to the sex, which has a similar effect; unnatural passions, and improper arts to prevent the consequences of irregular connections. These evidently come under the head of vice.

The positive checks to population include all the causes which tend in any way prematurely to shorten the duration of human life; such as unwholesome occupations, severe labour and exposure to the seasons, bad and insufficient food and clothing, arising from poverty, bad nursing of children, excesses of all kinds, great towns and manufactories, the whole train of common diseases and epidemics, wars, infanticide, plague, and famine. Of these positive checks, those which appear to arise from the laws of nature may be called exclusively misery; and those which we bring upon ourselves, such as wars, excesses of all kinds, and many others, which it would be in our power to avoid, are of a mixed nature. They are brought upon us by vice, and their consequences are misery.

Some of these checks, in various combinations, and operating with various force, are constantly in action in all the countries with which we are acquainted, and form the immediate causes which keep the population on a level with the means of subsistence.

Mr Malthus, in his work on this subject, has taken a view of the checks of population in most of the countries of which we have the best accounts. His object was evidently to trace in each country those checks which appeared to be most effective in repressing population; and to endeavour to answer the question generally which had been applied particularly to New Holland by Captain Cook, namely, By what means is the population of this country kept down to the number which it can subsist?

Prudential restraint on marriage.

It was hardly to be expected, however, that the general accounts of countries which are to be met with should contain a sufficient number of details of the kind required to enable us to ascertain what portion of the natural increase of population each individual check which could be traced had the power to overcome. In particular, it was not to be expected, that any accounts could inform us of the degree in which moral restraint prevails when taken in its strictest sense. It is necessary, therefore, to attend chiefly to the greater or smaller number of persons who remain unmarried, or marry late; and the delay of marriage, owing to the difficulty of providing for a family, when the degree of irregularity to which it may lead cannot be ascertained, may be usefully called the prudential restraint on marriage and population. And this will be found to be the chief mode in which the preventive check practically operates.

But if the preventive check to population, that check which can alone supersede great misery and mortality, operates chiefly by a prudential restraint on marriage, it will be obvious, as was before stated, that direct legislation cannot do much. Prudence cannot be enforced by laws, with-

Causes which principally affect the habits of the labouring classes.

out a great violation of natural liberty, and a great risk of producing more evil than good. But still the very great influence of a just and enlightened government, and the perfect security of property in creating habits of prudence, cannot for a moment be questioned. The principal causes and effects of these habits are thus stated in Mr Malthus's last work.[1]

"From high wages, or the power of commanding a large portion of the necessaries of life, two very different results may follow; one, that of a rapid increase of population, in which case the high wages are chiefly spent in the maintenance of large and frequent families; and the other, that of a decided improvement in the modes of subsistence, and the conveniences and comforts enjoyed, without a proportionate acceleration in the rate of increase.

"In looking to these different results, the causes of them will evidently appear to be the different habits existing among the people of different countries, and at different times. In an inquiry into the causes of these different habits, we shall generally be able to trace those which produce the first result to all the circumstances which contribute to depress the lower classes of the people, which make them unable or unwilling to reason from the past to the future, and ready to acquiesce, for the sake of present gratification, in a very low standard of comfort and respectability; and those which produce the second result, to all the circumstances which tend to elevate the character of the lower classes of society, which make them approach the nearest to beings who "look before and after," and who, consequently, cannot acquiesce patiently in the thought of depriving themselves and their children of the means of being respectable, virtuous, and happy.

"Among the circumstances which contribute to the character first described, the most efficient will be found to be despotism, oppression, and ignorance; among those which contribute to the latter character, civil and political liberty, and education.

"Of all the causes which tend to encourage prudential habits among the lower classes of society, the most essential is unquestionably civil liberty. No people can be much accustomed to form plans for the future, who do not feel assured that their industrious exertions, while fair and honourable, will be allowed to have free scope; and that the property which they either possess or may acquire will be secured to them by a known code of just laws impartially administered. But it has been found by experience, that civil liberty cannot be permanently secured without political liberty; consequently political liberty becomes almost equally essential, and, in addition to its being necessary in this point of view, its obvious tendency to teach the lower classes of society to respect themselves, by obliging the higher classes to respect them, must contribute greatly to all the good effects of civil liberty."

"With regard to education, it might certainly be made general under a bad form of government, and might be very deficient under one in other respects good; but it must be allowed that the chances, both with regard to its quality and its prevalence, are greatly in favour of the latter. Education alone could do little against insecurity of property; but it would powerfully assist all the favourable consequences to be expected from civil and political liberty, which could not indeed be considered as complete without it."

The varying prevalence of these habits, owing to the causes above referred to, combined with the smaller or greater mortality occasioned by other customs, and the varying effects of soil and climate, must necessarily produce great differences in different countries, and at different periods, in the character of the predominant checks to population, and the force of each. And this inference, which inevitably follows from theory, is fully confirmed by experience.

The positive checks to population predominated in ancient times.

It appears, for instance, from the accounts we have received of ancient nations, and of the less civilized parts of the world, that war and violent diseases were the predominant checks to their population. The frequency of wars, and the dreadful devastations of mankind occasioned by them, united with the plagues, famines, and mortal epidemics of which there are records, must have caused such a consumption of the human species, that the exertion of the utmost power of increase must, in many cases, have been insufficient to supply it; and we see at once the source of those encouragements to marriage, and efforts to increase population, which, with inconsiderable exceptions, distinguished the legislation and general policy of ancient times. Yet there were some few men of more extended views, who, when they were looking to the settlement of a society in a more improved state, were fully aware, that under the most beautiful form of government which their imagination could conceive, the greatest poverty and distress might be felt from a too rapid increase of population. And the remedies which they proposed were strong and violent in proportion to the greatness of the evil which they apprehended. Even the practical legislators who encouraged marriage, seemed to think that the supplies of children might sometimes follow too rapidly for the means of supporting them; and it appears to have been with a view to provide against this difficulty, and of preventing it from discouraging marriage, that they frequently sanctioned the inhuman practice of infanticide.

Under these circumstances, it is not to be supposed that the prudential restraint on marriage should have operated to any considerable extent. Except in a few cases where a general corruption of morals prevailed, which might act as a preventive check of the most vicious kind, a large portion of the procreative power was called into action, the occasional redundancy from which was checked by violent causes. These causes will be found resolvable almost wholly into vice and misery; the first of which, and a large portion of the second, it is always in the power of man to avoid.

Prudential restraint the predominant check to population in modern times.

In a review of the checks to population in the different states of modern Europe, it appears that the positive checks to population have prevailed less, and the preventive checks more, than in ancient times, and in the more uncultivated parts of the world. The destruction occasioned by war has unquestionably abated, both on account of its occurring, on the whole, less frequently, and its ravages not being so fatal, either to man or the means of his support, as they were formerly. And although, in the earlier periods of the history of modern Europe, plagues, famines, and mortal epidemics were not unfrequent, yet, as civilization and improvement have advanced, both their frequency and their mortality have been greatly reduced, and in some countries they are now almost unknown. This diminution of the positive checks to population, as it has been certainly much greater in proportion than the actual increase of food and population, must necessarily have been accompanied by an increasing operation of the preventive checks; and probably it may be said with truth, that in almost all the more improved countries of modern Europe, the principal check which at present keeps the population down to the level of the actual means of subsistence, is the prudential restraint on marriage.

Yet in comparing together the accounts and registers of the different countries of modern times, we shall still find a vast difference in the character and force of the checks which are mainly in action; and it is precisely in this point

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[1] Principles of Political Economy, c. iv. sect. 2.

Difference in the character and force of the checks in different countries.

of view that these accounts afford the most important instruction. Some parts of Europe are yet in an unimproved state, and are still subject to frequent plagues and mortal epidemics. In these countries, as might be expected, few traces are to be found of the prudential restraint on marriage. But even in improved countries, the circumstances may be such as to occasion a great mortality. Large towns are known to be unfavourable to health, particularly to the health of young children; and the unwholesomeness of marshy situations may be such as in some cases to balance the principle of increase, even when nearly the whole of the procreative power is called into action, which is seldom the case in large towns.

Thus, in the registers of twenty-two Dutch villages given by Sussmilch,[1] and quoted by Mr Malthus, the mortality (occasioned, as may be supposed, chiefly by the natural unhealthiness of the country) was as high as one in twenty-two or twenty-three, instead of the more common proportion of one in thirty-five or forty; and the consequence was, that the marriages, instead of being in the usual proportion of one in about 108 of the population, were in the extraordinary high proportion of one in sixty-four;[2] showing a most unusual frequency of marriage, while, on account of the great mortality, the number of inhabitants was nearly stationary, and the births and deaths about equal.

On the other hand, in Norway, where the climate and modes of living seem to be extremely favourable to health, and the mortality was only one in forty-eight, the prudential restraint on marriage was called more than usually into action, and the marriages were only one in 130 of the population.

Gradual diminution in the proportion of marriages.

These may be considered as extreme cases, but the same result in different degrees is observable in the registers of all countries; and it is particularly to be remarked, that in those countries where registers of births, deaths, and marriages have been kept for a considerable time, the progressive diminution or mortality occasioned by the introduction of habits more favourable to health, and the consequent diminution of plagues and mortal epidemics, have been accompanied invariably by a smaller proportion of marriages and births. Sussmilch has given some striking instances of the gradual diminution in the proportion of the number of marriages during a part of the last century.[3]

In the town of Leipsic, in the year 1620, the annual marriages were to the population as 1 to 82; from the year 1741 to 1756, they were as 1 to 120.

In Augsburg, in 1510, the proportion of marriages to the population was 1 in 86; in 1750 as 1 to 123.

In Dantzic, in the year 1705, the proportion was as 1 to 89; in 1745, as 1 to 118.

In the dukedom of Magdeburg, in 1700, the proportion was as 1 to 87; from 1752 to 1755, as 1 to 125.

In the principality of Halberstadt, in 1690, the proportion was as 1 to 88; in 1756, as 1 to 112.

In the dukedom of Cleves, in 1705, the proportion was as 1 to 83; in 1755, as 1 to 100.

In the churmark of Brandenburg, in 1700, the proportion was as 1 to 76; and in 1755, as 1 to 108.

Instances of this kind are numerous, and they tend to show the dependence of the marriages on the deaths in all old countries. A greater mortality almost invariably produces a greater number of marriages; and it must be equally certain, that except where the means of subsistence can be adequately increased, a greater proportion of marriages must occasion a greater mortality.

Dependence of the births and marriages on the deaths.

The proportion of yearly births to the whole population must evidently depend principally on the proportion of marriages; and it appears, consequently, from registers, that in countries which will not admit of any considerable increase of population, the births, as well as the marriages, are mainly influenced by the deaths. When an actual decrease of population is not taking place, the births will always supply the vacancies made by death, and exactly so much more as the increasing wealth of the country and the demand for labour will admit. Everywhere in the intervals of plagues, epidemics, and destructive wars, the births considerably exceed the deaths; but while from these and other causes the mortality in different countries is extremely various, it appears from registers that, with the exception above stated, the births vary in the same proportion.[4]

Thus, in 39 villages of Holland, where the deaths, at the time to which the registers refer, were about 1 in 23, the births were also 1 in 23. In 15 villages round Paris, the births bore the same or even a greater proportion to the whole population, on account of a still greater mortality, the births being 1 in $22\frac{7}{10}$ths, and the deaths the same. In the small towns of Brandenburg, which were in an increasing state, the mortality was 1 in 29, and the births 1 in $24\frac{7}{10}$ths. In Sweden, where the mortality was about 1 in $34\frac{1}{2}$, the births were 1 in 28. In 1056 villages of Brandenburg, in which the mortality was about 1 in 39 or 40, the births were about 1 in 30. In Norway, where the mortality was 1 in 48, the births were 1 in 34.

In all these instances the births are evidently measured by the deaths, after making a proper allowance for the excess of births which the state of each country will admit. In such a country as Russia, this allowance must be great; as, although the mortality might perhaps be taken as low as 1 in 48 or 50, the births were as high as 1 in 26, owing to the increasing resources of the country, which admit of a rapid increase of the population.

Dependence of the births on the deaths illustrated in Switzerland.

Of all the countries which Mr Malthus has reviewed, there is none which so strikingly illustrates the most important fact of the dependence of the proportions of marriages and births on the deaths, and the general principles of population, as Switzerland. It appears, that between 1760 and 1770, an alarm prevailed respecting the continued depopulation of the country; and, to ascertain the point, M. Muret, minister of Vevay, made a very laborious and careful search into the registers of different parishes from the time of their first establishment. He compared the number of births which had taken place during three different periods of seventy years each, the first ending in 1620, the second in 1690, and the third in 1760. And finding by this comparison, that the number of births was less in the second period than in the first, and less in the third period than in the second, he considered the evidence of a continued depopulation of the country from the year 1550 as incontrovertible.[5] But the accounts which he himself produces clearly show, that, in the earlier periods to which he refers, the mortality was very much greater than in the latter; and that the greater *number* of births found in the registers formerly, was not owing to a greater population, but to the greater *proportion* of births which always accompanies a greater mortality.

It appears from accounts which are entirely to be depended on, that during the last period the mortality was extraordinarily small, and the proportion of children reared from infancy to puberty extraordinarily great. At the time when M. Muret wrote his paper, in 1766, the proportion of deaths to the population in the Pays de Vaud was 1 in 45, of births 1 in 36, and of marriages 1 in 140. These are all very small proportions of births, deaths, and marriages, compared with other countries; but the state of things must have been totally different in the sixteenth and seventeenth centuries. M. Muret gives a list of all the plagues which had prevailed in Switzerland from 1520, from which it appears that this dreadful scourge desolated the country at short intervals during the whole of the first period, and extended its occasional ravages to within twenty-two years of the termination of the second. We may safely conclude, that, in these times, the average mortality was very much greater than at present. But what puts the question beyond a doubt, is the great mortality which prevailed in the neighbouring town of Geneva in the sixteenth century, and its gradual diminution in the seventeenth and eighteenth. It appears from calculations, published in the *Bibliothèque Britannique* (tom. iv. p. 328), that in the sixteenth century the probability of life, or the age to which half of the born lived, was only 4·883, or under four years and eleven months; and the mean life, or the average number of years due to each person, 18·511, or about eighteen years and a half. In the seventeenth century, the probability of life in Geneva was 11·607, about eleven years and seven months; the mean life 23·358, or twenty three years and four months. In the eighteenth century, the probability of life had increased to 27·183, twenty-seven years and two months; and the mean life to thirty-two years and two months.

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[1] *Gottliche Ordnung*, vol. i. c. iv. s. 57, p. 128. Malthus' Essay on Population, b. ii. c. iv. p. 444 of vol. i. fifth edition.

[2] This very large proportion of marriages could not all have been supplied from the births in the country, but must have been occasioned in part by the influx of strangers.

[3] *Gottliche Ordnung*, vol. i. p. 134 *et seq.*

[4] Sussmilch, *Gottliche Ordnung*, vol. i. p. 225. Essay on Population, vol. i. p. 456, fifth edition.

[5] *Mémoires, &c. par la Société Economique de Berne*, 1766, pp. 15 *et seq.* Essay on Population, vol. i. pp. 464 *et seq.* fifth edition.

There can be no doubt, from the prevalence of the plague, and its gradual extinction, as noticed by M. Muret, that a diminution of mortality of the same kind, though not perhaps to the same extent, must have taken place in Switzerland; but if, with a mortality which could not have been less than one in thirty or thirty-two, the proportion of births had been what it was when M. Muret wrote, it is quite evident that the country would have been rapidly depopulated. But as it is known, from the actual amount of births found in the registers, that this was not the case, it follows as a necessary consequence, that the greater mortality of former times was accompanied by a greater proportion of births. And this at once shows the error of attempting to determine the actual population, either of different countries, or of different periods in the same country, by the amount of the births; and the strong tendency of population to fill up all vacancies, and very rarely to be limited by any other cause than the difficulty of supporting a family.

Swizerland and the Pays de Vaud afford other most striking instances of the dependence of the births on the deaths; and the accounts of them are perhaps more to be depended upon, as they appear to contradict the preconceived opinions of the person who collected them.

Speaking of the want of fruitfulness in the Swiss women, M. Muret says, that Prussia, Brandenburg, Sweden, France, and indeed every country the registers of which he had seen, give a greater proportion of baptisms to the number of inhabitants than the Pays de Vaud, where this proportion is only as 1 to 36. He adds, that from calculations lately made in the Lyonnois, it appeared that in Lyons itself the proportion of baptisms was 1 in 28, in the small towns 1 in 25, and in the villages 1 in 23 or 24. What a prodigious difference, he exclaims, between the Lyonnois and the Pays de Vaud, where the most favourable proportion, and that only in two small parishes of extraordinary fecundity, is not above 1 in 26, and in many parishes it is considerably less than 1 in 40 The same difference, he remarks, takes place in the mean life. In the Lyonnois it is little above 25 years; while in the Pays de Vaud, the lowest mean life, and that only in a single marshy and unhealthy parish, is 29½ years, and in many places it is above 45 years.

"But whence comes it," he says, "that the country where children escape the best from the dangers of infancy, and where the mean life, in whatever way the calculation is made, is higher than in any other, should be precisely that in which the fecundity is the smallest? How comes it, again, that, of all our parishes, the one which gives the mean life the highest should also be the one where the tendency to increase is the smallest?"[1]

To resolve this question, M. Muret says, "I will hazard a conjecture, which, however, I give only as such. Is it not that, in order to maintain in all places a proper equilibrium of population, God has wisely ordered things in such a manner as that the force of life in each country should be in the inverse ratio of its fecundity? In fact, experience verifies my conjecture. Leyzin, a village in the Alps, with a population of 400 persons, produces but a little above eight children a year. The Pays de Vaud, in general, in proportion to the same number of inhabitants, produces eleven, and the Lyonnois sixteen. But if it happen, that at the age of twenty years, the eight, the eleven, and the sixteen are reduced to the same number, it will appear that the force of life gives in one place what fecundity does in another. And thus the most healthy countries, having less fecundity, will not over-people themselves, and the unhealthy countries, by their extraordinary fecundity, will be able to sustain their population."

These facts and observations are full of the most important instruction, and strikingly illustrate the principle of population. The three gradations in the proportions of births which are here so distinctly presented to our view, may be considered as representing that variety in the proportion of births which is known to take place in different countries and at different periods; and the practical question is, whether, when this variety prevails without a proportionate difference in the rate of increase, which is almost universally the case, we are to suppose, with M. Muret, that a special providence is called into action to render women less prolific in healthy countries, and where improved habits of cleanliness have banished plagues and mortal epidemics; or to suppose, as experience warrants, that the smaller mortality of healthy and improved countries is balanced by the greater prevalence of the prudential restraint on marriage and population.

The subject is seen with particular clearness in Switzerland, on account of the population of some of the districts being stationary. The number of inhabitants on the Alps was supposed to have diminished. This was probably an error; but it is not improbable that they should have remained stationary, or nearly so. There is no land so little capable of providing for an increasing population as mountainous pastures. When they have been once fully stocked with cattle, little more can be done; and if there be neither emigration to take off the superabundant numbers, nor manufactures wherewith to purchase an additional quantity of food, the deaths must equal the births.

This was the case with the Alpine parish of Leyzin before referred to, where, for a period of thirty years, the mortality and the proportion of births almost accurately kept pace with each other; and where, in consequence, if the positive checks to population had been unusually small, the preventive checks must have been unusually great. In the parish of Leyzin, according to M. Muret, the probability of life was as high as sixty-one years;[2] but it is obvious that this extraordinary degree of healthiness could not *possibly* have taken place under the actual circumstances of the parish with respect to the means of subsistence, if it had not been accompanied by a proportionate action of the prudential restraint on marriage; and accordingly the subsisting marriages, being late and unprolific, yielded only one birth to every twelve; the births were only one in forty-nine, and the number of persons below sixteen was only one fourth of the population.

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[1] *Mémoires, &c. par la Société Economique de Berne*, 1766, pp. 48 *et seq.*

[2] *Ibid.* table v. p. 65 of the tables.

There can be little doubt that in the present case the extreme healthiness of the people, arising from their situation and employments, had more effect in producing the prudential check to population than the prudential check in producing the extreme healthiness; yet it is quite certain that they must constantly act and re-act upon each other, and that if, when the circumstances are such as to furnish no adequate means for the support of an increased population, and no relief in emigration, the prudential check does not prevail, no degree of natural healthiness could prevent an excessive mortality. Yet to occasion such a mortality, a much greater degree of poverty and misery must have taken place than in districts less favourably circumstanced with regard to health; and we see at once the reason why, in countries of mountainous pasture, if there be no vent in emigration, the necessity of the prudential check should be more strongly forced on the attention of the inhabitants, and should in consequence prevail to a greater degree.

Differences in the registers of different countries.

Taking countries in general, there will necessarily be differences as to natural healthiness in all the gradations, from the most marshy habitable situations to the most pure and salubrious air. These differences will be further increased by the nature of the employments of the people, their habits of cleanliness, and their care in preventing the spread of epidemics. If in no country was there any difficulty in obtaining the means of subsistence, these different degrees of healthiness would make a great difference in the progress of population; and as there are many countries naturally more healthy than the United States of America, we should have instances of a more rapid increase than that which has there taken place. But as the actual progress of population is, with very few exceptions, determined by the relative difficulty of procuring the means of subsistence, and not by the relative natural powers of increase, it is found by experience that, except in extreme cases, the actual progress of population is little affected by unhealthiness or healthiness; but that these circumstances show themselves most powerfully in the character of the checks which keep the population down to the level of the means of subsistence, and occasion that sort of variety in the registers of different countries which was noticed in the instances mentioned by M. Muret.

Thus the population of two or three countries may be increasing at nearly the same rate, but one may be increasing chiefly from a great proportion of births, another from a small proportion of deaths, and a third from a more common proportion of both, in which three different cases the structure of the population, and the registers of births, deaths, and marriages, will be essentially different.

The rate at which the population of Sweden and Norway was increasing, at the time referred to by Mr Malthus, was not far from the same; but their registers differed in almost all points. While the births in Sweden were 1 in 28 of the population, the births in Norway were only 1 in 34; while the marriages in Sweden were 1 in 112, in Norway they were only 1 in 130; and while the mortality in Sweden was 1 in 34½, in Norway it was only 1 in 48.[1] These different proportions of births, deaths, and marriages, must essentially alter the whole structure of the population. The proportion of persons living at different ages would be essentially different; the generations in one country would pass away sooner than the generations in the other; and Sweden might be said to increase principally from the large proportion of its births, and Norway from the small proportion of its deaths, or its small mortality.

A large proportion of births, when they have room to expand themselves, is the most powerful element of increase, and is absolutely necessary in order to effect the shortest period of doubling with which we are acquainted; but two countries may have nearly the same proportion of births, and yet the population of one be quite stationary, while the population of the other is increasing with the greatest known rapidity. The proportion of births in the Dutch villages first noticed approaches towards that of the United States of America; yet in the one case the population did not increase at all, and in the other it has increased so fast as to be taken as a specimen of the natural progress of population when interrupted by the fewest checks to which human society is subject. In this case, though the proportions of births and marriages to the whole population might not be very unlike, and possibly no very great difference might appear in the proportion of marriages to births, the other points in the registers would be in the opposite extremes. While the mortality in the Dutch villages was as high as 1 in 22, it would probably be 1 in 41, or less, in the United States. While the births and deaths in the Dutch villages were in the ratio of equality, in the United States they would be nearly in the proportion of 41 to 19.

In the same manner, two countries might have nearly the same mortality, and yet, in other points, be very different; and while one was increasing most rapidly, the other might be increasing very slowly. The proportion of deaths to the population in the Pays de Vaud is not very essentially different from that of the United States, but the proportion of births and the structure of the population present the most striking contrasts. The proportion of births for the whole of the Pays de Vaud was, according to M. Muret, 1 in 36, in many parishes it was considerably less than 1 in 40, and in one parish as low as 1 in 49; while, in the United States, it must be somewhere between 1 in 19 and 1 in 20. The structure of the population was different accordingly. In the whole of the Pays de Vaud, the proportion of the population under sixteen was one third; in many parts, and in the whole of the Canton of Berne, one fourth; while in the United States, it is as high as one half.

Variations in the age to which half of the born live in different countries.

We have seen, that, according to M. Muret, the probability of life, or the age to which half the born live, was, in the extraordinary parish of Leyzin, as high as 61 years. On the same authority, it appears that in nine other parishes of the Alps it was as high as 47; in 41 parishes of the Pays de Vaud and Jura 42; in 12 corn parishes 40; in 18 parishes among the great vineyards 37, in one marshy parish 24.[2] From other authorities we learn, that in country villages and parishes, the age to which half of the born live is such, that the major part will probably live to marry.[3] In the parish of Ackworth, in Yorkshire, it appears from an exact account kept by Dr Lee, of the ages at which all died there for twenty years from 1747 to 1767, that half the inhabitants live to the age of 46 (Price, vol. ii. p. 35, 7th edit.); and if the same account had been kept in many of the other healthy parishes in England, where the yearly mortality, instead of being 1 in 47 as in Ackworth, was 1 in 60, 1 in 66, and even 1 in 75 (vol. ii. p. 224), half of the born would be found to have lived to above 50 or 55. In the whole of Sweden, where the annual mortality, at the time referred to by Dr Price, was greater than 1 in 35, it appears from his tables, that half of the born must have lived to above 33 (vol. ii. p. 413, 7th edit.); and in Great Britain generally, where the mortality at present, after making due allowance for the omissions in the deaths, appears to be less than 1 in 51, it cannot be doubted that there is scarcely a village in the country tolerably well situated, where half of the born do not live till above 40. In towns the case is very different. According to the data collected by Dr Price, one half of the born died in London under three years of age, in Vienna and Stockholm under two, in Manchester under five, in Northampton under ten (vol. ii. p. 33); and although in most of these towns, particularly those in England, a great improvement has taken place in their healthiness of late years, yet still they will always fall far short of the healthiness of country situations.

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[1] See Malthus on Population, chapters i. and ii. of book ii.

[2] *Mémoires, &c. par la Société Economique de Berne*, 1766, table viii. p. 92 of the tables. As these calculations seem all to have been made from mortuary registers, they are all too low, except where the population was absolutely stationary.

[3] Graunt's and Short's Observations, &c. referred to by Dr Price, vol. ii. pp. 41, 42, &c. 7th edition.

The age to which half the born live appears, therefore, to vary in different countries and places, and under different circumstances, in the very extraordinary degree of from 3 to 60.[1]

Variations n the ex- ectation f life in lifferent ountries.

The mean age of death, or the expectation of life, must necessarily be more steady; yet it appears to vary from about 16 or 17 to 50.

In Stockholm, according to a table calculated by Dr Price, from the medium of three different enumerations in 1757, 1760, and 1763, the expectation of life for males at birth was 14·25, and for females 18·10.[2] Taken together, the expectation of life was a little above 16. In Vienna, as appears from another table, it was 16½.[3] While, according to M. Muret, at Leyzin, the expectation of life at birth was, about the same period, 50 years.[4]

ariations the an- ual mor- lity.

The annual mortality, which is different, both from the age to which half of the born live, and the mean age of death, is found to vary in different places and countries, from about 1 in 19 to about 1 in 70. In Stockholm, the annual mortality was but 1 in 19 (Price's Observations, vol. ii. p. 136); and in some of the villages in England, even at the time that Dr Price wrote, it was as low as 1 in 70 and 1 in 75.

roportion births the po- ulation.

The proportion of births to the population appears to vary in different countries and under different circumstances, from about 1 in 17 to 1 in 49. In New Spain, according to Humboldt, it was 1 in 17. In New Jersey, according to the rate of increase determined by the census taken in 1738 and seven years afterwards, the proportion of births must have been about 1 in 18. (Price, vol. ii. p. 50.) At present, as far as can be collected from scattered facts and inferences, the proportion of births in the whole of the United States is about 1 to 19. In the table for Prussia and Lithuania given by Sussmilch, it appears, that after the great plague of 1709 and 1710, and omitting the extraordinary year immediately subsequent, the proportion of births in the five years ending with 1716 was 1 in less than 17;[5] while, according to M. Muret, in the parish of Leyzin, the proportion of births was only 1 in 49 of the population.

riations the mber of bsisting rriages one an- al birth.

The number of subsisting marriages which yields one annual birth appears to vary from 12 to 4, and the two extreme cases occur in what may be called the same country, and are both noticed by M. Muret; the one in the parish of Leyzin, which presents all the symptoms of the prudential check to population in the greatest excess, and where twelve subsisting marriages yield only one annual birth; and the other in the parish of St Cergue, in the Jura, where marriage is encouraged by the habit of emigration, and four subsisting marriages are sufficient to yield one annual birth.

Different proportions of the population under 16.

The proportion of the population under 16 years of age to that above 16 seems to vary in different countries and places, and under different circumstances, from one half to one fourth. In the United States, it appears by the late census that it is one half; while in the canton of Berne it is not much more than one fourth, and in the parish of Leyzin not more than one fourth.[6]

Variations in the mortality under 15.

The mortality under the age of 15 varies in different places and circumstances, from above two thirds to one fifth. It appears from a table of Dr Price, that in Stockholm above two thirds died under 15 (vol. ii. p. 418); while, according to M. Muret, the proportion of the deaths under the age of 15 was, in the whole of the Pays de Vaud, one third, in many parishes of the Alps one fourth, and in the extraordinary parish of Leyzin only one fifth.[7]

Under these very great variations in the registers of different countries and places, and in the structure of their population, it is obvious that we might fall into the grossest possible errors, by applying the registers of one country to the population of another. Even if we could find a country which was near to a just mean between these opposite extremes, and the registers of which were kept with the greatest accuracy, we could not apply such registers to any other country with a view to any important inferences, unless we knew that the two countries nearly resembled each other, not only in one or two particulars, but in all the main points relating to the structure of their population and the character of the prevailing checks to it.

First tables of mortality formed from the registers of towns.

When attention was first directed to tables of mortality with a view to assurances on lives and survivorships, these tables were almost universally formed from the registers of towns, and of the neighbouring villages influenced by them. Buffon, calculating the probability of life from the registers of three parishes in Paris, and twelve country parishes in the neighbourhood, collected by M. Dupré de St Maur, makes it appear that half of the born died under eight years of age. The parishes in Paris seemed to be healthier than the villages in the neighbourhood, which was occasioned by the custom of sending the children from the city to be nursed in the country. Other calculations from the registers of Breslau by Dr Halley, of London by Mr Simpson, and subsequently of Northampton, Warrington, Chester, Norwich, &c. by Dr Price and other writers, all concurred to convey the impression that more than half of the born die under the age of puberty; and though Dr Price, in his two volumes of Observations on Reversionary Payments, takes frequent opportunities of dwelling upon the prodigious difference in the mortality of towns and of country situations, and produces abundance of evidence to show that, taken together, in the actual state of things, half of the born live much beyond the age of puberty; yet, among some persons who have not attended to the subject, the former impression seems still to have remained; and, what is more strange, it has been lately asserted that this must happen from the constitution and course of human nature (Godwin's Answer to Malthus); which is going very much further than to say that it happens under the poverty, distress, and unhealthy occupations which are known to affect the mortality of a considerable body of people in all the nations with which we are acquainted.

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[1] This last number, stated by M. Muret for the parish of Leyzin, on the Alps, is so very extraordinary, that possibly it may not be correct.

[2] Observations on Reversionary Payments, vol. ii. p. 421, 7th edition.

[3] *Ibid.* vol. ii. p. 128.

[4] *Mémoires, &c. par la Société Economique de Berne*, 1766, table v. p. 65.

[5] *Gottliche Ordnung*, vol. i. table xxi. p. 83 of the tables. Malthus, vol. ii. p. 168, 5th edition.

[6] *Mémoires, &c. par la Société Economique de Berne*, 1766, pp. 11 and 12.

[7] *Ibid.* table xiii. p. 12.

The constitution and course of human nature determinable only by experience.

The constitution and course of human nature can only be determined by experience, and the analogies derived from it; and the kind of experience necessary to determine the point in question is to be obtained only by a reference to registers which inform us of the ages at which the born have died. Now, from the evidence of registers of this kind which have been carefully kept in country parishes, it appears that the age to which half of the born live is much nearer to forty than to the age of puberty. Even in Sweden, where the general mortality is unquestionably very great, owing to the poverty of the labouring classes, and the diseases brought upon them by bad and insufficient food during seasons of scarcity, the age to which half of the born live is, as before stated, above thirty-three;[1] in the whole of the Pays de Vaud it is forty-one; in many particular parishes forty-seven; in a parish in England not so healthy as many others, forty-seven; and as the expectation of life appears, by the late returns from the parish registers of Great Britain, to be as high as in Switzerland, there is little reason to doubt, from the evidence of registers, that the age to which half of the born live in this country can fall but little short of what it is in the Pays de Vaud, that is, it must be somewhere near forty. But it will hardly be contended that there is no premature mortality in Great Britain occasioned by the pressure of poverty, and the effect of large towns and unwholesome occupations. Consequently, unless we are prepared to say that agricultural employments, airy and moderately-sized towns, cleanliness, healthy occupations, and prudence, are against the constitution and course of nature, as applied to reasonable beings, we must acknowledge, that if the constitution and course of nature were carefully observed, and the admonitions which they give properly attended to, half of the born would, in healthy climates, live on an average to forty-five. Taking things, however, as they are, it is obvious that, according to the testimony of the best registers, more than half of the born might live to marry in most countries, even if the average age of marriage was so late as thirty.

Immediate causes of the increase of population.

The immediate cause of the increase of population is the excess of the births above the deaths; and the rate of increase, or the period of doubling, depends upon the proportion which the excess of the births above the deaths bears to the population.

The excess of births is occasioned by, and proportioned to, three causes: 1*st*, the prolificness of the marriages; 2*dly*, the proportion of the born which lives to marry; and, 3*dly*, the earliness of these marriages compared with the expectation of life, or the shortness of a generation by marriage and birth, compared with the passing away of a generation by death.

In order that the full power of increase should be called into action, all these circumstances must be favourable. The marriages must be prolific, owing to their being contracted early; the proportion of the born living to marry must be great, owing both to the tendency to marriage, and the great proportion of births rising to the age of puberty; and the interval between the average age of marriage and the average age of death must be considerable, owing to the great healthiness of the country, and the expectation of life being high. Probably these three causes, each operating with the greatest known force, have never yet been found combined. Even in the United States, though the two first causes operate very powerfully, the expectation of life, and consequently the distance between the age of marriage and the average age of death, is not so favourable as it might be. In general, however, the excess of births which each country can admit being very far short of the full power of increase, the causes above mentioned contribute to the required supply in very various proportions, according to the different circumstances and habits of each state.

Inferences drawn from registers.

It would be very desirable to know something of these proportions, with a view to their influence on the happiness of society. Our main sources of information on this subject are registers of births, deaths, and marriages; but in order to draw just inferences from them, we must consider well what they imply. The following observations and rules, modified from Mr Malthus's chapter on the fruitfulness of marriages, may be useful for this purpose.

Proportion of births to a marriage.

If we suppose a country where the population is stationary, where there are no emigrations, immigrations, or illegitimate children, and where the registers are accurate, then the proportion of the annual births to the annual marriages will accurately express both the number of children born to each marriage, including second and third marriages, and also the proportion of the born which lives to marry once or oftener, while the annual mortality will accurately express the expectation of life.

But if the population be either increasing or decreasing, and the births, deaths, and marriages increasing or decreasing in the same ratio, such a movement will necessarily disturb all the proportions, because the events which are contemporary in the registers are not contemporary in the order of nature.

In the first place, the births of any year cannot, in the order of nature, have come from the contemporary marriages, but must have been derived principally from the marriages of preceding years.

If we were to cut off a period of thirty years in the registers of any country some time ago, and inquire what was the number of births which had been produced by all the marriages included in the period cut off, it is evident, that with the marriages at the beginning of the period will be arranged a number of births proceeding from marriages anterior to it; and at the end a number of births produced by the marriages included in the period will be found arranged with the marriages of a succeeding period. Now, if we could subtract the former number, and add the latter, we should obtain exactly all the births produced by the marriages of the period, and thus ascertain the real prolificness of marriages. If the population had been stationary, the number of births to be added would exactly equal the number to be subtracted, and the proportion of births to marriages, as found in the registers, would exactly represent the real prolificness of marriages. But if the population be increasing, the number to be added would be greater than the number to be subtracted, and of course the proportion of births to marriages, as found in the registers, would always be too small to represent the true prolificness of marriages. A contrary effect would take place in a decreasing population. The question therefore is, what we are to add, and what to subtract, when the births and deaths are not equal.

The average proportion of births to marriages in Europe, as taken from registers, is about four to one. Let us suppose, for the sake of illustration, that each marriage yields four children, one every other year. In this case, wherever the period in the registers is begun, the marriages of the preceding eight years will only have produced half their births, and the other half will be arranged with the marriages within the period, and ought to be subtracted from them. In the same manner the marriages of the last eight years of the period will only have produced half their births, and the other half ought to be added. But half the births of any eight years may be considered as nearly equal to all the births of the succeeding three years and three quarters. In instances of the most rapid increase it will rather exceed the births of the next three years and a half, and in cases of slow increase approach towards the births of the next four years. The mean, therefore, may be taken at three years and three quarters. Consequently, if we subtract the births of the first three years and three quarters, and add the births of the three years and three quarters subsequent to the period, we shall have a number of births nearly equal to the number of births produced by all the marriages included in the period, and, of course, the prolificness of marriages. But if the population of a country be increasing regularly, and the births, deaths, and marriages continue always to bear the same proportion to each other and to the whole population, it is evident that all the births of any period will bear the same proportion to all the births of any other period of the same extent taken a certain number of years later, as the births of any single year to the births of a single year taken the same number of years later. And, consequently, to estimate the prolificness of marriages, we have only to compare the marriages of the present, or any other year, or the mean of five years, with the births of a subsequent year, or the mean of five years taken three years and three quarters later.

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[1] We allude to the registers and tables referred to by Dr Price. Since his time the health of the country has increased, like that of most of the countries in Europe, and the proportions of both the births and deaths have decidedly diminished.

It has been supposed, in the present instance, that each marriage yields four births; but the proportion of births to marriages apparent in the registers of most of the countries of Europe is four to one, and as the population of most of the countries of Europe is known to be increasing, the prolificness of marriages must be greater than four. If, allowing for this circumstance, we take the distance of four years instead of three years and three quarters, we shall still be sure of not erring in excess. And though undoubtedly the period which we take, whatever it may be, will not answer exactly in different countries, yet its application generally will not be so incorrect as we might at first imagine, because, in countries where the marriages are more prolific, the births generally follow at shorter intervals, and where they are less prolific, at longer intervals; and, with different degrees of prolificness, the length of the period might still remain the same.

Probably, however, the period here assumed, which is the one taken by Mr Malthus, is too short. If, as he says, there is reason to think, that, in almost all registers, the omissions in the births and deaths are greater than in the marriages, there ought to be a greater number of births to each marriage, in which case it would take a longer time to have them in; and if, further, it is probable that a birth every other year is too rapid a succession for those countries where the marriages are frequently late, it may be thought that the births at the distance of five years will more nearly represent the prolificness of marriages than at the distance of four years. But this matter must be left to the judgment of the reader.

At all events, it will follow, from what has been said, that the more rapid is the increase of population, the more will the real prolificness of marriages exceed the proportion of births to marriages in the registers.

The rule which has here been laid down attempts to estimate the prolificness of marriages, taken as they occur; but this prolificness should be carefully distinguished from the prolificness of first marriages, and of married women, and still more from the natural prolificness of women in general, taken at the most favourable age. It is probable that the natural prolificness of women is nearly the same in most parts of the world; but the prolificness of marriages is liable to be affected by a variety of circumstances peculiar to each country, and particularly by the number of second, and third, and late marriages. In all countries the second and third marriages alone form a most important consideration, and materially influence the average proportions. According to Sussmilch, in all Pomerania, from 1748 to 1756 both included, the number of persons who married were 56,956, and of these 10,586 were widows and widowers.[1] According to Busching, in Prussia and Silesia, for the year 1781, out of 29,308 persons who married, 4841 were widows and widowers;[2] and, consequently, the proportion of marriages will be given fully one sixth too much. In estimating the prolificness of married women, the number of illegitimate births would tend, though in a slight degree, to counterbalance the overplus of marriages; and as it is found that the number of widowers who marry again is greater than the number of widows, the whole of the correction should not, on this account, be applied; but in estimating the proportion of the born which lives to marry, which is what we are now about to proceed to, the whole of this correction is always necessary.

Proportion of the born which lives to marry.

To find the proportion of the born which lives to marry, from registers, we must consider that the marriages of any year can never be contemporary with the births from which they have resulted, but must always be at such a distance from them as is equal to the average age of marriage.

If the population be increasing, the marriages of the present year have resulted from a smaller number of births than the births of the present year; and, of course, the marriages, compared with the contemporary births, will always be too few to represent the proportion of the born which lives to marry, and the contrary will take place if the population be decreasing; and to find this proportion, after having first made the proper correction for second and third marriages, we must compare the marriages of any year with the births of a previous year at the distance of the average age of marriage.[3]

Expectation of life.

The third principal object which it is desirable to attain, and of which some estimate may be formed from registers, is the expectation of life. It has before been stated, that, in a country where the births and deaths are equal, the rate of the annual mortality will express the expectation of life, or the average age of death. But if the population be increasing, the actual population of any one year will be greater than would belong to the contemporary deaths, supposing the births equal to the deaths, and less than would belong to the contemporary births, supposing the deaths equal to the births. Consequently, if we divide the actual population by the number of contemporary deaths in an increasing country, the result will be too high to express the average age of death belonging to any given number of births. If we divide the actual population by the number of births, the result will be too low to express this average, or, in other words, to express the expectation of life. And, in order to approximate to the true proportion, we are directed by Dr Price (vol. ii. p. 39, seventh edition), in the absence of better data, to divide the actual population by a mean between the proportions of deaths and births. Consequently, when we know the proportion of births to deaths in any country, and the proportions which they usually bear to the whole population, we may form some estimate of the expectation of life, or the average age of death.

If we attend to these observations in drawing our inferences from registers, we shall generally be able to form an approximating estimate of the prolificness of marriages, the proportion of the born living to marry, and the expectation of life, in different countries and places, and under different circumstances; or if we cannot do this satisfactorily, owing to the varying rate of increase, and the inaccuracy of the registers, we shall at least guard ourselves against drawing incorrect inferences from them in their present state, and reconcile many of the difficulties with which they appear to be accompanied.

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[1] *Gottliche Ordnung*, vol. i. tables, p. 98.

[2] Malthus, vol. ii. p. 140.

[3] It is a shorter and more obvious process to compare the marriages at once with the births of the earlier period, than with the deaths, as Mr Malthus has done.

Prolificness of marriages in England.

Thus, to estimate the prolificness of marriages in England, the proportion of the marriages to the births, according to the parochial returns ending with 1820, was 100 to 369; adding one sixth for the omissions in the births, or on the present occasion only one seventh, in order to make full allowance for illegitimate births, the proportion of marriages to births will be as 100 to 422. These births, at the rate at which the population was increasing in England and Wales from 1810 to 1820, would, in about four years and a half, increase ·07, which, added to 4·22, makes 4·51. Consequently, the prolificness of marriages, taken as they occur, and including second and third marriages, would be 4·51. If we wish to estimate the prolificness of married women, we must subtract from the marriages those which consist of widows who have married again. According to some tables of Sussmilch, this would be little less than one sixth, according to others one eighth. If we take one seventh, and deduct it from the marriages, the proportion will be 1 to 5·26, that is, each married woman will have 5·26 births. But of these married women, some have married at above forty-five years of age, and many more above thirty-five, so that there can be little doubt that, if the births could be collected from all the marriages in which the age of the woman did not exceed thirty-five, nor the age of the man forty-five, the births would appear to be nearly six; and this number would be still further increased if the average age of marriage for males was twenty-two, and for females twenty. These conclusions are fully confirmed by some accurate observations of M. Muret. At Vevay, where the proportion of marriages to births, in the registers, was as ten to thirty-nine, he found that 375 mothers had had 2093 children born alive, by which it appears that each mother had produced 5·55 births. But these, M. Muret observes, were all mothers, which is not the case of all married women. Allowing, however, for the usual proportion of barren wives at Vevay, which was about twenty out of 478, it appears that the married women, one with another, must have had above 5·3 births. Yet this was in a town where he intimates that the inhabitants do not enter into the marriage state at the time when nature calls them, nor, when married, always have as many children as they might have. It is evident, therefore, that the proportions of marriages to births, to be found in registers, require considerable and important corrections, in order to deduce from them just estimates of the prolificness of marriages, the prolificness of married women, and the prolificness of women marrying at the most favourable age. The instance here given is sufficient to illustrate the mode in which the rule should be applied.

Proportion of the born living to marry in England.

If we wish to apply the rule for estimating the proportion of the born living to marry in England, we must first take the proportion of marriages to births in the registers. This proportion, as before stated, was, during the ten years ending with 1820, as 100 to 369; which, increased by one sixth, the supposed omissions in the registers of births will be as 100 to 430. But the marriages of the present year must have resulted, not from the births of the present year, but from the births at such an earlier period in the registers as is equal to the average age of marriage. Suppose this age to be twenty-eight, then, at the rate at which the population was increasing, the present marriages must have resulted from a number of births equal to about two thirds of the present number, so as to be to the present marriages in the proportion of 286 instead of 430 to 100. But of the 200 persons forming the 100 marriages, more than one sixth have been married before. Deducting, therefore, one sixth from the marriages, the proportion of the marriages to the births from which they have resulted will be as 100 to 343; or, out of 343 births, 200 have lived to be married once or oftener; from which it would appear, that on account of the late increase in the healthiness of the country, a greater proportion had lived to marry than when Mr Malthus last estimated it; which, together with a slight increase in the prolificness of marriages apparent in the latter registers, may account for the more rapid increase of the population from 1810 to 1820. It should be recollected, however, that as the rate of increase which prevailed from 1810 to 1820 had by no means prevailed during the whole twenty-eight years, the births, from which 200 person had lived to marry in 1820, were decidedly more than 343.

It will be observed how very important the correction for second and third marriages is. Supposing each marriage to yield four births, and the births and deaths to be equal, it might at first be thought necessary, that in order to keep up the population, half of the born should live to marry; but if, on account of the second and third marriages, we subtract one sixth from the marriages, and then compare them with the births, the proportion will be as five to twenty-four; and it will appear, that instead of one half, it will only be necessary, that out of twenty-four births, ten should live to marry. Upon the same principle, if the births were to the marriages as four to one, and exactly half of the born lived to marry, it might be supposed at first that the population would be stationary; but if we subtract one sixth from the marriages, and then compare them with the births, it will be obvious that, on the supposition of half the born living to marry, the births at the earlier period in the registers, at the distance of the age of marriage, must be to the present births as five to six, which would imply a moderate rate of increase.

To estimate the proportion of male births living to marry, we must subtract full one fifth from the marriages; and, according to this correction, if each marriage yielded four births, it would only be necessary that two male children out of five should live to marry, in order to keep up the population. It is necessary, also, in estimating the proportion of male births living to marry, to make allowance for the greater number of males born.

The foregoing illustrations and remarks show the error of supposing that a country must be in a precarious state when the proportion of births to marriages in the registers is less than four to one. If, indeed, this observation were just, the population of many countries in Europe would be in a precarious state, as in many countries the proportion is less than this. But it has been shown in what manner this proportion in the registers should be corrected, in order to make it a just representation of the prolificness of marriages; and if a large part of the born live to marry, and the age of marriage be considerably earlier than the expectation of life, such a proportion in the registers is by no means inconsistent with a rapid increase of population.

In Russia, the proportion of births to marriages is less than four to one; yet, on account of the large proportion of the born living to marry, the early age of marriage, and the high expectation of life, it is one of the countries in Europe which increases the fastest. In England, the population increases much more rapidly than in France; yet in England the proportion of births to marriages in the registers, when allowance has been made for omissions, was, from 1800 to 1810, four to one, while in France it was four and four fifths to one. (Malthus, vol. ii. p. 161. 5th edit.)

In England, indeed, for the ten years from 1810 to 1821, the proportion of births to marriages seems slightly to have exceeded the former proportion, being about 4·22 to 1; but this excess has been accompanied by such a rapidity of increase as would double the population in less than forty-six years; and comparing this rapid rate of increase with the slow increase of France, where the births were to the marriages as four and four fifths to one, and in Sweden, where these proportions were as four and one fourth to one, it follows that the two other causes of the excess of births above the deaths, besides the prolificness of marriages, must have very great power, and that the proportion of births to marriages, as found in registers, when taken alone, is a most uncertain criterion of increase.

Expectation of life in England.

To apply the rule for estimating the average age of death, or the expectation of life, in England, we must first ascertain from the registers the proportions which the births and deaths bear to the whole population. The annual average of the births for the ten years from 1810 to 1821 was 325,506, of the deaths 200,999. Adding one sixth to the births, and one twelfth to the deaths, for the omission in the registers, the births will be 379,757, and the deaths 217,749. The population of England and Wales, according to the census taken in 1810, was 10,502,500, in 1821, 12,218,500,[1] the mean of which is 11,360,500. The average births and deaths, compared with the mean population, give $\frac{1}{29\cdot9}$ as the proportion of the births, and $\frac{1}{52\cdot17}$ as the proportion of the deaths; and, according to Dr Price, the mean between them, which in this case is forty-one, will give the expectation of life. This rule, however, is only a rough approximation, and, in the few cases where sufficient data have been obtained in progressive countries for calculating the expectation of life more accurately, it has turned out to be much nearer to the annual mortality than to the mean here referred to; while, according to the more correct estimates before adverted to, the annual mortality might, with the same expectation of life, be in different countries 1 in 39·38, 1 in 41·97, or 1 in 41·09, according as the population was stationary, or progressive at various rates.

This appears in the table which Dr Price himself calculated for Sweden (vol. ii. p. 410, 7th edit.), founded on data which he considered as quite satisfactory. It also appears in the table for Sweden and Finland, subsequently calculated by Mr Milne from similar data, in his Treatise on Annuities and Assurances, vol. ii. p. 569; and, further, in a table for Sweden and Finland, published in this work, under the head Mortality. We have also seen a calculation by Mr Milne, by which it appears that the difference between the annual mortality and the expectation of life goes on increasing with the rate of the increase of the population to a certain point, but afterwards, owing to the increasing proportion of young children included in the population, diminishes; and is less when the population doubles in twenty-five years, than when it doubles in fifty years. Thus, on the three different suppositions of a stationary population, a population doubling in fifty years, and a population doubling in twenty-five years (all subjected to the same law of mortality as that which prevailed in Sweden and Finland during the five years ended with 1805), in the first case, both the expectation of life and the annual mortality would be 39·388, and, of course, the expectation of life would be the same in all the cases; but in the second case, the annual mortality would be 1 in 41·971; and, in the third, 1 in 41·096. It would be difficult, however, or at least premature, without further data, to lay down a general rule, with a view to determine correctly the expectation of life at birth, in countries progressive at various rates. But, from what has been stated, it may safely be concluded, that the expectation of life lies very much nearer the annual mortality, particularly in cases of very rapid increase, than to the mean proposed by Dr Price; and that both the expectation of life, and the age to which half of the born live, are, in most countries, and especially in England, at the present time, considerably higher than they have generally been estimated.

It may be remarked here, in reference to England during the ten years from 1810 to 1821, that the omissions assumed in the births and deaths do not give such proportions as to make the increase of population, from the excess of births above the deaths, answer to the increase determined by the two censuses; an agreement which must necessarily take place if both the enumerations and the registers are accurate, and no external causes disturb the result. An addition of one sixth to the births, and one twelfth to the deaths, seemed to answer correctly for the interval from 1800 to 1810; but to produce the same coincidence under the more rapid increase of the subsequent ten years, either a greater allowance must be made for omissions in the births, or a less allowance for the omissions in the deaths. If we add one fifth instead of one sixth to the births, retaining one twelfth for the deaths, the excess of births above deaths in the ten years will be 1,728,587, the excess according to the censuses being 1,716,000; if we add only one thirtieth to the deaths, retaining one sixth for the births, the excess will be 1,720,502, within 4502 of the excess, as shown by the censuses; whereas, under the actual allowances which have been made for omissions, the excess will be only 1,620,800, leaving a difference of 95,200, and on the wrong side. On account of the almost incredible healthiness, considering our great towns and manufactories, which would be implied by supposing the deaths to be only deficient one thirtieth, an increased omission in the births might be thought more probable; but it is believed, that since 1812 the omissions in the births have been diminished rather than increased; and under this uncertainty it has been thought better to leave the question as it stands at present, rather than attempt to determine it on insufficient data. It should always be remembered, however, that if the increase of population by the enumerations is different from the increase of population by the registers, one or the other must be incorrect.

Expectation of life at birth, and annual mortality, not the same when the population is progressive.

On the supposition that the omissions in the deaths were only one thirtieth, the average mortality, compared with the average population, would be 1 in 54·7; and the proportion of births, with the addition of one sixth, being, as before stated, 1 in 29·9, the expectation of life, according to Dr Price's rule, would be 42·3. On the other supposition, of an omission of one fifth of the births and one twelfth of the deaths, the births would be 1 in 29, and the deaths 1 in 52·17, and the expectation of life would be 40·58.

It appears, then, that when the population of a country is progressive, it would be erroneous to estimate its healthiness by the proportion which the annual mortality bears to the whole population. Healthiness must be measured by the expectation of life; and if, with the same expectation of life, the annual mortality is affected by the rate of increase, it is obvious that the healthiness of different countries may be different, with the same rate of annual mortality.

Mortuary registers fallacious.

But whilst it is evidently necessary that we should be cautious in inferring that a country is healthy just in proportion to the smallness of its annual mortality, we should be still more cautious in inferring that it is unhealthy at all the ages under puberty, on account of the number which appear to die in mortuary registers under that age. Here, as in the preceding case, but in a much greater degree, the excess of the births above the deaths has a powerful effect, but exactly in the opposite direction. When we compare the annual mortality of an increasing country with its actual population, we compare with it a number of deaths which may be said, properly speaking, to belong to an earlier and smaller number of births, and must necessarily represent the country as more healthy than it really is. On the other hand, when, in a mortuary register, we compare the deaths under puberty with those above, if the population be increasing, we evidently compare the deaths belonging to a much greater number of births than those which have furnished the deaths above the age of puberty; and, consequently, these proportions must represent the country as much less healthy than it really is.[1] According to the mortuary registers of Sweden for twenty-one years from 1755 to 1776, more than half of the deaths were under fifteen, but it was by no means true that half of the born died under fifteen.[2] In the tables of mortality for Sweden during the same period, constructed by Dr Price, it appears that half of the born lived to above thirty-three years.[3]

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[1] Preliminary Observations to Population Abstracts, p. 32.

In the same manner, in drawing inferences from an abstract of the mortuary registers of the principal cities in America, Baltimore, Boston, New York, and Philadelphia, given by Dr Seybert,[4] we must take care not to conclude that the proportions of the deaths which take place under twenty years of age represent the proportions of any given number of births in these cities which die under twenty. As, on account of the excess of the births above the deaths, all the early ages of the population are more numerous in proportion than the other, there will necessarily be a greater proportion of the deaths at these ages than would naturally belong to a given number of births, if each infant born were traced to the age of its death.

In the present case, the abstract is only for a year, and no safe conclusions therefore can be drawn from it; but, so far as it goes, as even, notwithstanding the increase of population, these mortuary registers show that considerably less than half of the deaths take place under twenty (on an average only about 45½ per cent.), it would appear, that in the early ages of life, even the towns of America are more healthy than the whole of Sweden from 1755 to 1776. It should, however, be considered, that though the towns in America may be increasing fast by procreation, they are increasing still faster by the influx of inhabitants from the country; and as these inhabitants generally come to the towns after the age of sixteen, this accession diminishes the proportion of persons in the earlier ages of life so much, that there is probably a larger proportion of mortality at these ages in the country than in the towns.

Criterion of the prevalence of prudential restraint.

One of the most interesting and useful points of view in which registers can be considered, is in the proofs which they afford of the varying prevalence of the prudential check to marriage and population in different countries and places. It has been not an uncommon opinion, and has even been strongly expressed of late years, although the subject has been much better understood than formerly, that the labouring classes of people, under the circumstances in which they are placed, cannot reasonably be expected to attend to prudential considerations in entering upon the marriage state. But that this opinion does them great injustice, is not only obvious to common observation, by which we can scarcely fail to see that numbers delay marriage beyond the period when the passions most strongly prompt to it, but is proved by the registers of different countries, which clearly show, either that a considerable number of persons of a marriageable age never marry, or that they marry comparatively late, and that their marriages are consequently less prolific than if they had married earlier. As the prudential restraint on marriage may show itself in either of these ways, it may prevail nearly in the same degree with a different proportion of the whole population. But on the supposition of the same natural prolificness in the women of most countries, the smallness of the proportion of births will generally indicate, with tolerable correctness, the degree in which the prudential check to population prevails, whether arising principally from late, and consequently unprolific marriages, or from a large proportion of the population dying unmarried.

Referring, then, to the different proportions of births in different countries as the best criterion of the different degrees in which the prudential restraint on marriage operates, it will be recollected that these proportions vary from about one in thirty-six to about one in nineteen or even seventeen, in different countries, and in a much greater degree in different parishes or districts.

A particular parish in the Alps has already been mentioned, where the births were only a forty-ninth part of the population; and it appears by the late returns of the parish registers of England and Wales, that the births in the county of Monmouth are only one in forty-seven, and in Brecon one in fifty-three;[5] which, after making ample allowance for omissions, would show the prevalence of the prudential restraint on marriage in a high degree.

Effect of the absence of prudential restraint.

If in any country all were to marry at twenty or twenty-one, the proportion of the births would probably be more than one in nineteen; and this result would be still more certain if the resources of the country could not support an accelerated rate of increase, than if the means of subsistence were in the greatest abundance, and the demand for labour as effectual as it has ever been in the United States. Of the latter supposition, taking the births at one nineteenth, and the expectation of life the same as it is in England, the effect would be to occasion a most rapid increase of population; and the period of doubling, instead of being about forty-six or forty-eight years, would be less than in America. On the other hand, if the resources of the country could not support a more rapid increase than that which has taken place in England and Wales during the ten years previous to the census of 1821, the effect would be a great diminution in the expectation of life. If the births were one in nineteen instead of one in nearly thirty, the same rate of increase would take place as at present if the annual mortality were increased to about one in twenty-six and a half; and in that case the expectation of life would be reduced in the proportion of from forty-one, or, as is more probable, from above forty-five, to less than twenty-six.[6] This is the kind of effect which must inevitably follow the absence of the prudential check to marriage and population; and it cannot be doubted, that a considerable part of the premature mortality which is found to take place in all parts of the world is occasioned by it. The laws of nature, in application to man as a reasonable being, show no tendency to destroy half of the human race under the age of puberty. This is only done in very particular situations, or when the constant admonitions which these laws give to mankind are obstinately neglected.

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[1] In the first case, the effect is, in a considerable degree, counteracted by the large proportion of children under four years old, which a rapid increase occasions. In the second case, the effect has no such drawback.

[2] Price's Observations, vol. ii. p. 405, 7th edit.

[3] *Ibid.* table xlv. vol. ii. p. 413.

[4] Statistical Annals, p. 48.

[5] Preliminary Observations, p. 27.

[6] If, as it has appeared, the expectation of life, though by no means the same, does not differ very much from the annual mortality, and the annual mortality in this country during the ten years from 1810 to 1820, after every abatement, appears to be not more than one in fifty-one, the expectation of life cannot be less than forty-five, and is probably greater.

Objection to the principle of population arising from the mortality it must occasion.

It has been said that a tendency in mankind to increase at such a rate as would double the population in twenty-five years, and, if it had full scope, would fill the habitable globe with people in a comparatively short period, cannot be the law of nature, as the very different rate of increase which is actually found to take place must imply such an excessive degree of mortality and destruction of life as to be quite irreconcileable with actual facts and appearances. But the peculiar advantage of a law of increase in a geometrical progression is, that though its power be absolutely immense if it be left unchecked, yet, when this becomes impossible, it may be restrained by a comparatively moderate force. It can never of course happen that any considerable part of that prodigious increase which might be produced by an uninterrupted geometrical progression, should exist, and then be destroyed. The laws of nature, which make food necessary to the life of man, as well as of plants and animals, prevent the continued existence of an excess which cannot be supported, and thus either discourage the production of such an excess, or destroy it in the bud, in such a way as to make it scarcely perceptible to a careless observer. It has been seen, that in some countries of Europe where the actual progress of the population is slower than in many others, as in Switzerland and Norway, for instance, the mortality is considerably less. Here, then, the necessity of a greater check to the natural progress of population produces no increase of mortality. And it appears farther, that even the degree of mortality which in each year would be sufficient to destroy that excess of births which would naturally be produced if all married young, and all could be supported, might take place, and often does take place in particular situations, and yet is very little noticed. About the middle of last century, the mortality in Stockholm and London was about one in nineteen and one in twenty. This is a degree of mortality which would probably keep the births on a level with the deaths, even though all married at twenty. And yet numbers resorted both to Stockholm and London from choice, the greater part probably not aware that, by so doing, they would shorten their own lives and those of their children; and the rest thinking that the difference was not worth attending to, or was at least balanced by the advantages of society and employment which the town presented. There is nothing, therefore, in the actual state of the mortality observed to take place in different countries and situations, which, in the slightest degree, contradicts the supposition of a natural tendency to increase quite as great as that which has been stated.

Objection that mere tendencies are not to be considered.

It has been further remarked, that as, in point of fact, it very rarely happens that mankind continue to increase in a geometrical progression of any kind, and only in a single instance in such a one as to double the population in twenty-five years, it is useless and absurd to lay any stress upon tendencies which never for any length of time together produce their natural effects. But it might really as well be said, that we are not to estimate the natural rate of increase in wheat or sheep, as it is quite certain that their natural tendency to increase has never practically continued to develope itself for so long a time together as that of mankind. Both as a physical and even economical question, it is curious and desirable to know the natural law of increase which prevails among the most important plants and animals. In the same view, it must be still more interesting to know the natural law of increase with respect to man. It may be said, indeed, with truth, that the actual appearances all around us,—the varying rate of increase in different countries, its very slow progress or stationary state in some, and its very rapid progress in others,—must be a mass of anomalies, and quite contrary to the analogies of all the rest of animated nature; if the natural tendency of mankind to increase be not at the least as great as that which is developed under the most favourable circumstances, while in all others it is kept down by the varying difficulties which the state of the soil and other obstacles oppose to it. But the question, as it applies to man, assumes at once a tenfold importance, in reference to the moral and political effects which must result from those checks to increase, the existence and operation of which, in some form or other, no human exertions can by possibility prevent. A field is here opened for the most interesting inquiries which can engage the friends of human happiness.

But, as a preliminary to these inquiries, it is obvious that we must know the degree of force to be overcome, and the varying character of the checks which, in the different countries of the world, are practically found to overcome it; and, for this purpose, the first step must be an endeavour to ascertain the natural law of population, or the rate at which mankind would increase under the fewest known obstacles. Nor can this tendency to increase ever safely be lost sight of in the subsequent inquiries, which have for their object the improvement of the moral condition of man in society.

Right of the poor to full support considered.

The existence of a tendency in mankind to increase, if unchecked, beyond the possibility of an adequate supply of food in a limited territory, must at once determine the question as to the natural right of the poor to full support in a state of society where the law of property is recognised. The question, therefore, resolves itself chiefly into a question relating to the necessity of those laws which establish and protect private property. It has been usual to consider the right of the strongest as the law of nature among mankind as well as among brutes; yet, in so doing, we at once give up the peculiar and distinctive superiority of man as a reasonable being, and class him with the beasts of the field. In the same language, it may be said that the cultivation of the earth is not natural to man. It certainly is not to man, considered merely as an animal without reason. But to a reasonable being, able to look forward to consequences, the laws of nature dictate the cultivation of the earth, both as the means of affording better support to the individual, and of increasing the supplies required for increasing numbers; the dictates of those laws of nature being thus evidently calculated to promote the general good, and increase the mass of human happiness. It is precisely in the same way, and in order to attain the same object, that the laws of nature dictate to man the establishment of property and the absolute necessity of some power in the society capable of protecting it. So strongly have the laws of nature spoken this language to mankind, and so fully has the force of it been felt, that nothing seems to be thought so absolutely intolerable to reasonable beings as the prevalence in the same society of the right of the strongest; and the history of all ages shows, that if men see no other way of putting an end to it, than by establishing arbitrary power in an individual, there is scarcely any degree of tyranny, oppression, and cruelty, which they will not submit to from some single person and his satellites, rather than be at the mercy of the first stronger man who may wish to possess himself of the fruit of their labour. The consequence of this universal and deeply-seated feeling, inevitably produced by the laws of nature, as applied to reasonable beings, is, that the almost certain consequence of anarchy is despotism.

Allowing, then, distinctly, that the right of property is the creature of positive law, yet this law is so early and so imperiously forced on the attention of mankind, that if it cannot be called a natural law, it must be considered as the most natural as well as the most necessary of all positive laws; and the foundation of this pre-eminence is its obvious tendency to promote the general good, and the obvious tendency of the absence of it to degrade mankind to the rank of brutes.

As property is the result of positive law, and the ground on which the law which establishes it rests is the promotion of the public good and the increase of human happiness, it follows, that it may be modified by the same authority by which it was enacted, with a view to the more complete attainment of the objects which it has in view. It may be said, indeed, that every tax for the use of the government, and every country or parish rate, is a modification of this kind. But there is no modification of the law of property having still for its object the increase of human happiness, which must not be defeated by the concession of a right of full support to all that might be born. It may be safely said, therefore, that the concession of such a right, and a right of property, are absolutely incompatible, and cannot exist together.

To what extent assistance may be given even by law to the poorer classes of society when in distress, without defeating the great object of the law of property, is essentially a different question. It depends mainly upon the feelings and habits of the labouring classes of society, and can only be determined by experience. If it be generally considered as so discreditable to receive parochial relief, that great exertions are made to avoid it, and few or none marry with a certain prospect of being obliged to have recourse to it, there is no doubt that those who were really in distress might be adequately assisted, with little danger of a constantly increasing proportion of paupers; and in that case a great good would be attained, without any proportionate evil to counterbalance it. But if, from the numbers of the dependent poor, the discredit of receiving relief is so diminished as to be practically disregarded, so that many marry with the almost certain prospect of becoming paupers, and the proportion of their numbers to the whole population is in consequence continually increasing, it is certain that the partial good attained must be much more than counterbalanced by the general deterioration in the condition of the great mass of the society, and the prospect of its daily growing worse; so that, though, from the inadequate relief which is in many cases granted, the manner in which it is conceded, and other counteracting causes, the operation of poor-laws such as they exist in England might be very different from the effects of a full concession of the right, and a complete fulfilment of the duties resulting from it, yet such a state of things ought to give the most serious alarm to every friend to the happiness of society, and every effort consistent with justice and humanity ought to be made to remedy it. But whatever steps may be taken on this subject, it will be allowed, that with any prospect of legislating for the poor with success, it is necessary to be fully aware of the natural tendency of the labouring classes of society to increase beyond the demand for their labour, or the means of their adequate support, and of the effect of this tendency to throw the greatest difficulties in the way of permanently improving their condition.

It would lead far beyond the limits which must be prescribed to this article, to notice all the various objections which have been made by different writers to the principles which have been here explained. Those which contain in them the slightest degree of plausibility have been answered by Mr Malthus in various parts of the late editions of his work, and particularly in the appendix to the fifth edition, to which we refer the reader. We will only, therefore, further notice the objection which has been made by some persons on religious grounds; for, as it is certainly of great importance that the answer which has been given to it should be kept in mind, we cannot refuse a place to a condensed statement of it at the end of this article.

Religious objection considered

It has been thought that a tendency in mankind to increase beyond the greatest possible increase of food which could be produced in a limited space, impeaches the goodness of the Deity, and is inconsistent with the letter and spirit of the Scriptures. If this objection were well founded, it would certainly be the most serious one which has been brought forward; but the answer to it appears to be quite satisfactory, and it may be compressed into a very small compass.

First, It appears that the evils arising from the principle of population are exactly of the same kind as the evils arising from the excessive or irregular gratification of the human passions in general, and may equally be avoided by moral restraint. Consequently, there can be no more reason to conclude, from the existence of these evils, that the principle of increase is too strong, than to conclude, from the existence of the vices arising from the human passions, that these passions are all too strong, and require diminution or extinction, instead of regulation and direction.

Secondly, It is almost universally acknowledged, that both the letter and spirit of revelation represent this world as a state of moral discipline and probation. But a state of moral discipline and probation cannot be a state of unmixed happiness, as it necessarily implies difficulties to be overcome, and temptations to be resisted. Now, in the whole range of the laws of nature, not one can be pointed out which so especially accords with this scriptural view of the state of man on earth; as it gives rise to a greater variety of situations and exertions than any other, and marks, in a more general and stronger manner, and nationally as well as individually, the different effects of virtue and vice, of the proper government of the passions, and the culpable indulgence of them. It follows, then, that the principle of population, instead of being inconsistent with Revelation, must be considered as affording strong additional proofs of its truth.

Lastly, It will be acknowledged, that in a state of probation, those laws seem best to accord with the views of a benevolent Creator, which, while they furnish the difficulties and temptations which form the essence of such a state, are of such a nature as to reward those who overcome them with happiness in this life as well as in the next. But the law of population answers particularly to this description. Each individual has the power of avoiding the evil consequences to himself and society resulting from it, by the practice of a virtue dictated to him by the light of nature, and sanctioned by revealed religion. And as there can be no question that this virtue tends greatly to improve the condition and increase the comforts both of the individuals who practise it, and through them of the whole society, the ways of God to man with regard to this great law are completely vindicated.

Subjoined are two tables, which may assist the reader in calculating the rate of increase in different countries, under different circumstances, and from different data. The first is the table calculated by Euler, and printed in Mr Malthus's work, at the end of his chapter on the Fruitfulness of Marriage; and the second has been calculated by Mr Bridge of Cambridge, well known as an able mathematician, and most useful elementary writer.

The first is to be used when it is wished to estimate the rate of increase by the proportions of the births to the deaths, and of these to the whole population. The yearly increase of people, independently of immigration, is the yearly excess of the births above the deaths; and the yearly rate of increase is measured by the proportion which this excess bears to the whole population. The fraction expressing the deaths must therefore be subtracted from the fraction expressing the births, and the remainder will be the fraction expressing the yearly rate of increase; opposite to which will be found the number of years in which the population will double itself, supposing the yearly rate of increase to continue the same for a sufficient length of time.

The second table is to be used when it is wished to know the period of doubling, resulting from a given per centage increase in ten years, determined by enumeration. An estimate of population from births and deaths is always liable to much uncertainty, on account of the varying proportions which they bear to the population. The only remedy for this uncertainty is a census; and as the useful custom of taking a census of the population every ten years has latterly prevailed in some countries, the second table is constructed to show the period of doubling, or general rate of increase, which results from any given per centage increase in ten years. The first column represents the per centage increase in ten years determined by two enumerations; and the second column the number of years in which the population will double itself, supposing it to proceed at the same rate.

TABLE I.

The Proportion of the Excess of Births above the Deaths to the whole of the Living.	Periods of Doubling in Years and Ten Thousandth Parts.	The Proportion of the Excess of Births above the Deaths to the whole of the Living.	Periods of Doubling in Years and Ten Thousandth Parts.
10	7·2722	110	76·5923
11	7·9659	120	83·5230
12	8·6595	130	90·4554
13	9·3530	140	97·3868
14	10·0465	1 : 150	104·3183
1 : 15	10·7400	160	111·2598
16	11·4333	170	118·1813
17	12·1266	180	125·1128
18	12·8200	190	132·0443
19	13·5133	200	138·9757
20	14·2066		
21	14·9000	210	145·9072
22	15·5932	220	152·8387
23	16·2864	230	159·7702
24	16·9797	240	166·7017
1 : 25	17·6729	1 : 250	173·6332
26	18·3662	260	180·5647
27	19·0594	270	187·4961
28	19·7527	280	194·4275
29	20·4458	290	201·3590
30	21·1391	300	208·2905
32	22·5255	310	215·2220
34	23·9119	320	222·1535
36	25·2983	330	229·0850
38	26·6847	340	236·0164
1 : 40	28·0711	1 : 350	242·9479
42	29·4574	360	249·8794
44	30·8438	370	256·8109
46	32·2302	380	263·7425
48	33·6161	390	270·6740
50	35·0029	400	277·6055
55	38·4687	410	284·5370
60	41·9345	420	291·4685
65	45·4003	430	298·4000
70	48·8661	440	305·3314
1 : 75	52·3318	1 : 450	312·2629
80	55·7977	460	319·1943
85	59·2634	470	326·1258
90	62·7292	480	333·0573
95	66·1950	490	339·9888
100	69·6607	500	346·9202
		1: 1000	693·49

TABLE II.

Per Centage Increase in Ten Years.	Period of Doubling.	Per Centage Increase in Ten Years.	Period of Doubling.
	Years.		Years.
1·	696·60	23·5	32·83
1·5	465·55	24·	32·22
2·	350·02	24·5	31·63
2·5	280·70	25·	31·06
3·	234·49	25·5	30·51
3·5	201·48	26·	29·99
4·	176·73	26·5	29·48
4·5	157·47	27·	28·99
5·	142·06	27·5	28·53
5·5	129·46	28·	28·07
6·	118·95	28·5	27·65
6·5	110·06	29·	27·22
7·	102·44	29·5	26·81
7·5	95·84	30·	26·41
8·	90·06	30·5	26·03
8·5	84·96	31·	25·67
9·	80·43	31·5	25·31
9·5	76·37	32·	24·96
10·	72·72	32·5	24·63
10·5	69·42	33·	24·30
11·	66·41	33·5	23·99
11·5	63·67	34·	23·68
12·	61·12	34·5	23·38
12·5	58·06	35·	23·09
13·	56·71	35·5	22·81
13·5	54·73	36·	22·54
14·	52·90	36·5	22·27
14·5	51·19	37·	22·01
15·	49·59	37·5	21·76
15·5	48·10	38·	21·52
16·	46·70	38·5	21·28
16·5	45·38	39·	21·04
17·	44·14	39·5	20·82
17·5	42·98	40·	20·61
18·	41·87	41·	20·17
18·5	40·83	42·	19·76
19·	39·84	43·	19·37
19·5	38·91	44·	19·00
20·	38·01	45·	18·65
20·5	37·17	46·	18·31
21·	36·36	47·	17·99
21·5	35·59	48·	17·68
22·	34·85	49·	17·38
22·5	34·15	50·	17·06
23·	33·48		

For the population of the British Islands, see the articles ENGLAND, SCOTLAND, and IRELAND.

(T. R. M.)

PORAMUSHIR, an island in the Pacific, belonging to Russia, the largest of the Kurile group, extending from N.E. to S.W., 35 miles S. of Cape Lopatka in Kamtschatka. It is about 60 miles in length, by 20 in breadth; and the surface is for the most part hilly and bare. Bears, foxes, otters, and wolves are found on it; and seals and fish are got in the surrounding seas. The inhabitants, who do not exceed 400 in number, derive their subsistence from these animals; and the skins of the fox, otter, and wolf are exported from the island.

PORCELAIN. See POTTERY.

PORCH, in Greek στοά, a public portico in Athens, adorned with the pictures of Polygnotus and other eminent painters. It was in this portico that Zeno the philosopher taught; and hence his followers were called Stoics.

PORCUNA, a town of Spain, Andalucia, in the province of Jaen, and 21 miles W.N.W. of the town of that name. It has clean, well-paved streets, and several squares, one of which contains the parish church and the public granary. There are also a town-hall, hospital, several schools, prisons, &c. Woollen cloth, serge, and soap are manufactured here. Pop. 5272.

PORDENONE, or PORTENAU, a town of Austrian Italy, in the government of Venice, stands on the Noncello, 40 miles N.N.E. of Venice. It is well built, and surrounded with an old wall; and it contains several churches, a convent, hospital, workhouse, and theatre. Manufactures, especially that of paper, are actively carried on here; and there is some trade in corn and wine. As early as the twelfth century, Pordenone belonged to Austria, but afterwards passed, with the rest of the province of Friuli, under the dominion of Venice. Pop. 6300.

PORDENONE, the surname which *Giovanni Antonio Licinio Regillo*, an able Italian painter, received from his birth-place, Pordenone, a small town in Friuli. He was born in 1483, and acquired a knowledge of art by studying the works of Pellegrino and Giorgione. In spite, however, of this inadequate training, a strong and vigorous intellect soon made him a bold and effective artist. He adorned many villas and castles in his native district, designing with an active and ingenious fancy, and executing with a skilful and rapid hand. He painted many altar-pieces at Udine, Piacenza, and other cities, cleverly resolving all the difficulties of his art, and employing the most novel foreshortening, the most laboured perspective, and a power of relief which made his pictures appear as if actually starting from the canvass. There was no artistic feat indeed, which could daunt his towering ambition. Happening to take up his abode in Venice, he was smitten with a desire to rival the great Titian. This desire in course of time became inflamed into a mania, and actuated his entire conduct. He toiled night and day at his easel. He tried every conciliating art to secure the suffrages of the great and the influential. He placed his works on every possible occasion in juxtaposition to those of his rival. He even carried about weapons, in order that he might be ready, if every other method should fail, to decide the contest by physical force. Nor were these aspirations of Pordenone altogether without success. Some people really placed him above Titian; Charles V. presented him with the title of cavalier; and Duke Ercole invited him to the court of Ferrara. Other honours were in store for him, when he was suddenly cut off in 1539, not without suspicion of having been poisoned. The best known paintings of Pordenone are the pictures of "St Christopher," in one of the churches of his native town; "The Marriage of St Catherine," in the church of Santa Maria della Campagna at Piacenza; and the picture of "San Lorenzo Giustiniani," in the church of Santa Maria dell' Orto at Venice.

PORISM, in *Geometry*, is a name given by the ancient geometers to two classes of mathematical propositions. Euclid applies this name to propositions which are involved in others which he is professedly investigating, and which, although they do not form his principal object, are obtained along with it, as is expressed by their name, *porismata*, or acquisitions. Such propositions are now called *corollaries*. But he gives the same name, by way of eminence, to a particular class of propositions which he collected in the course of his researches, and selected from amongst many others, on account of their great subserviency to the business of geometrical investigation in general. These propositions were so named by him, either from the way in which he discovered them, that is to say, whilst he was investigating something else, so that they might be considered as *gains* or *acquisitions*, or from their utility as steps in the investigation. In this sense they are *porismata;* for πορίζω (from which, according to Proclus, the term is derived) signifies both to investigate and to acquire by investigation. These propositions formed a collection in three books, which was familiarly known to the ancient geometers by the name of Euclid's *porisms;* and Pappus of Alexandria says that it was a most ingenious collection of many things conducive to the analysis or solution of the most difficult problems, and which afforded great delight to those who were able to understand and investigate them.

Unfortunately for mathematical science, this valuable collection is now lost, and it still remains a doubtful question in what manner the ancients conducted their researches upon this curious subject. We have, however, reason to believe that their method was both comprehensive and excellent; for their analysis led them to many profound discoveries, and was restricted by the severest logic. The only account we have of this class of geometrical propositions is in a fragment of Pappus, in which he attempts a general description of them, as a set of mathematical propositions distinguishable in kind from all others; but of this description nothing remains, except a criticism on a definition of the term given by some geometers, namely, "A porism is that which is deficient in hypothesis from a local theorem," and which he finds fault with, as defining the porisms only by an accidental circumstance. Pappus also gives an account of Euclid's porisms; but the enunciations are so extremely defective, at the same time that they refer to a figure now lost, that Dr Halley confesses the fragment in question to be beyond his comprehension.

The high encomiums pronounced by Pappus on these propositions have excited the curiosity of the greatest geometers of modern times, who have attempted to discover their nature and the manner of investigating them. Fermat gave a few propositions, which have been published in his *Opera* (Tolosæ, 1679), and Bullialdus, in a tract entitled *Exercitationes Geometricæ Tres* (Paris, 1657), attempted the same thing, but with less success. Albert Girard, at a still earlier period, announced that he had restored the whole of the three books of Euclid, but it does not appear that this part of his works was ever published.[1]

At length Dr Simson, professor of mathematics in the university of Glasgow, was so fortunate as to succeed in restoring the porisms of Euclid. In the preface to his treatise *De Porismatibus*, he gives the following account of his progress and of the obstacles he encountered: "Postquam vero apud Pappum legeram Porismata Euclidis Collectionem fuisse artificiosissimam multarum rerum, quæ spectant ad analysin difficiliorum et generalium problematum, magno desiderio tenebar, aliquid de iis cognoscendi; quare sæpius et multis variisque viis tum Pappi propositionem generalem, mancam et imperfectum, tum primum lib. 1. Porisma, quod, ut dictum fuit, solum ex omnibus in tribus libris integrum adhuc manet, intelligere et restituere conabar; frustra tamen, nihil enim proficiebam. Cumque cogitationes de hac re multum mihi temporis consumpserint, atque tandem molestæ admodum evaserint, firmiter animum induxi haec nunquam in posterum investigare; præsertim cum optimus Geometra Halleius spem omnem de iis intelligendis abjecisset. Unde quoties menti occurrebant, toties eas arcebam. Postea tamen accidit ut improvidum et propositi immemorem invaserint, meque detinuerint donec tandem lux quædam effulserit quae spem mihi faciebat inveniendi saltem Pappi propositionem generalem, quam quidem multa investigatione tandem restitui."

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[1] In his *Trigonometry*, published at the Hague in 1629, after enumerating the forms of certain rectilinear figures, Girard adds, "Le tout, quand il n'y a que deux lignes qui passant par un point, comme jadis estoyent les Porismes d'Euclid, qui sont perdus, lesquelles J'espère de mettre bientot en lumière, les ayant restituez, il y a quelques années en ça." A similar announcement is also made by him in his edition of the works of Stevinus (Lugdum. Batav. 1634, p. 459). Having mentioned that Euclid rarely employs a compound ratio, he adds, "Mais il est à estimer qu'il en a plus escrit en ses trois livres de Porismes qui sont perdus, lesquelles, Dieu aidant, J'espère de mettre en lumière, les ayant inventez de nouveau." (See the Preface to Simson's *Tractatus de Porismatibus*, in his *Opera Reliqua.*)

Dr. Simson's *Restoration* has every appearance of being just. All the lemmas which Pappus has given for the better understanding of Euclid's propositions are equally applicable to those of Dr. Simson, which are found to differ from local theorems precisely as Pappus affirms those of Euclid to have done. They require a particular mode of analysis, and are of immense service in geometrical investigation.

Whilst Dr. Simson was employed in this inquiry, he carried on a correspondence upon the subject with the late Dr. Matthew Stewart, Professor of Mathematics in the University of Edinburgh; who, besides entering into Dr. Simson's views, and communicating to him many curious porisms, pursued the same subject in a new and very different direction. He published the result of his inquiries in 1746, under the title of *General Theorems*, not wishing to give them any other name, lest he might appear to anticipate the labours of his friend and former preceptor. The greater part of the propositions contained in that work are porisms, but without demonstration; and those who wish to investigate one of the most curious subjects in geometry, will there find abundance of materials, and an ample field for discussion.

Dr. Simson defines a porism to be "a proposition, in which it is proposed to demonstrate, that one or more things are given, between which, and every one of innumerable other things not given, but assumed according to a given law, a certain relation, described in the proposition, is to be shewn to take place."

This definition is somewhat obscure, but will be plainer if expressed thus: "A porism is a proposition affirming the possibility of finding such conditions as will render a certain problem indeterminate, or capable of innumerable solutions." This definition agrees with Pappus's idea of these propositions, as far at least as they can be understood from the fragment already mentioned; for the propositions here defined, like those which he describes, are, strictly speaking, neither theorems nor problems, but of an intermediate nature between both. They neither simply enunciate a truth to be demonstrated, nor propose a question to be resolved, but are affirmations of a truth in which the determination of an unknown quantity is involved. In as far, therefore, as they assert that a certain problem may become indeterminate, they are of the nature of theorems; and, in as far as they seek to discover the condition by which that is brought about, they are of the nature of problems.

In order to give our readers a clear idea of the subject of porisms, we shall consider them in the way in which it is probable they occurred to the ancient geometers in the course of their researches. This will at the same time shew the nature of the analysis peculiar to them, and their great use in the solution of problems.

It appears to be certain, that it has been the solution of problems which, in all states of the mathematical sciences, has led to the discovery of geometrical truths. The first mathematical inquiries, in particular, must have occurred in the form of questions, where something was given, and something required to be done; and by the reasoning necessary to answer these questions, or to discover the relation between the things given and those to be found, many truths were suggested, which came afterwards to be the subject of separate demonstrations. The number of these was the greater, because the ancient geometers always undertook the solution of problems, with a scrupulous and minute attention, insomuch that they would scarcely suffer any of the collateral truths to escape their observation.

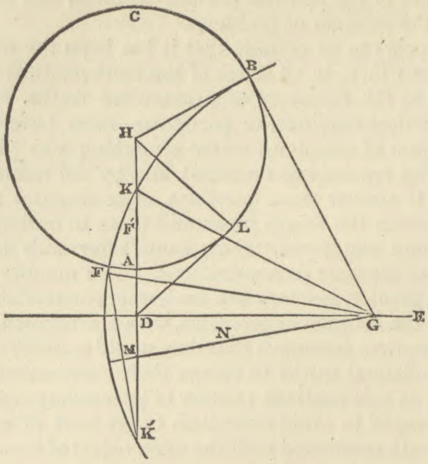
Now, as this cautious manner of proceeding was not better calculated to avoid error than to lay hold of every collateral truth connected with the main object of inquiry, these geometers soon perceived, that there were many problems which in certain cases would admit of no solution whatever, in consequence of a particular relation existing amongst the quantities which were given. Such problems were said to become impossible; and it was soon perceived, that this always happened when one of the conditions of the problem was inconsistent with the rest. Thus, when it was required to divide a line, so that the rectangle contained by its segments might be equal to a given space, it was found that this was possible only when the given space was less than the square of half the line; for when it was otherwise, the two conditions defining, the one the magnitude of the line, and the other the rectangle of its segments, were inconsistent with each other. Such cases would occur in the solution of the most simple problems; but if they were more complicated, it must have been remarked, that the constructions would sometimes fail, for a reason directly contrary to that just now assigned. Cases would occur, where the lines, which by their intersection were to determine the thing sought, instead of intersecting each other as they did commonly, or of not meeting at all, as in the above mentioned case of impossibility, would coincide with one another entirely, and of course leave the problem unresolved. It would appear to geometers upon a little reflection, that since, in the case of determinate problems, the thing required was determined by the intersection of the two lines already mentioned, that is, by the points common to both; so in the case of their coincidence, as all their parts were in common, every one of these points must give a solution, or, in other words, the solutions must be indefinite in number.

Upon inquiry, it would be found that this proceeded from some condition of the problem having been involved in another, so that, in fact, the two formed but one, and thus there was not a sufficient number of independent conditions to limit the problem to a single or to any determinate number of solutions. It would soon be perceived, that these cases formed very curious propositions of an intermediate nature between problems and theorems; and that they admitted of being enunciated in a manner peculiarly elegant and concise. It was to such propositions that the ancients gave the name of *porisms*.

This deduction requires to be illustrated by an example. Suppose, therefore, that it were required to resolve the following problem. A circle ABC, (fig. 1), a straight line DE, and a point F, being given in position, to find a point G in the straight line DE such, that GF, the line drawn from it to the given point, shall be equal to GB, the line drawn from it touching the given circle.

Suppose G to be found, and GB to be drawn touching the given circle ABC in B, let H be its centre, join HB, and let HD be perpendicular to DE. From D draw DL,

Fig. 1



touching the circle ABC in L, and join HL; also from the centre G, with the distance GB or GF, describe the circle BKF, meeting HD in the points K and K'. It is evident that HD and DL are given in position and magnitude: also because GB touches the circle ABC, HBG is a right angle; and since G is the centre of the circle BKF, HB touches that circle, and consequently HB^2 or $HL^2 = KH \times HK'$; but because KK' is bisected in D, $KH \times HK' + DK^2 = DH^2$, therefore $HL^2 + DK^2 = DH^2$. But $HL^2 + LD^2 = DH^2$, therefore $DK^2 = DL^2$ and $DK = DL$. But DL is given in magnitude, and consequently K is a given point. For the same reason K' is a given point, therefore the point F being given in position, the circle KFK' is given in position. The point G, which is its centre, is therefore given in position, which was to be found. Hence this construction:

Having drawn HD perpendicular to DE, and DL touching the circle ABC, make DK and DK' each equal to DL, and find G the centre of the circle described through the points K'FK; that is, let FK' be joined and bisected at right angles by MN, which meets DE in G, G will be the point required; or it will be such a point, that if GB be drawn touching the circle ABC, and GF to the given point, GB is equal to GF.

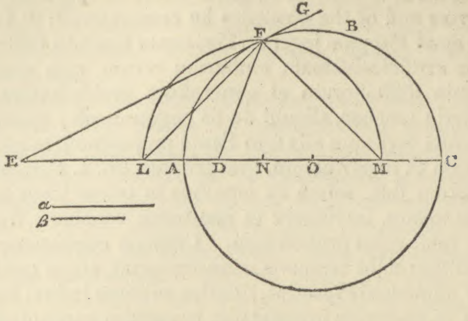
The synthetical demonstration is easily derived from the preceding analysis; but it must be remarked, that in some cases this construction fails. For, first, if F fall anywhere in DH, as at F', the line MN becomes parallel to DE, and the point G is nowhere to be found; or, in other words, it is at an infinite distance from D. This is true in general; but if the given point F coincide with K, then MN evidently coincides with DE; so that, agreeable to a remark already made, every point of the line DE may be taken for G, and will satisfy the conditions of the problem; that is to say, GB will be equal to GK, wherever the point G is taken in the line DE: the same is true if F coincide with K'. Thus we have an instance of a problem, and that too a very simple one, which, in general, admits but of one solution; but which, in one particular case, when a certain relation takes place among the things given, becomes indefinite, and admits of innumerable solutions. The proposition which results from this case of the problem is a porism, and may be thus enunciated:

"A circle ABC being given by position, and also a straight line DE, which does not cut the circle, a point K may be found, such, that if G be any point whatever in DE, the straight line drawn from G to the point K shall be equal to the straight line drawn from G touching the given circle ABC."

The problem which follows, appears to have led to the discovery of many porisms.

A circle ABC (fig. 2), and two points D, E, in a diameter of it being given, to find a point F in the circumference of the given circle, from which, if straight lines be drawn to the given points E, D, these straight lines shall have to one another the given ratio of α to β, which is supposed to be that of a greater to a less. Suppose the problem resolved, and that F is found, so that FE has to FD the given ratio of α to β; produce EF towards G, bisect the angle EFD by FL, and DFG by FM: therefore $EL : LD :: EF : FD$, that is in a given ratio, and since ED is given, each of the segments EL, LD, is given, and the point L is also given; again, because DFG is bisected by FM, $EM : MD :: EF : FD$, that is, in a given ratio, and therefore M is given. Since DFL is half of DFE, and DFM half of DFG, therefore LFM is half of (DFE + DFB), that is, the half of two right angles, therefore LFM is a right angle; and since the points L, M, are given, the point F is in the circumference of a circle described upon LM as a diameter, and therefore given in position. Now the point F is also in the circumference of the given circle ABC, therefore it is in the intersection of the two given circumferences, and therefore is found. Hence this construction: Divide ED in L, so that EL may be to LD in the given ratio of α to β, and produce ED also to M, so that EM may be to MD in the same given ratio of α to β; bisect LM in N, and from the centre N with the distance NL, describe the semicircle LFM; and the point F, in which it intersects the circle ABC, is the point required.

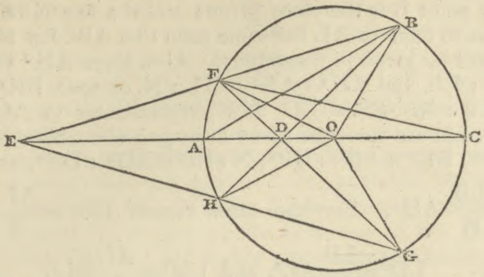
Fig. 2.



The synthetical demonstration is easily derived from the preceding analysis. It must, however, be remarked, that the construction fails when the circle LFM falls either wholly within or wholly without the circle ABC, so that the circumferences do not intersect; and in these cases the problem cannot be solved. It is also obvious that the construction will fail in another case, viz. when the two circumferences LFM, ABC, entirely coincide. In this case, it is farther evident, that every point in the circumference ABC will answer the conditions of the problem, which is therefore capable of numberless solutions, and may, as in the former instance, be converted into a porism. We are now to inquire, therefore, in what circumstances the point L will coincide with A, and also the point M with C, and of consequence the circumference LFM with ABC. If we suppose that they coincide, $EA : AD :: \alpha : \beta :: EC : CD$, and $EA : EC :: AD \cdot CD$, or by conversion, $EA : AC :: AD : CD - AD :: AD : 2DO$, O being the centre of the circle ABC; therefore, also, $EA : AO :: AD : DO$, and by composition, $EO : AO :: AO : DO$, therefore $EO \times OD = AO^2$. Hence, if the given points E and D (fig. 3), be so situated that $EO \times OD = AO^2$, and at the same time $\alpha : \beta :: EA : AD :: EC : CD$, the problem admits of numberless solutions; and if either of the points D or E be given, the other point, and also the ratio which will render the problem indeterminate, may be found. Hence we have this porism:

"A circle ABC, and also a point D being given, another point E may be found, such that the two lines inflected from these points to any point in the circumference ABC,

Fig. 3.



shall have to each other a given ratio, which ratio is also to be found." Hence also we have an example of the derivation of porisms from one another, for the circle ABC, and the points D and E remaining as before, if, through D we draw any line whatever HDB, meeting the circle in B and H; and if the lines EB, EH, be also drawn, these lines will cut off equal circumferences BF, HG. Let FC be drawn, and it is plain from the foregoing analysis, that the angles DFC, CFB, are equal; therefore if OG, OB, be drawn, the angles BOC, COG, are also equal; and consequently the angles DOB, DOG. In the same manner, by joining AB, the angle DBE being bisected by BA, it is evident that the angle AOF is equal to AOH, and therefore the angle FOB to HOG; hence the arch FB is equal to the arch HG. It is evident that if the circle ABC, and either of the points DE were given, the other point might be found. Therefore we have this porism, which appears to have been the last but one of the third book of Euclid's *Porisms.* "A point being given, either within or without a circle given by position, if there be drawn, anyhow through that point, a line cutting the circle in two points; another point may be found, such, that if two lines be drawn from it to the points in which the line already drawn cuts the circle, these two lines will cut off from the circle equal circumferences."

The proposition from which we have deduced these two porisms, also affords an illustration of the remark, that the conditions of a problem are involved in one another in the porismatic or indefinite case; for here several independent conditions are laid down, by the help of which the problem is to be resolved. Two points D and E are given, from which two lines are to be inflected, and a circumference ABC, in which these lines are to meet, as also a ratio which these lines are to have to each other. Now these conditions are all independent of one another, so that any one may be changed without any change whatever in the rest. This is true in general; but yet in one case, viz. when the points are so related to another, that the rectangle under their distances from the centre is equal to the square of the radius of the circle, it follows, from the preceding analysis, that the ratio of the inflected lines is no longer a matter of choice, but a necessary consequence of this disposition of the points.

From what has been already said, we may trace the imperfect definition of a porism which Pappus ascribes to the later geometers, viz. that it differs from a local theorem, by wanting the hypothesis assumed in that theorem. Now, to understand this, it must be observed, that if we take one of the propositions called *loci,* and make the construction of the figure a part of the hypothesis, we get what was called by the ancient geometers, a *local theorem.* If, again, in the enunciation of the theorem, that part of the hypothesis which contains the construction be suppressed, the proposition thence arising will be a porism, for it will enunciate a truth, and will require to the full understanding and investigation of that truth, that something should be found, viz. the circumstances in the construction supposed to be omitted.

Thus, when we say, if from two given points, E, D, two straight lines EF, FD, are inflected to a third point F, so as to be to one another in a given ratio, the point F is in the circumference of a given circle, we have a locus. But when conversely, it is said, if a circle ABC, of which the centre is O, be given by position, as also a point E; and if D be taken in the line EO, so that $EO \times OD = AO^2$, and if from E and D the lines EF, DF be inflected to any point of the circumference ABC, the ratio of EF to DF will be given, viz. the same with that of EA to AD, we have a local theorem.

Lastly, when it is said, if a circle ABC be given by position, and also a point E, a point D may be found, such that if EF, FD be inflected from E and D to any point F in the circumference ABC, these lines shall have a given ratio to one another, the proposition becomes a porism, and is the same that has just now been investigated.

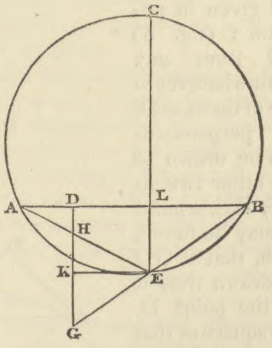
Hence it is evident, that the local theorem is changed into a porism, by leaving out what relates to the determination of D, and of the given ratio. But though all propositions formed in this way from the conversion of loci, are porisms, yet all porisms are not formed from the conversion of loci; the first, for instance, of the preceding, cannot, by conversion, be changed into a locus; therefore Fermat's idea of porisms, founded upon this circumstance, could not fail to be imperfect.

If the idea which we have given of these propositions be just, it follows, that they are to be discovered by considering those cases in which the construction of a problem fails, in consequence of the lines which by their intersection, or the points which by their position, were to determine the problem required, happening to coincide with one another. A porism may therefore be deduced from the problem to which it belongs, just as propositions concerning the *maxima* and *minima* of quantities are deduced from the problems of which they form limitations; and such is the most natural and obvious analysis of which this class of propositions admits.

Another general remark which may be made on the analysis of porisms is, that it often happens that the magnitudes required may all, or a part of them, be found by considering the extreme cases; but for the discovery of the relation between them, and the indefinite magnitudes, we must have recourse to the hypothesis of the porism in its most general or indefinite form; and must endeavour so to conduct the reasoning, that the indefinite magnitudes may at length totally disappear, and leave a proposition asserting the relation between determinate magnitudes only.

For this purpose accordingly Dr. Simson frequently employs two statements of the general hypothesis, which he compares together. This double statement, however, cannot be made without rendering the investigation long and complicated; nor is it even necessary, for it may be avoided by having recourse to simpler *porisms,* or to *loci,* or to propositions of the *data.* The porism which follows, is given as an example where this is done with some difficulty, but with considerable advantage, both with regard to the simplicity and shortness of the demonstration. It will be proper to premise the following lemma.

Fig. 4.



Let AB (fig. 4.) be a straight line, and D, L any two points in it, one of which D is between A and B; also let CL be any straight line. Then shall

$$\frac{LB}{CL}\cdot AD^2+\frac{LA}{CL}\cdot BD^2=\frac{LB}{CL}\cdot AL^2+\frac{LA}{CL}\cdot BL^2+\frac{AB}{CL}DL^2.$$

For place CL perpendicular to AB, and through the points

Porism.

A, C, B describe a circle, and let CL meet the circle again in E, and join AE, BE. Also draw DG parallel to CE, meeting AE and BE in H and G, and draw EK parallel to AB. Then, from the elements of geometry,

$$CL : LB :: (LA : LE ::)\ LA^2 : LA \times LE,$$

$$\text{and hence } LA \times LE = \frac{LB}{CL} \cdot LA^2.$$

$$\text{Also } CL : LA :: (LB : LE ::)\ LB^2 : LB \times LE,$$

$$\text{and hence } LB \times LE = \frac{LA}{CL} \cdot LB^2.$$

$$\text{Now } CL : LB :: LA : LE :: EK \text{ or } LD : KH,$$

$$\text{and } CL : LA :: LA : LE :: EK \text{ or } LD : KG,$$

$$\text{therefore, } CL : AB :: (LD : GH ::)\ LD^2 : EK \times GH,$$

$$\text{and hence } EK \times GH = \frac{AB}{CL} \cdot LD^2.$$

From the three equations now deduced, there results

$$\frac{LB}{LC} . LA^2 + \frac{LA}{LC} . LB^2 + \frac{AB}{CL} . LD^2 = AB \times LE + EK \times GH.$$

Again, because

$$CL : LA :: (LB : LE :: DB : DG ::)\ DB^2 : DB \times DG,$$

therefore $DB \times DG = \frac{LA}{CL} \cdot DB^2$. And because

$$CL : LB :: (LA : LE :: DA : DH ::)\ DA^2 : DA \times DH,$$

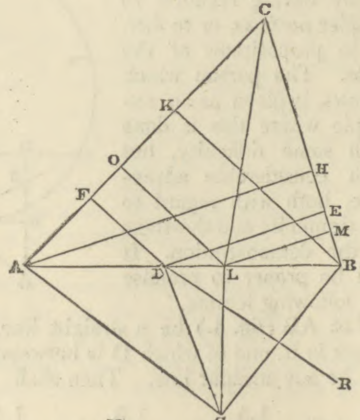
therefore $DA \times DH = \frac{LB}{CL} . DA^2$. From the result of these two last propositions we have

$$\frac{LB}{CL} \cdot DA^2 + \frac{LA}{CL} DB^2 = DA \times DH + DB \times DG;$$

But $DA \times DH =$ *twice trian.* ADH, and $DB \times DG =$ *twice trian.* BDG, and therefore $DA \times DH + DB \times DG = 2$ (*trian.* ADH + *trian.* BDG) = 2 (*trian.* AEB + *trian.* HEG) $= AB \times LE + EK \times HG$. Now it has been proved, that $DA \times DH + DB \times DG = \frac{LB}{CL} \cdot DA^2 + \frac{LA}{CL} . BD^2$, and that $AB \times LE + EK \times HG = \frac{LB}{CL} \cdot LA^2 + \frac{LA}{CL} \cdot LB^2 + \frac{AB}{CL} \cdot LD^2$, therefore $\frac{LB}{CL} \cdot AD^2 + \frac{LA}{CL} BD^2 = \frac{LB}{CL} \cdot AL^2 + \frac{LA}{CL} \cdot BL^2 + \frac{AB}{CL} \cdot DL^2$, as was to be demonstrated.

Porism. Let there be three straight lines AB, AC, CB given in position; (fig. 5) and from any point whatever in one of them, as D, let perpendiculars be drawn to the other two, as DF, DE, a point G may be found, such, that if GD be drawn from it to the point D, the square of that line shall have a given ratio to the sum of the squares of the perpendiculars DF and DE, which ratio is to be found.

Fig. 5.



Draw AH, BK perpendicular to BC and AC; and in AB take L, so that $AL : LB :: AH^2 : BK^2 :: AC^2 : CB^2$. The point L is therefore given; and if a line N be taken, so as to have to AL the same ratio that AB^2 has to AH^2, N will be given in magnitude. Also, since $AH^2 : BK^2 :: AL : LB$, and $AH^2 : AB^2 :: AL : N$, *ex equo*, $BK^2 : AB^2 :: LB : N$. Draw LO, LM perpendicular to AC, CB; LO, LM are therefore given in magnitude. Now, because $AB^2 : BK^2 :: AD^2 : DF^2$, $N : LB :: AD^2 : DF^2$, and $DF^2 = \frac{LB}{N} \cdot AD^2$. For the same reason $DE^2 = \frac{AL}{N} \cdot BD^2$.

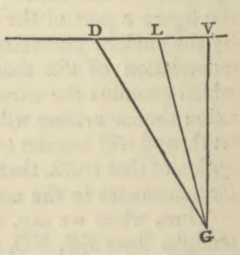
$$LO^2 = \frac{LB}{N} \cdot AL^2, \text{ and } LM^2 = \frac{AL}{N} \cdot BL^2.$$

But, by the preceding lemma, $\frac{LB}{N} \cdot AD^2 + \frac{AL}{N} \cdot BD^2 = \frac{LB}{N} \cdot AL^2 + \frac{AL}{N} \cdot BL^2 + \frac{AB}{N} \cdot DL^2$; that is, $DE^2 + DF^2 = LO^2 + LM^2 + \frac{AB}{N} \cdot DL^2$. Join LG, then by hypothesis $LO^2 + LM^2$ has to LG^2, the same ratio as $DF^2 + DE^2$ has to DG^2; let it be that of R to N, then $LO^2 + LM^2 = \frac{R}{N} . LG^2$; and therefore $DE^2 + DF^2 = \frac{R}{N} . LG^2 + \frac{AB}{N} . DL^2$; but $DE^2 + DF^2 = \frac{R}{N} . DG^2$; therefore, $\frac{R}{N} . LG^2 + \frac{BA}{N} . DL^2 = \frac{R}{N} . DG^2$, and $\frac{AB}{N} . DL^2 = \frac{R}{N} (DG^2 - LG^2)$; therefore $DG^2 - LG^2$ has to DL^2 a constant ratio, viz. that of AB to R. The angle DLG is therefore a right angle, and the ratio of AB to R that of equality, otherwise LD would be given in magnitude, contrary to the supposition. LG is therefore given in position: and since $R : N :: AB : N :: LO^2 + LM^2 : LG^2$; therefore the square of LG, and consequently LG, is given in magnitude. The point G is therefore given, and also the ratio of $DE^2 = DF^2$ to DG^2, which is the same with that of AB to N.

The construction easily follows from the analysis, but it may be rendered more simple; for since $AH^2 : AB^2 :: AL : N$, and $BK^2 : AB^2 :: BL : N$; therefore $AH^2 + BK^2 : AB^2 :: AB : N$. Likewise, if AG, BG, be joined, $AB : N :: AH^2 : AG^2$, and $AB : N :: BK^2 : BG^2$; wherefore, $AB : N :: AH^2 + BK^2 : AG^2 + BG^2$, but it was proved that $AB : N :: AH^2 + BK^2 : AB^2$, therefore $AG^2 + BG^2 = AB^2$; therefore the angle AGB is a right angle, and $AL : LG :: LG : LB$. If therefore AB be divided in L, so that $AL : LB :: AH^2 : BK^2$; and if LG, a mean proportional between AL and LB, be placed perpendicular to AB, G will be the point required.

The step in the analysis, by which a second introduction of the general hypothesis is avoided, is that in which the angle GLD is concluded to be a right angle; which follows from $DG^2 - GL^2$ having a given ratio to LD^2, at the same time that LD is of no determinate magnitude. For, if possible, let GLD be obtuse, (fig. 6,) and let the perpendicular from G to AB meet in V, therefore V is given: and since $GD^2 - LG^2 = LD^2 \times 2DL \times LV$; therefore, by the supposition, $LD^2 + 2\,DL \times LV$ must have a given ratio to LD^2; therefore the ratio of LD^2 to $DL \times VL$, that is, of LD to VL, is given, so that VL being given in magnitude, LD is also given. But this is contrary to the supposition; for LD is indefinite by hypothesis, and therefore GLD cannot be obtuse,

Fig. 6.



Porism.

nor any other than a right angle. The conclusion that is here drawn immediately from the indetermination of LD would be deduced, according to Dr. Simson's method, by assuming another point D′ any how, and from the supposition that $GD'^2-GL^2 : LD'^2 :: GD^2-GL^2 : LD^2$, it would easily appear that GLD must be a right angle, and the ratio that of equality.

These porisms facilitate the solution of the general problems from which they are derived. For example, let three straight lines AB, AC, BC, (fig. 5), be given in position, and also a point R, to find a point D in one of the given lines, so that DE and DF being drawn perpendicular to BC, AC, and DR, joined; DE^2+DF^2 may have to DR^2 a given ratio. It is plain, that having found G, the problem would be nothing more than to find D, such that the ratio of GD^2 to DR^2, and therefore that of GD to DR, might be given, from which it would follow, that the point D is in the circumference of a given circle, as is well known to geometers.

The same porism also assists in the solution of another problem. For if it were required to find D such that DE^2+DF^2 might be a given space; having found G, DG^2 would have to DE^2+DF^2 a given ratio, and DG would therefore be given; whence the solution is obvious.

The connection of this porism with the impossible case of the problem is evident; the point L being that from which, if perpendiculars be drawn to AC and CB, the sum of their squares is the least possible. For since $DF^2+DE^2 : DG^2 :: LO^2+LM^2 : LG^2$; and since LG is less than DG, LO^2+LM^2 must be less than DF^2+DE^2.

It is evident from what has now appeared, that in some instances at least there is a close connection between these propositions and the *maxima* or *minima*, and of consequence the impossible cases of problems. The nature of this connection requires to be farther investigated, and is the more interesting because the transition from the indefinite to the impossible case seems to be made with wonderful rapidity. Thus in the first proposition, though there be not properly speaking an impossible case, but only one where the point to be found goes off *in infinitum*, it may be remarked, that if the given point F (fig. 1), be anywhere out of the line HD, the problem of drawing GB equal to GF is always possible, and admits of just one solution; but if F be in DH, the problem admits of no solution at all, the point being then at an infinite distance, and therefore impossible to be assigned. There is, however, this exception, that if the given point be at K in this same line, DH is determined by making DK equal to DL. Then every point in the line DE gives a solution, and may be taken for the point G. Here therefore the case of numberless solutions, and of no solution at all, are as it were *conterminal*, and so close to one another, that if the given point be at K the problem is indefinite; but if it remove ever so little from K, remaining at the same time in the line DH, the problem cannot be resolved. This affinity might have been determined *a priori*; for, as we have seen, it is a general principle, that a problem is converted into a porism when one or when two of the conditions of it necessarily involve in them some one of the rest. Suppose, then, that two of the conditions are exactly in that state which determines the third; then whilst they remain fixed or given, should that third one vary or differ ever so little from the state required by the other two, a contradiction will ensue. Therefore if, in the hypothesis of a problem, the conditions be so related to one another as to render it indeterminate, a porism is produced; but if, of the conditions thus related to one another, some one be supposed to vary, whilst the others continue the same, an absurdity follows, and the problem becomes impossible. *Wherever, therefore, any problem admits both of an indeterminate and an impossible case, it is certain, that these cases are nearly related to one another, and that some of the conditions by which they are produced are common to both.*

It is supposed above, that *two* of the conditions of a problem involve in them a third; and wherever that happens, the conclusion which has been deduced will invariably take place. But a porism may in some cases be so simple as to arise from the mere coincidence of *one* condition with another, though in no case whatever can any inconsistency take place between them. There are, however, comparatively few porisms so simple in their origin, or that arise from problems where the conditions are but little complicated; for it usually happens that a problem which can become indefinite may also become impossible; and if so, the connection already explained never fails to take place.

Another species of impossibility may frequently arise from the porismatic case of a problem which will affect in some measure the application of geometry to astronomy, or any of the sciences depending upon experiment or observation. For when a problem is to be resolved by means of data furnished by experiment or observation, the first thing to be considered is, whether the data so obtained be sufficient for determining the thing sought; and in this a very erroneous judgment may be formed, if we rest satisfied with a general view of the subject. For though the problem may in general be resolved from the data with which we are provided, yet these data may be so related to one another in the case under consideration, that the problem will become indeterminate, and instead of one solution will admit of an indefinite number. This we have already found to be the case in the foregoing propositions. Such cases may not indeed occur in any of the practical applications of geometry; but there is one of the same kind which has actually occurred in astronomy. Sir Isaac Newton, in his *Principia*, has considered a small part of the orbit of a comet as a straight line described with an uniform motion. From this hypothesis, by means of four observations made at proper intervals of time, the determination of the path of the comet is reduced to this geometrical problem. Four straight lines being in position, it is required to draw a fifth line across them, so as to be cut by them into three parts, having given ratios to one another. Now this problem had been constructed by Dr. Wallis and Sir Christopher Wren, and also in three different ways by Sir Isaac himself in different parts of his works; yet none of these geometers observed that there was a particular situation of the lines in which the problem admitted of innumerable solutions; and this happens to be the very case in which the problem is applicable to the determination of the comet's path, as was first discovered by Boscovich, who was led to it by finding, that in this way he could never determine the path of a comet with any degree of certainty.

The preceding account of this interesting branch of the ancient geometry, is taken from a very elegant and elaborate paper, *On the Origin and Investigation of Porisms*, by the late Professor Playfair, published in the third volume of the Transactions of the Royal Society of Edinburgh, and also in his collected *Works*, (vol. iii. p. 178.) For further particulars on the subject, the reader may consult the original paper of Professor Playfair; Dr. Simson's treatise, *De Porismatibus*, contained in his *Opera Reliqua*; a paper in the fourth volume of the Edinburgh Transactions, by Professor Wallace, entitled, *Some Geometrical Porisms, with examples of their application to the Solution of Problems*; Dr. Traill's *Account of the Life and Writings of Robert Simson, M.D.*; and Professor Leslie's *Geometrical Analysis*. At the end of Dr. Stewart's *General Theorems*, above mentioned, five very remarkable porisms are enunciated, the demonstration of the first of which is given in Leybourn's *Mathematical Repository*, (vol. i.) and of the remaining four in the fifth volume of the same work published in 1830. The algebraic analysis may frequently be applied with great advantage in the investigation of porisms, but this manner of treating the subject does not come within the scope of the present article.

POROS (anciently *Sphæria*), an island of Greece, at the S.E. entrance of the Gulf of Ægina, separated from the mainland by a narrow channel. It is hilly and of volcanic origin. A town of the same name occupies a singular position among the dark-coloured rocks on the south coast. Poros is the national arsenal of Greece, and has a small naval yard and a harbour between the island and the mainland. Pop. 7000, chiefly Albanians.

PORPHYREON (Πορφυρέων ; Eth. Πορφυρεώνιος, Πορφυρεωνίτης), a city of Phœnicia, referred to by Scylax, situated between Berytus and Sidon, and marked in the Jerusalem Itinerary (where it is written *Parphirion*), as 8 Roman miles north of Berytus. Procopius speaks of it as a village built upon the coast. (*Hist. Arc.*, c. 30, p. 164.) Polybius mentions it, and relates that it was situated in the neighbourhood of Platanus. It would seem accordingly to be correctly placed at the *Khân Neby Yûnas*, where Pococke records that he witnessed numerous broken pillars, a Corinthian capital, and various ruins on each side of a mountain torrent. In the side of this mountain there are tombs, extensively excavated, at the back of the Khân, which must once have belonged to an ancient city. Porphyreon was made a bishopric under the metropolitan of Tyre; and Justinian is said to have erected a church to the Virgin at that place. (Robinson's *Bib. Researches*, vol. iii.)

PORPHYRY (Πορφύριος), a celebrated Neo-Platonist, and an antagonist of Christianity, was born at Tyre, of a distinguished family, in A.D. 233. His original name was *Malchus*, a word signifying king; but he received his usual designation, in allusion to the colour of his robes, from his master Longinus. When very young he was placed under the instruction of Origen, most probably at Cæsarea. On removing to Athens, he took lessons from Apollonius and Longinus. At the age of twenty he went to Rome to visit Plotinus, but finding that the latter had closed his instructions there, he returned to the East. For the next ten years of his life nothing is known regarding him. Plotinus having returned to Rome, Porphyry, then in his thirtieth year, joined Antonius of Rhodes, and went in quest of the great Neo-Platonist. Among his earliest works in the city of Rome was to assail a dogma of Plotinus in a written treatise. Amelius, the pupil and friend of Plotinus, drew up a reply, which was met by Porphyry, and a rejoinder was called for from Amelius. This rejoinder satisfied the inquirer, and he wrote a recantation. Porphyry gained so thoroughly the confidence and approbation of Plotinus that he was regarded by the latter as the ornament of his school. The Tyrian had assigned to him the task of correcting and arranging the writings of his master. After a six years' acquaintanceship, Porphyry, at the advice of Plotinus, retired to Sicily. Here he occupied himself, according to Eusebius, in writing his treatise against the Christian religion, in 15 books. He subsequently visited Carthage, and ultimately settled at Rome, where his instructions were held in great esteem by the Senate and the people. He married Marcella, a widow with seven children, when far advanced in life, to enjoy, as he expressed it, the pleasure of superintending their education. Ten months after his marriage he had occasion to leave home, and wrote to his wife a consolatory epistle, which is still extant. Porphyry probably died about A.D. 305 or 306.

The philosophical doctrines of Porphyry were in all respects identical with those of Plotinus. He was a man of great abilities and very extensive learning. Yet he is charged with inconsistencies and contradictions. As a writer he is tolerably clear; and not unfrequently exhibits strokes of vigorous imagination. Though much less confused than his master, he was likewise much less profound. Of the very numerous writings of Porphyry nineteen are still extant in whole or in part, including his works on portions of Aristotle; while no less than thirty-seven are said to be lost. (Fabric. *Bibl. Græc.*, vol. v.; Ritter, *Geschichte der Philosophie*, vol. iv.; and Smith's *Dictionary of Greek and Roman Biog. and Myth.*)

PORSĔNA, or PORSĒNNA, LARS, king of the Etruscan town of Clusium, plays an important part in one of the Roman wars as narrated by Livy. Espousing the cause of the expelled Roman monarch Tarquin the Proud, he advanced southward towards the banks of the Tiber at the head of a formidable army. The terrified rustics fled before him, carrying the news of his approach to the Roman forces on the Janiculum; the Roman forces at his first appearance retreated in panic across the Pons Sublicius; and the capture of the city seemed to be already within his reach. Yet at this juncture he began to find that although he could overwhelm the collected strength of Rome, he was no match for the indomitable spirit that animated each individual of the race. Horatius Cocles, bringing up the rear of the fugitives, stopped up the entrance to the bridges with his body; kept back the pressing pursuers with the prowess of his single arm; and not until his countrymen had all crossed, and the bridge had been broken down behind him, did he throw himself into the Tiber and swim to the other side amidst a continuous shower of arrows. The enemy was thus compelled to sit down on the further side of the river, and turn the attack into a blockade. But even in that safe position, and in the character of a conqueror and besieger, the king was again destined to be foiled by a simple citizen of Rome. One day, as he was sitting in his tent surrounded by attendants, his secretary was struck down by his side. The assassin was seized, and was discovered to be a Roman in disguise. On being arraigned, he fearlessly confessed that his name was Caius Mucius; that he had come with the intent of slaying the king, but had mistaken his victim; and that there were many other youths in Rome who had sworn to repeat, if necessary, the same attempt. On being threatened with torture, he thrust his hand in among the live coals on the altar, held up his flaming fingers before them, and told them to try torture if they thought it could have any effect. The king, despairing of conquering a state which contained such citizens as Caius Mucius and Horatius Cocles, immediately came to terms with the besieged. The Romans agreed to restore the land which they had taken from the Veientines, and Porsena receiving hostages, raised the blockade, and returned to Clusium.

This story of Porsena, however, receives from other authors a colouring considerably different from that which Livy gives it. Tacitus relates that the city was actually captured. Pliny gives us to understand that the citizens were so thoroughly crushed, that they durst not use iron for any other purpose than agriculture. From Dionysius of Halicarnassus we infer that the Romans sent to the Etruscan king, as an acknowledgment of their vassalage, an ivory throne, and other insignia of royalty. Taking the combined evidence of those writers, as well as additional grounds, Niebuhr and other modern historians conclude, that Porsena really subdued the Romans, and instead of receiving the territory of the Veientines by negotiation, actually wrested it with the strong hand of a conqueror.

PORSON, RICHARD, the greatest verbal critic and classical scholar of modern times, born on the 25th of December 1759, was the son of Huggin Porson, parish clerk of East Ruston, near North Walsham, in Norfolk. His father taught him, in his childhood, to practise all the common rules of arithmetic by memory only; and, before he was nine years old, he had learned to extract the cube root in this manner. At the same time, for teaching him to read and write, he employed the method which has since been generally introduced into the schools of mutual instruction, making him draw the letters with chalk or on sand; and the neatness and accuracy of his hand-writing, for which he was distinguished through life, may be considered as bearing ample testimony to his father's ingenuity and success.

At the age of nine he was sent to a village school, kept by a Mr Summers; but his father still made him repeat by heart in the evening the whole of the lessons of the day; and there seems to be sufficient evidence for considering this practice of exercising the memory continually, in very early life, as the best, if not the only method of cultivating, if not of producing great talent. Mr Hewitt, the vicar of the parish of East Ruston, hearing of young Porson's uncommon capacity, undertook to instruct both him and his brother Thomas in classical literature; and when he was about fifteen, Mr Norris, a wealthy and respectable gentleman of the neighbourhood, having ascertained the truth of the reports that he heard of him, resolved to be at the expense of sending him to Eton.

At Eton his talents procured him the friendship and admiration of the seniors amongst his school-fellows, and upon the unfortunate death of his first patron, Mr Norris, he found a number of liberal contributors, who stept forward to supply the deficiency; but by far the most active of them was Sir George Baker, then president of the Royal College of Physicians, a man as much distinguished by his own classical taste and acquirements, as by his laudable disposition to cherish learning in others. He received the boy into his house for a vacation, and undertook, at the request of a relation of Mr Norris, the disagreeable task of receiving, in small sums, as much as was sufficient to purchase an income of L.80 a year, for a few years, in the short annuities, which served, with great economy, to enable him to remain at Eton. This favour appears to have been too great to be properly acknowledged, or perhaps even duly appreciated, by its object, who only after many years paid Sir George the tardy compliment of a dedication, not, however, of an edition, but of a handsome copy of a single play of Euripides. In his own opinion, Porson learned little at Eton besides the quantity of syllables, being able to repeat by heart before he went there the principal part of the authors that he had to read,—that is, almost the whole of Horace and Virgil, the *Iliad*, and many parts of Cicero, Livy, and the *Odyssey*. A story is accordingly told of his book having been changed by one of his schoolfellows in joke, when he was going up to a lesson in Horace, and of his having read and translated what was required of him, without at all betraying the change to his master. At the same time, the emulation of a public school must have been a great advantage to him, as affording him a motive for exertion in his exercises, whether they were to be called his own, or to be written for other boys. It was a copy of Toup's *Longinus*, presented to him as a reward for a good exercise, that first gave him a decided inclination for the pursuit of critical researches; but he always considered Bentley and Dawes as his great masters in criticism.

In 1777 he was sent to Trinity College, Cambridge, and at first he began to apply more particularly to the mathematics, which had been the favourite study of his boyhood, and in which, as he himself remarked, his proficiency first brought him into a certain degree of public notice. He was, however, soon diverted from this pursuit, although he attained a place amongst the *senior optimes* of his year. But he was in fact more calculated for classical than for mathematical excellence. His memory would have been in a great measure thrown away if he had been employed in abstract calculations; and his inventive powers do not appear to have been at all of the same class with his retentive faculties; although certainly in the mechanical pursuit of the fashionable methods of modern analysis, which are intended, like steam-engines, to overcome all difficulties by the inanimate force of mere patience and perseverance, he was capable of filling as distinguished a place as any living algebraist. The classical prize medal, and the university scholarship, he obtained without difficulty, as matters of course. The exercise which he exhibited upon the examination for the scholarship is the well-known translation of an epitaph into Greek iambics; which, although not free from some inaccuracies in the use of the tenses, is still a very remarkable production, when it is considered as having been completed in less than an hour, with the help of Morrell's *Thesaurus* only, and never afterwards corrected.

He obtained a fellowship of Trinity College in 1781, and took his degree of Master of Arts in 1785; but not thinking it right to subscribe the Articles of the Church of England, he could not enter into orders, and he was therefore unavoidably deprived of his fellowship in 1791, having no dependence left for his subsistence through life but his own abilities and acquirements. His friends, however, did not abandon him on this urgent occasion, and in order to keep him out of actual want, a private subscription was set on foot, to which Mr Cracherode was one of the principal contributors, and by which enough was raised to purchase him an annuity of about L.100 a year for life. A small addition was made to his income, about two years afterwards, by his election to the Greek professorship at Cambridge, with a salary of only L.40 a year. The situation, however, gave him the option of at least doubling his whole receipts, by the delivery of an annual course of lectures in the university; and it was supposed that he would have made this exertion, if he had not been discouraged by the difficulty of obtaining rooms in his college, where it would have been his wish to reside.

Porson married in 1795, Mrs Lunan, a sister of the late Mr Perry, well known as the editor of the *Morning Chronicle*, but he had the misfortune to lose his wife two years afterwards. Perry continued to be his greatest friend through life, and was so far his best benefactor, as he knew how to oblige him essentially, without the appearance of doing him a favour. Porson had sometimes chambers in the Temple, and sometimes he lodged at the *Morning Chronicle* office; frequently also he was a visitor at Perry's house at Merton, where he had the misfortune to leave several of his books at the time of a fire, which destroyed them all, and amongst them some letters of Rhunkenius, with whom he had begun a correspondence in 1783, and who had committed to him some valuable fragments of Æschylus, besides his manuscript copy of the Lexicon of Photius, which had cost him ten months' labour. He used indeed to say that this fire had destroyed the fruits of twenty years of his life; but he had the resolution to complete a second copy of the Photius, which is now in the library of Trinity College. His fondness for the mechanical employment of his pen has been regretted by some of his biographers, as having tempted him to waste much of his most valuable time on a trifling amusement; but in fact, his mode of writing Greek was fully as much calculated for expedition as for beauty; and those who have not been in the habit of correcting mutilated passages of manuscripts can form no estimate of the immense advantage that is obtained by the complete sifting of every letter, which the mind involuntarily performs whilst the hand is occupied in tracing it; so that, if the correction of Photius was really worth the labour of two years of Porson's life, it would have been scarcely possible to employ the greater part of those years more advantageously than by copying him twice over. Mr Weston, in speaking of "his matchless penmanship," has observed, not very intelligibly, that "here, indeed, he thought himself surpassed by" another person "not in the stroke, but the sweep, of his letters." What Porson really said on this subject was, that, with respect to "command of hand," that person had the advantage, but he preferred the *model* on which his own hand was formed. His writing was, in fact, more like that of a scholar, whilst the method explained in Hodgkin's *Calligraphia* exhibits more the appearance of the work of a writing-master; holding, however a middle place between the neatness of Porson and the wonderful accuracy of the country schoolmaster who made the fac-simile of the Oxford Pindar in the British Museum.

Upon the establishment of the London Institution, his friends obtained for him the very desirable appointment of principal librarian, with a salary of L.200 a year, and apartments in the house of the Institution, which was then in the Old Jewry; but although the arrangement was highly honourable to all parties, the librarianship was little more than a sinecure. Porson was, however, in the habit of attending in his place when the reading-room was open, and of communicating very readily all the literary information that was required by those who consulted him respecting the object of their researches. Had the inhabitants of Finsbury Square and its neighbourhood been more disposed to classical studies, and had the librarian of the Institution survived to witness its completion and prosperity, his sphere of utility would without doubt have been greatly extended.

But it must ever be lamented that Porson's habits of life had unfortunately been such as to lay a foundation for a multitude of diseases. He suffered much from asthma throughout the year 1808; his memory began to fail him a little; and in the autumn he had had some symptoms of intermittent fever. On Monday the 19th of September he had an apoplectic attack in the street, and he was carried to a neighbouring poor-house in a state of insensibility. The next day an advertisement appeared in one of the papers, relating the accident, and describing some manuscripts which were found in his pocket, consisting of Greek fragments and algebraical characters. His friends at the London Institution immediately went in quest of him. He was afterwards well enough to appear in the library, and to receive a visit there from Dr Adam Clarke; but his speech was impaired, and his faculties evidently imperfect. He survived only through the week, and died in his forty-ninth year, on Sunday the 25th of September 1808, at midnight.

He was buried at Cambridge, in Trinity College chapel, near the grave of Bentley and the monument of Newton. He founded by will an annual prize, to be given to the best Greek translation from an English dramatic author; and several specimens of the successful pieces have been published from time to time in the *Classical Journal*. His books were sold by auction, and many of them found purchasers at high prices, especially such as were enriched with any of his manuscript notes in their margins; but more than two hundred of these, which appeared to be the most valuable, were withheld from the sale, and were afterwards purchased, together with the whole of his manuscript papers, by the Society of Trinity College, for the sum of a thousand guineas. He left a sister, married to Mr Siday Hawes, of Coltishall, Norfolk. His brother Thomas kept a boarding-school at Fakenham, and died without issue in 1792; his second brother, Henry, was a farmer in Essex, and died young, leaving three children. His father had lived to seventy-four, his mother to fifty-seven.

The principal works of Porson are his *Letters to Travis*, his four plays of Euripides with their prefaces, and the manuscript copy of Photius; the rest, though somewhat voluminous, are chiefly miscellaneous annotations upon detached passages of a multitude of ancient authors. We find nothing in the nature of theory, or of the discovery of general laws, except some canons, which he has laid down, chiefly as having been used by the Greek tragedians in the construction of their verses. These are chiefly contained in the preface to the *Hecuba*, together with its supplement. 1. The first is, that when a tragic iambic ends with a trisyllable or a cretic, this word must be preceded either by a short syllable or by a monosyllable. For example, an ancient tragedian would not have written the line Ἔχοι δὲ μήποτ' ἐξ ἀπευκτοῦ δώματος, though it might have been unexceptionable in a comedy. It seems to have been about the year 1790 that Porson first made this observation. He certainly did not attend to it in his own serious translation of the *Epitaph on Alexis;* but it was mentioned in 1791, by one of Porson's intimate friends, in a moment of conviviality, whilst he was somewhat characteristically attempting to fill his glass out of an empty bottle; and the author of this article observed in answer, that it would certainly sound better, on such an occasion as then occurred, to say, Πᾶν ἐκπέπωκας· οὐδ' ἜνεσΤΙ κότταβος, than οὐ λελειπΤΑΙ κότταβος. 2. The second canon is, that an anapaest is only admissible in a tragic iambic, as constituting the first foot, except in some cases of proper names. This, indeed, had been cursorily hinted by Dawes. 3. The same critic had also remarked, that the Attic poets never lengthen a short vowel before a mute or aspirate, followed by a liquid, or a middle consonant followed by ρ; and Porson more amply confirmed the observation as very generally, though not universally, correct. On the other hand, Dawes had cursorily observed that Homer and the other ancient epic poets generally lengthened the vowel in such cases; and Porson's great rival, Hermann, has more fully established this distinction as affording a good criterion of antiquity. 4. There are also some original remarks of Porson on the cæsura, in iambics, and trochaics, and anapaests. He showed that the scenic poets do not elide the final iota, and that the tragedians do not employ the preposition περὶ before a vowel; and some other general laws, of greater importance than these, may probably be found in some of his publications, which it will now be necessary to enumerate in the order of time.

1. His first attempts as an author consisted of some anonymous articles in Dr Maty's *Review*, beginning with a part of Shutz's *Æschylus*, June 1783, *Tracts*, ii. Brunck's *Aristophanes*, July 1783, *Tracts*, iii.; *Mus. Crit.* ii. 113; written in a day. In Latin, by Schäfer, *Class. Jour.* v. 136. Weston's *Hermesianax*, April 1784, *Tracts*, iv. Huntingford's *Apology for his Menostrophics*, August 1784, *Tracts*, v. *Account of the Learned Pig*, April 1785, *Tracts*, vi. Note, with letters of Le Clerc and Bentley, April 1786, *Tracts*, vii.

2. He added some Notes to an edition of Xenophon's *Anabasis*, published by Nicholson at Cambridge, 4to and 8vo, 1786. They are addressed *Lectori si quis erit.*

3. Three Panegyrical Epistles to Sir J. Hawkins, *Gent. Mag.*, August, September, and October 1787; *Tracts*, ix.

4. Notes on *Toupii Emendationes in Suidam.* Oxford, 8vo, 1790. Written in 1787.

5. Letters on the Three Witnesses, *Gent. Mag.*, Oct. and Dec. 1788; Feb., April, May, June, Aug. 1789; Feb. 1790. The last was reprinted in *Tracts*, xix.; most of the others in the collection of *Letters to Mr Archdeacon Travis*, in answer to his defence of the *Three Heavenly Witnesses*, London, 8vo, 1790. These letters are generally considered, by critics of all parties, as finally decisive of a question which had often been agitated before, but never so learnedly argued, nor so satisfactorily discussed in all its bearings.

6. In the *Monthly Review*, Robertson's *Essay on the Parian Chronicle*, Jan. 1789, *Tracts*, xiii.,—satisfactorily answering the principal part of the objections alleged against the authenticity of that monument. Edward's edition of the work attributed to Plutarch, *On Education*, July 1793, *Tracts*, xxi. Payne Knight's *Greek Alphabet*, Jan. 1794, *Tracts*, xxiii. Pybus's *Sovereign*, Dec. 1800; an article affording a good specimen of his talent for humour.

7. He is supposed to have written some remarks on an *Essay upon the Transfiguration*, but never expressly acknowledged them. *Tracts*, xv.

8. He added a few short Notes to the London edition of Heyne's *Virgil*, 8vo, 1793, for which he made an agreement with the bookseller to correct the press; but he complained that his corrections

were disregarded; and in fact several hundred errors, of no great importance, were suffered to disfigure it.

9. He corrected the Greek text of Æschylus for the Glasgow editions, the folio of 1795, and the two volumes octavo, printed in 1794, but only published at London in 1806. The folio is said to have appeared surreptitiously. There are more than two hundred original corrections, and a further number of passages pointed out as corrupt.

10. In the *Morning Chronicle* he published, at different times, a variety of spirited articles of a temporary nature. One of the most amusing was the Nursery Song in Greek iambics, 13th of April 1796, called *A Fragment of Sophocles*, and signed "S. England," in ridicule of Ireland's pretended discoveries.

11. *Imitations of Horace. Spirit of the Public Journals*, 1797; *Class. Jour.* iv. 97.

12. The first four plays of Euripides appeared separately at different periods. The *Hecuba*, London, 1797, 8vo; Cambridge, 1802, with a Supplement and additional Notes; which were also published separately, London, 1808. *Orestes*, London, 1798, 1811. *Phœnissæ*, London, 1799, 1811. *Medea*, Cambridge, 1801; London, 1812. The four together, London, 1822.

13. *Collation* of the Harleian manuscript of the *Odyssey* for the Grenville *Homer*, Oxford, 1800, 4to; with some short Notes. Reprinted, *Class. Jour.* ix.

14. Of the review of Wakefield's *Lucretius*, in the *British Critic* for May 1801, the principal part appears to be Porson's.

15. A Letter signed by J. N. Dawes, *Monthly Mag.*, Dec. 1802, on some Greek constructions; admitting also an inaccuracy of his own with respect to a hiatus pointed out by Mr C. Falconer.

16. A Letter to Professor Dalzel, dated September 1803 (*Mus. Crit.* i., p. 326), in answer to some remarks published in the Professor's *Collectanea Majora*; with an Epigram respecting Hermann, in Greek and in English.

17. *Herodotus*, Edinburgh, 1806. Porson corrected the press for the first volume.

18. Supplement to some Indices, *Tracts*, xxxvi.

19. It is well known that Porson bestowed considerable pains on the restoration of the text of the *Rosetta Stone*. His Supplements were added to the plates engraved by the Society of Antiquaries; and they also appear amongst his *Tracts*, xxxvii. In Dr Clarke's *Greek Marbles* (Cambridge, 1809, 8vo) we find a translation of this inscription, communicated to the editor by Porson, and printed from "a *corrected copy* in his own beautiful handwriting." But we may here venture to apply Porson's favourite remark on the facility of transposition, and to read "a *copy corrected* in his own writing," that is, on the margin of Mr Gough's translation, as published in Duane's *Coins*; for the whole is very negligently performed; and it is not a little remarkable that this translation, which was at least approved by Porson, is decidedly less accurate than the Latin translation of Heyne, as appears from the investigation of the enchorial inscription published in the sixth number of the *Museum Criticum*.

20. A variety of Porson's fugitive and miscellaneous pieces have re-appeared at different times in the *Classical Journal*. *Authors cited by the Scholiast on Plato*, ii. 619; *Tracts*, xxxviii. *The Epitaph*, iii. 233; more correctly than in the *Tracts*, but still with a gross error in the punctuation of the last line, which stands, in a manuscript copy of his own, Τέθνηχ', ὃ δὴ τάχιστα πάσχοντ' οἱ 'γαθοί. This reading, though not very elegant, is at least more defensible than to make πάσχειν alone signify to die, and a phrase to end with ὃ δή. A *Charade* in Latin, vii. 248. Some *Notes on Æschylus*, vii. 456; viii. 15, 181; x. 114. A property of the lines employed in the 47th proposition of the first book of *Euclid*, p. 401. *Notes on Apollonius Rhodius*, xviii. 370.

21. *Adversaria* (Cambridge, 1812, 8vo), consisting of Notes on the Greek Poets, selected from his manuscripts, and arranged by Professor Monk and Mr C. J. Bloomfield. The first article is an interesting *Lecture on Euripides*, delivered upon his appointment to the Greek professorship. It is followed by a few miscellaneous observations, and by a large collection of Notes on Athenæus, on Euripides, on the *Fragments of the Tragic and Comic Poets*, on Stobæus, and on a variety of poets of miscellaneous descriptions. The volume was reprinted at Amsterdam without any alteration, but the sale of the foreign edition has never been permitted in Great Britain.

22. *Tracts and Miscellaneous Criticisms*, collected and arranged by the Rev. T. Kidd, M.A.; London, 1815, 8vo. Besides the articles already noticed as reprinted in this volume, there are a few Notes on Dawes's *Miscellanea Critica*, not before published, No. 51. There are also some supplementary pages of Simplicius and Cebes, reprinted by Porson for the use of his friends, as restored by Schweighäuser. The want of this leaf of the manuscript of Simplicius had given rise to the mistaken assertion that Xenophon was proclaimed a public benefactor at the Olympic games, on occasion of the return of the Ten Thousand. There are likewise some miscellaneous Notes on Athenæus, Menander, and Philemon, Aristides, Pausanias, and the lexicographers; and some Indices of authors quoted by the Scholiasts.

23. *Notæ in Aristophanem*, quibus Plutum comœdiam adjecit P. P. Dobree. Cambridge, 1820, 8vo.

24. Gaisford *Lectiones Platonicæ*. Accedunt R. Porsoni *Notæ ad Pausaniam*. Oxford, 1820, 8vo.

25. *Photii Lexicon*. Cambridge, 1822, 8vo.

To attempt to form a just estimate of the merit of such a man as Porson, without servilely following the dictates of common fame, or blindly adopting the opinions of others, is a task of no small difficulty, even to one who had the advantage of his personal acquaintance for the last twenty years of his life. But it may safely be conceded to common fame and to partial friendship, that he was one of the greatest men, and the very greatest critic, of his own or of any other age. "Nothing came amiss," says Mr Weston, "to his memory. He would set a child right in his twopenny fable book, repeat the whole of the moral tale of the *Dean of Badajoz*, a page of Athenæus on cups, or of Eustathius on Homer, even though he did everything to impair his mental faculties." It cannot, however, be denied that the talents, and even the industry, that he possessed, might have made him a much greater man had they been employed in some other department of human intellect. He might *probably* have been as great a statesman or as great a general as he was a scholar, and in these capacities his acquirements would have affected the interests of a much greater multitude of his fellow-creatures than can ever be benefited by the fruits of his erudition; and he might *possibly* have gained more popularity as an orator or a poet than his refined investigations of grammar and prosody could ever procure him, although it is not by any means certain that his fancy and invention could have been rendered by any cultivation at all comparable to his memory and acuteness. But as far as regards the possession of a combination of the faculties which he did cultivate, he appears to have been decidedly the most successful of any man on record in the same department. On the other hand, it must be admitted that the subjects of his pursuits were in their nature incapable of raising a man to the first rank amongst the permanent benefactors of the human race; and, if we calmly consider the ultimate objects of prosody and metre, it will appear almost unfair to allow the discoverer of the prosodiacal rules adopted by the ancient poets in their melodrames and choruses, to rank so very high amongst the luminaries of an age, and yet to look down with so much contempt, as we are accustomed to do, on the character of a modern *dieu de la danse*, notwithstanding that he thought himself the third great man of his day, with Voltaire and the King of Prussia, for having given soul and sentiment to the measures and movements of the choric representations of the present times.

Amongst the talents of Porson, however, which were so far superior to the importance of the objects on which they were employed, we ought not, perhaps, to consider his remarkable strength of memory as the most to be envied, since many persons who have been possessed of singular and almost miraculous, not to say morbid, memories, have been but little distinguished by any other faculty. But it must be repeated, that Porson's judgment and acuteness were really almost paramount to his memory; and with the addition of these faculties, his memory naturally rendered him capable of much that would have been impossible without it.

The respect that is justly due to classical learning has frequently been exaggerated in this country, partly perhaps on account of the awe which is naturally entertained by an ingenuous mind for its instructors in the earliest studies, by which it is advanced towards maturity. And classical learning having most wisely been placed by our ancestors the foremost in the order of a liberal education, which is most commonly adopted in Great Britain, a personal as well as a general respect has been involuntarily paid to the characters of the individuals concerned, and to the dignity of all those who are engaged in similar occupations; besides that, the means being, by a most frequent inattention of the human mind, confounded with the end for which they are sought, the words and syllables, and the phrases and measures of the Greek and Latin authors, have often been the almost frivolous occupation of a valuable life, instead of that of a few of the years of boyhood, which it was intended to devote to them, and which could not have been so well engaged in any other way. It is, however, wholly unjust to stigmatize the study of the classics, and of languages in general, as being confined to words instead of things; for it is utterly impossible that words can be learned without the acquisition of a considerable degree of knowledge of the things to which they relate, and of the historical facts which they have been employed to express, and without an involuntary modelling of the mind to the elegance and elevation of sentiment which pervade the works of those authors who are habitually put into the hands of boys in the course of their elementary studies; an acquirement which is of still greater value to the orator and the statesman than the command of language, and facility of expression, and beauty of imagery, and power of reasoning, which he derives from a perfect familiarity with the great masters of antiquity. But granting all the respect that can possibly be claimed for ancient literature, we cannot but lament that such a man as Porson should have lived and laboured for nearly half a century, and yet have left little or nothing to the world that was truly and originally his own.

After the full admission of the very high rank which is due to the comparative merits of Porson's talents and acquirements, it may be thought almost idle, if not invidious, to dwell on any trifling exceptions to their magnitude. The English critics have been reproached, and not without some foundation, as paying too servile a deference to Porson's opinions; and it seems to have been very generally believed amongst them that it was scarcely possible for him to commit an error or an oversight.

Although Porson was in many respects irregular, and often idle, or even intemperate, yet what he did perform as a critic may be allowed to leave a large balance, at the end of his life, in favour of his general industry, when compared with that of most of his countrymen. It has indeed been asserted, and perhaps with truth (*Classical Journal*, xxi.), that "with things Porson appears to have possessed but a very inconsiderate acquaintance; and not a trace is to be found amidst his writings of that combination of universal encyclopædiacal knowledge with language learning which is so abundantly found in the *Dissertation on Phalaris*, and the countless pages of Scaliger, Salmasius, and Casaubon." Certainly, however, neither Salmasius nor Casaubon, with all their learning, much less Scaliger, with all his industry and parade, nor even Bentley himself, with all his talent and acuteness, was at all comparable to Porson in his own department, that is, as a sound, accurate, and refined Greek critic.

But it must be confessed that at Cambridge, even although Porson had resolved to make the classics his principal study, and although there had not yet been many instances of senior wranglers who were also senior medallists, it was scarcely reputable for a man with his undeniable abilities to be only the twenty-first of his year in mathematics. Amongst the literary objects also which afterwards engaged his attention, he might easily have found time for the study of some of the modern languages; and he might have derived essential benefit from it on many occasions of critical research. He had, indeed, read a good deal of French, but very little Italian. He had studied the Anglo-Saxon, but he knew nothing of the kindred dialects of the north of Europe, in which it is preserved almost entire; and he was wholly unacquainted with oriental literature. He might have profited materially by some of these studies, in deriving from them a clearer conception of the distinctions of the tenses than he seems to have possessed, and he might have enlightened us in no small degree, with respect to the history of languages and of nations, by such etymological investigations as his comprehensive mind, thus employed, would have rendered him peculiarly capable of pursuing with success.

It has been candidly and very truly admitted by a rival critic in Germany, that Porson committed fewer errors than almost any other person; but it is right to be aware that he has now and then committed some errors, even where he would have been expected to be the most correct. There is, for example, a very strange oversight in one of the criticisms contained in his early review of Weston's *Hermesianax*, which implies a palpable blunder with respect to the gender of a particle, *Ζωρὸν μετροῦσα θυῶν πορφυρέης Λυσβιον ἐὲ ὑέλου*, "the cup of purple glass, which *measured* the fragrant wine;" and even in a subsequent correction of the same passage, published in his *Adversaria*, he has changed the gender of an adjective in a way that is at least very unusual, if not wholly without example, *μετροῦν θυόεντα*. A mere omission, in a criticism on another author, would scarcely be called an error in an ordinary person; but in such a critic as Porson, it is very remarkable that he should have neglected to notice, in his catalogue of the *Errors of Le Clerc*, omitted by Bentley, (*Adv.* p. 291), the grossest of all Le Clerc's blunders, which is the quotation of the word *Hypophauli* or *semi-barbarous*, from Pollux, with the translation *Sartagines*, or *frying-pans;* whilst the real text of Pollux simply and plainly states that the *Teganismi* or *fricassations*, in the *Hippocomus Menander*, is *a semibarbarous word.* These instances, which have occurred in a very cursory perusal of some of Porson's works, would certainly not deserve to be noticed in a general sketch of his character, any otherwise than as exceptions to his perfect infallibility.

It can scarcely be considered as an imperfection in the constitution of Porson's mind, that he wanted that amiable vanity which is gratified by the approbation even of the most inconsiderable, and which delights to choose for its objects the most innocent and the most helpless of those who are casually present in society. It has been observed that he would neither give nor take praise; and when he was told that somebody had called him a giant in literature, he remarked that a man had no right to tell the height of that which he could not measure. In fact, having learned "to know how little can be known," it is not surprising that he found himself "without a second, and without a judge;" and that he was unwilling to affect a community of sentiment, and an interchange of approbation with those whose acquirements and opinions he felt that he had a right to despise. It might have been wiser, in some instances, to conceal this feeling; but, on the other hand, he had perhaps occasion for something of the habit of retreating into his conscious dignity, from his deficiency in those general powers of ephemeral conversation which are so valuable in mixed societies; for, with all his learning and all his memory, he was by no means prominent as a talker. He had neither the inclination nor the qualifications to be a fascinating story-teller, or to become habitually a parasite at the tables of the affluent; but he was the delight of a limited circle of chosen friends, possessing talent enough to appreciate his merits, and to profit by the information that he afforded them.

There has not yet been a Life of Porson that has collected all the particulars that would deserve to be recorded by a biographer who undertook the task on an extensive scale; but of detached documents there is no deficiency.

Kidd has pointed out almost every work in which his name has been mentioned. The most material articles relating to him will be enumerated here.

Morning Chronicle, 6th October 1808; *A Short Account of the late Mr Richard Porson, with some particulars relative to his extraordinary talents*, by an admirer of great genius (the Rev. S. Weston), Μηκέτι πάπταινε κόρσιον (*Look for nothing beyond him*), London, 1808, 8vo; re-published, with some additions, under the title of *Porsoniana, or Scraps from Porson's Rich Feast*, London, 1814, 8vo; Bloomfield's Sapphic Ode, *Class. Journ.* i. 1.; *Some anonymous Iambics*, p. 81; *Sale of his Library*, p. 385; *Athenæum*, iv. 426, 521; v. 55; *Class. Journ.* ix. 386; Savage's *Librarian*, i. 274; *Gentleman's Magazine*, lxxviii.; *Monthly Magazine;* Dr Adam Clarke's *Narrative; Class. Journ.* ii. 720; *Correspondence of Wakefield and Fox*, London, 1813, 8vo; Greek Epitaph, *Class. Journ.* xxiii. 179, making Porsōnum equal to Newtŏnus; Aitken's *General Biography*, x., London, 1815, 4to; Kidd's *Imperfect Outline*; *Tracts*, 1815; Chalmers's *Biographical Dictionary*, xxv., London, 1816. (T. Y.)

PORT, a harbour, river, or haven, formed either by nature or art to receive and shelter shipping from the storms of the open sea.

Port is also a name given on some occasions to the larboard or left side of the ship, as in the following instances: Thus, it is said, "the ship heels to port," that is, stoops or inclines to the larboard side. "Top the yard to port," the order to make the larboard extremity of a yard higher than the other. "Port the helm," the order to put the helm over the larboard side of the vessel. In all these senses this phrase appears intended to prevent any mistakes happening from the similarity of sounds in the words *starboard* and *larboard.*

Ports, the embrasures or openings in the side of a ship of war, wherein the artillery is ranged in battery upon the decks above and below.

PORTADOWN, a market-town of Ireland, in the county of Armagh, on the Upper Bann river, which is here crossed by a fine bridge 10 miles N.E. of Armagh, and 84 N. by W. of Dublin. It is well built and paved, containing a parish church in the early English style; also Presbyterian, Methodist, and Roman Catholic places of worship, endowed and national schools, a good market-house, a dispensary, and a loan society, which has done much for the encouragement of industry in the neighbourhood. The manufacture of linen, lawn, cambric, &c., gives employment to many of the inhabitants; and the town contains besides, large corn-mills, a manufactory of steam-engines and other machinery, and a soap and candle work. Markets for the sale of cattle, pork, and rural produce are held at Portadown on Saturdays; and there are also monthly and annual fairs. Pop. (1851) 3091.

PORTAFERRY, a seaport and market-town of Ireland, in the county of Down, near the entrance of Lough Strangford, 7 miles N.E. of Downpatrick. It contains places of worship belonging to the Established Church, the Presbyterians, Methodists, and Roman Catholics; two public schools, a market-house, and a dispensary. There are also here a distillery and a quay. Many of the women of the town are employed in embroidering muslin for the Glasgow market. An active trade is carried on in coal, timber, and agricultural produce. There is a ferry here across to Strangford, on the other side of the lough. Besides weekly markets, four annual fairs are held here. Pop. (1851) 2074.

PORTALEGRE, a town of Portugal, in the province of Alemtejo, on a hill in the midst of a beautiful and fertile region, containing extensive chestnut forests, 49 miles N.N.E. of Evora. It is walled, but derives its chief strength from its position. The streets are narrow, steep, and irregular; but the houses are in general well built. The chief buildings are the Gothic cathedral and episcopal palace. Woollen cloth is manufactured here; and timber and chestnuts are exported to Lisbon. Pop. 5800.

PORTARLINGTON, a market-town and parliamentary borough of Ireland, partly in King's and partly in Queen's County, on the Barrow, which is here crossed by two bridges, 44 miles W.S.W. of Dublin. The principal public buildings are two Protestant churches (one of which is a fine edifice with a lofty spire), a large Roman Catholic chapel, and a Methodist meeting-house, two national and two free schools, a market-house, dispensary, and savings-bank. Soap and candles are manufactured here; and there are eight annual fairs. The town was founded by Lord Arlington, from whom it derives its name; but afterwards it was forfeited to the crown, and under William III. it was settled by many French and Flemish Protestants, who built the two churches of the town. In one of these the service was conducted in French till 1817. Portarlington returns a member to Parliament. Pop. (1851) 2728.

PORT-AU-PRINCE. See Port Republicain.

PORTCULLIS (Fr. *coulisse*, from *couler*, to slip down), is an assemblage of several large pieces of wood, joined across one another like a harrow, and each pointed with iron at the bottom. They are sometimes hung over the gateway of old fortified towns and castles, ready to be let down in the case of surprise, when the gates cannot be shut.

PORT ELIZABETH, a seaport-town of Cape Colony, South Africa, on the W. shore of Algoa Bay, 18 miles S.E. of Uitenhage. It contains churches belonging to Episcopalians, Wesleyans, Independents, and Roman Catholics; an arsenal, court-house, and jail. There is a harbour, which is, next to Cape Town, the most frequented in the colony, and a pier projecting 350 feet into the sea. The commerce of Port Elizabeth is great, and rapidly increasing. The number of ships that entered the harbour in 1855 was 163, tonnage 26,914; those that cleared 160, tonnage 26,045. The total value of the imports in the same year was L.376,638, and that of the exports L.584,447. Pop. upwards of 4000.

PORTER, a kind of malt liquor which differs from ale and pale beer, in its being made with high-dried malt. (See Brewing.)

PORTER, Jane, a popular novelist, was born at Durham in 1776, and spent her childhood in Edinburgh. A love for the marvellous, and a sentimental admiration for human excellence, increased with her increasing strength, and fitted her for becoming a popular story-writer. Accordingly in 1803, after her removal to London, she entered upon a successful career as a novelist by the publication of *Thaddeus of Warsaw.* The book gained for her at once a European reputation. She saw it translated into several of the continental languages; she was elected a lady canoness of the Teutonic order of St Joachim; and she received from a relation of Kosciusko a gold ring containing the portrait of that hero. Scarcely less effective was her next important work, the *Scottish Chiefs*, published in 1809. It is true that it failed to realize the scenes, the costumes, the manners, and the characters of the story; yet to mere novel readers the melodramatic exploits and the astounding chivalry of Wallace and Bruce were profoundly affecting. The ablest, however, of all her publications was probably *Sir Edward Seaward's Diary*, which appeared in 1831. So life-like were the representations in that work of fiction that a grave and pompous critic mistook it for a professed historical treatise. He laboriously rummaged the dusty collections of Admiralty records and Indian maps to test the accuracy of the incidents, and solemnly and triumphantly refuted them in one of the leading reviews. The latter part of Miss Porter's life was spent in paying lengthened visits to her relations and numerous friends. She died in May 1850, at the house of her eldest brother, an eminent physician at Bristol. Anna Maria, the younger sister of Jane Porter, was the author of several popular novels.

Porter, *Sir Robert Ker*, a well-known artist and traveller, was the brother of the preceding, and was born at Durham in 1780. A determination to be a painter began to characterize him while passing his boyhood in Edinburgh. He persisted in making sketches from his own fancy, until his mother, in 1790, took him up to London and enrolled him among the students of the Royal Academy. A few years only had been spent there when he boldly made his appearance as an artist by profession. Several altar-pieces were painted, and were either sold or presented to several churches. The "Storming of Seringapatam," the "Siege of Acre," and the "Battle of Agincourt," all large pictures, were executed, and London was invited to see them exhibited. No enterprise, in fact, was too great for the youthful aspirant to attempt. Venturing to push his fortune in Russia, he procured the appointment of historical painter to the Czar in 1804, and won the hand of the daughter of Prince Theodore de Sherbatoff in 1811. By this time Porter had begun to enter upon a new and more exciting sphere of action. The winter of 1808–9 saw him sharing in the hardships and glories of the campaign of Sir John Moore. From 1817 to 1820 he was journeying in the East, and with the aid of both pen and pencil recording what he saw in his travels. Between 1826 and 1841 he was residing as British consul at Venezuela in South America. Leave of absence had been obtained, and he was paying a visit to St Petersburg, when a stroke of apoplexy suddenly carried him off in May 1842. Ker Porter, at the time of his death, had gained considerable reputation. The title of Knight Commander of the Order of Hanover, which had been conferred upon him in 1832, shows how much his talents as a warrior and a diplomatist were esteemed. His literary gifts were also well known from the following works:—*Travelling Sketches in Russia and Sweden*, in 2 vols. 4to, 1808; *Letters from Portugal and Spain*, 8vo, 1809; *Narrative of the late Campaign in Russia*, 4to, 1813; and *Travels in Georgia, Persia, Armenia, Ancient Babylonia, &c. &c., during the years* 1817–20, in 2 vols. 4to, 1821–22.

Porter, *George Richardson*, an eminent statist, was born in London in 1792, and was educated at Merchant Taylors' School. A failure which he made in the trade of a sugar-broker was the occasion of bringing him into notice. Driven to literature, he published a paper on Life Assurance in the *Companion to the Almanac* for 1831, which introduced him to the acquaintance of Mr Charles Knight. That well-known publisher was instrumental not long afterwards in procuring for him the office of superintendent of the statistical department in the Board of Trade. Placed in this congenial situation, he soon had the opportunity of showing to the best advantage his skill in digesting and tabulating the most incongruous materials. His great work, *The Progress of the Nation*, which he began to publish in 1836, established his reputation as a statist. His growing skill in his official duties also recommended him in 1841 to the post of one of the joint secretaries of the Board of Trade. He was still holding this situation when he died at Tunbridge Wells in 1852, in consequence of inflammation, which had been caused by the sting of a gnat.

PORTEUS, Beilby, an eminent dignitary of the Church of England, was born at York in 1731, and was educated for holy orders at Christ's College, Cambridge. A Seatonian prize poem *On Death*, which appeared in 1759, gave him the start on the road to eminence. Attracting the notice of Dr Secker, Archbishop of Canterbury, he was presented to several benefices. The conscientious manner in which he discharged his ministerial duties, and the impressive and eloquent style in which he preached, soon secured for him the patronage of the queen. His prospects of promotion accordingly became certain. In 1769 he was appointed chaplain to George III.; in 1776 he was raised to the see of Chester; and in 1787 he was transferred to the see of London. Occupying this high position, Bishop Porteous used all his power and influence to promote the interests of religion. He established a fund for the relief of the poorer clergy of his diocese. He founded three prizes in Christ's College, Cambridge, as an incitement to the study of Christianity, both theoretical and practical. He also at his death, in 1808, bequeathed his library for the use of his successors in the metropolitan see. The collected works of Bishop Porteous, containing sermons, pamphlets, a *Life of Archbishop Secker*, and a *Summary of Christian Evidences*, and accompanied with a memoir of the author by the Rev. R. Hodgson, were published in 6 vols. 8vo, London, 1816.

PORT-GLASGOW, a parliamentary and municipal burgh, and a sea-port town of Scotland, in the county of Renfrew, on the south bank of the Firth of Clyde, about 15 miles below Glasgow and 3 above Greenock. This place originally formed part of the adjoining parish of Kilmalcolm, and consisted of the small village of Newark, so called from the barony of that name, which lay in its immediate vicinity. On a point of land projecting into the river, a little above the town, stands the ancient and now deserted castle of this barony. The ground on which the town stands was, in 1668, purchased from Sir Patrick Maxwell of Newark by the magistrates of Glasgow, with a view to provide a convenient harbour for the vessels belonging to the merchants of that city. In 1695 the place was detached from the parish of Kilmalcolm, and, with a few adjacent farms, erected into a distinct parish. It was called New Port-Glasgow, or more commonly Port-Glasgow, a name simply expressing the design of its erection as the port or harbour of Glasgow. In 1775 it was created a burgh of barony; and by the Reform Act of 1832 it became a parliamentary burgh, uniting with Kilmarnock, Rutherglen, Dumbarton, and Renfrew, in returning a member.

The town is romantically situated at the foot of a hill, which, covered with wood and verdure, exhibits a beautiful object to travellers passing along the river. It is one of the most handsome and regularly-built seaport-towns of Scotland. The streets are straight, and for the most part cross each other at right angles; whilst the houses, pretty nearly equal in size, and generally white-washed, give to the whole a light and uniform appearance. The only buildings worthy of particular notice are the town-house and the parish church. Of these, the former is of plain but substantial workmanship, ornamented in front with a portico, resting on four massy fluted columns, surmounted with a handsome spire, which rises from the centre. The parish church, built in 1823, is square in form, and plain but handsome in appearance. A commodious chapel of ease was built in 1774. The other places of worship in the parish belong to the Free and the United Presbyterian churches. Port-Glasgow has also an endowed school, two parish schools, a public library, and two reading-rooms.

Attached to this port are two capacious harbours, substantially built, and completely sheltered. The first dry or graving-dock in Scotland was constructed here in 1762, and has since been improved at great expense. More recently a wet-dock has been constructed in the bay of Newark, which admits vessels drawing 25 feet of water. It is provided with spacious quays and commodious sheds, cranes, and other conveniences; and possesses extraordinary facilities for ingress and egress, owing to the great depth of water in the roads and entrance. With all these advantages, Port-Glasgow now affords shipping accommodation of a very superior description. The trade of the place was at one time chiefly carried on in ships belonging to Glasgow merchants; but the inhabitants have of late themselves become shipowners.

The foreign trade is chiefly with the West Indies and North America. It is the principal place on the Clyde for the importation of North American timber, for the reception of which it has large wood-ponds. The number of sailing-vessels registered at Port-Glasgow, 31st December 1857, was 54, tonnage 5706: of steam-vessels 8, tonnage 1192. In 1857 there entered the port 124 sailing-vessels, tonnage 51,324; and there cleared 44 sailing-vessels, tonnage 29,410; and 10 steam-vessels, tonnage 3695. The improvements in the navigation of the Clyde, and the rise of Greenock, have proved injurious to the prosperity of Port-Glasgow. Its coasting trade was at one time very considerable; but owing to the facility with which vessels of small burden now find their way up the river, nearly the whole of this branch has been transferred to Glasgow. The work of ship-building is carried on here to a considerable extent. Of late years a great number of iron steamboats have been produced, some of them of the largest size. The manufacture of ropes and sail-cloth has been prosecuted for about a century. A considerable business is carried on in sugar-refining. Pop. in 1831, 5192; in 1841, 6973; and in 1851, 6986.

PORTICI, a town of Naples, in the province of Naples, on the shore of the Bay of Naples, 4 miles S.E. of the capital, with which it is connected by railway. It contains a royal palace, which was formerly used as a museum for the antiquities of Herculaneum and Pompeii. These, however, have been removed to Naples; and the palace has thus lost its chief attraction. It still possesses, however, some good pictures by modern French artists. Portici is a favourite resort during the autumn of the higher classes of Neapolitans. It has a harbour protected by a mole, a church, convent, barracks, and ribbon manufactory. Fishery and the coasting trade are actively carried on here. Pop. 6200.

PORTICO. See *Glossary* to ARCHITECTURE.

PORT-JACKSON, an inlet of New South Wales, in the county of Cumberland, has an entrance about 2 miles wide, between steep cliffs, called the North and South Heads; S. Lat. (of the South Head, on which is a lighthouse, 345 feet above the sea) 33. 51., E. Long. 151. 18. It is 15 miles in length, and has several arms and creeks stretching into the land. The anchorage is everywhere good and well sheltered. On the south shore, about 6 miles from the entrance, stands Sydney.

PORTLAND, ISLE OF, a peninsula and parish of England, in the county of Dorset, is joined to the land by Chesil Bank, which is a narrow ridge of clay covered with shingles, about 10 miles in length. The isle itself is about 4 miles in length by 2 in breadth; and it terminates in a rocky promontory called the Bill of Portland, on which stand two lighthouses,—the one 130, and the other 197 feet above the sea, N. Lat. 50. 3., W. Long. 2. 26. It consists of oolitic limestone, and slopes gradually from a height of 490 feet to within 30 feet of the sea. Portland Isle is approached from the land by a wooden bridge 600 feet long. It contains the castle of Portland, built by Henry VIII. in 1520; the Bow and Arrow Castle, a rudely-built tower, said to have been erected by William Rufus; a convict prison, erected in 1849; and several small villages. There are also here extensive quarries of Portland stone, with which many of the public edifices in the kingdom have been built. A harbour of refuge is in process of being constructed at Portland by means of a breakwater from the north end of the isle, partly inclosing Portland road. It is intended to be 2500 yards long, and to extend to a distance of 1¾ miles from Weymouth pier, thus sheltering from the S.E. an area of 2107 acres at low-water; while Chesil Bank forms a natural breakwater on the S.W. The work was begun August 11, 1847, and up to March 31, 1857, it had been extended to a length of 5145 feet by the deposition of 2,667,905 tons of Portland stone. The sum expended, from the beginning of the works up to March 31, 1857, was L.627,585. Pop. of the parish of Portland (1851), 5195.

PORTLAND, a seaport-town of the United States of North America, in the state of Maine, stands on the W. shore of Casco Bay, 60 miles S.S.W. of Augusta, and 105 N.E. of Boston, N. Lat. 43. 4., W. Long. 70. 46. It is built on what was originally an island, but is now connected with the continent by a neck of land only a few yards wide. It is about 3 miles in length from E. to W., and terminates at the E. in Munjoy, and at the W. in Bramhall's Hill, the former 156 and the latter 171 feet above the sea. Between these two eminences there is an elevated ridge, along which runs the principal street of the town. A broad street lined with wharves extends along the edge of the water for about 2 miles, and is intended to be continued round the whole peninsula. The houses of Portland, which are for the most part of brick, are regularly built, and many of the streets are very elegant. The beauty of the town is also much enhanced by the many shady trees which grow in different parts of it. Of these there are, it is calculated, no fewer than 3000 in all. One of the most conspicuous edifices is the custom-house, which is three storeys high, surmounted by a dome 75 feet above the ground, and adorned in front with a portico of eight fine columns. The city-hall and court-house are both handsome buildings. There are in all 26 churches in Portland belonging to various sects, and most of them built of wood. The number of schools in the town and neighbourhood is 25, with 57 teachers and an average attendance of 3600 pupils; and the sum devoted to the purposes of education in 1852-3 was L.4272. Portland has several scientific and literary associations, the chief of which are the Society of Natural History, numbering about 275 members, and possessing an excellent museum; and the Athenæum, which has a library of 8000 volumes. The town contains 6 banks and 11 newspaper offices. The manufactories of Portland comprehend a large sugar establishment, covering 1½ acres of ground, and employing about 200 hands; the Portland Company, for the manufacture of locomotive steam-engines, railway carriages, and all kinds of machinery. The latter was established in 1847, employed in 1854 about 325 hands, and had built up to that date 90 railway locomotives, besides steam-boat engines and other pieces of machinery. Ship-building is another branch of industry extensively carried on at Portland. The number of vessels built in the district during the year 1854 was 40, tonnage 30,195. The total shipping of the port, June 30, 1852, was 77,575 tons registered, and 28,403 tons enrolled and licensed. In that year there entered the port from foreign countries 384 vessels, tonnage 57,610; and there cleared for foreign countries 443 vessels, tonnage 69,893. The commerce of Portland is extensive and rapidly increasing. The total value of the exports in 1854 was L.627,985; and of the imports, L.650,970. The harbour of Portland is very good. It is easy of access, not being obstructed by any bar, and it is safe and well sheltered. Vessels of the largest size can enter or leave the harbour at all states of the tide; and there are numerous wharves and piers accessible for vessels drawing from 18 to 28 feet. Portland is connected by railway with Boston, and the other great cities of the United States on the one hand, and with Quebec, Montreal, and Toronto on the other. It has therefore a very advantageous position for commercial purposes; and to this position it owes not a little of its advancement and prosperity. The total amount of real and personal estate at Portland in 1857 was valued at L.4,661,180. Pop. (1850) 20,819; (1855) 27,090.

PORTLAND VASE, a celebrated funeral vase, long in possession of the Barberina family, but which was purchased by Sir William Hamilton, and afterwards passed to the Duchess of Portland for 1000 guineas. Its height is about 10 inches, and its diameter where broadest 6. There are upon it a variety of figures of most exquisite workmanship, in bas-relief, of white opaque glass raised on a ground of deep blue glass, which appears black except when held against the light. It seems to have been the work of many years, and there are antiquaries who date its production several centuries before the Christian era; since sculpture was declining in excellence even in the time of Alexander the Great. It was deposited in the British Museum in 1810 by the Duke of Portland.

PORT LOUIS, the capital of the island of Mauritius, on a small bay formed by basaltic and partially-wooded hills near the N.W. extremity of the island; S. Lat. 20. 10., E. Long. 57. 29. The streets are regular, though narrow, and some of them are planted with beautiful acacias. The houses are low, and built for the most part of wood. Behind the town lies an open space called the Champ de Mars, which is lined with many elegant villas. The chief buildings are the large and convenient barracks, hospital, bazaar, theatre, public library (containing more than 60,000 volumes), court-house, college, and botanic garden. The harbour is good and well sheltered, but it is difficult of access, on account of a coral reef at its mouth. During the season of hurricanes the anchorage is not safe, except for a small number of vessels. Port Louis is a convenient port for repairing vessels, and has docks for that purpose. The harbour and town are defended by fortifications of some strength. Pop. 35,000.

PORT MAHON. See MINORCA.

PORTO ALEGRE, a town of Brazil, in the province of Sao Pedro do Rio Grande do Sul, stands on the Jacuhy, near its mouth in Lake Patos, 150 miles N.N.W. of Rio Grande. It is regularly and well built, and contains several churches, a custom-house, hospital, lyceum and other schools. The harbour is much frequented by merchantmen, and an active trade is carried on. Pop., with the suburbs, 12,000.

PORTOBELLO, a parliamentary and municipal burgh of Scotland, and a suburb of Edinburgh, in the county of Mid-Lothian, on the S. shore of the Frith of Forth, 3 miles E. of Edinburgh. The older streets are narrow, but there are many elegant streets of recent erection. There are here places of worship belonging to the Established Church, the Free Church, the United Presbyterians, Episcopalians, Independents, and Roman Catholics. Portobello is much resorted to during the summer for bathing. The beach is sandy and gently sloping; and the town contains hot and cold baths. Many of the inhabitants are employed in the manufacture of bricks and tiles, pottery, flint-glass, and paper; and there are salt-works at the village of Joppa, which is within the limits of the burgh. The burgh is governed by a provost and nine councillors; and it unites with Leith and Musselburgh in returning a member to Parliament. Pop. (1851) 3497.

PORTO FELIX, a town of Brazil, in the province of Sao Paulo, on the left bank of the Tiete, 50 miles W. of Sao Paulo. It stands in a beautiful, rich, and salubrious country, which produces sugar in large quantities, and feeds numerous herds of cattle. Pop. of the district, 10,000.

PORTO FERRAJO, a town of Tuscany, capital of the island of Elba, occupies a promontory on the N. coast of the island. It is fortified and defended by two forts on the hill above. There are in the town, which is well built, two parish churches, courts of law, a theatre, hospital, barracks, &c. Iron is exported from the mines in the vicinity; and there is an excellent harbour. Napoleon I. resided at Porto Ferrajo from May 1814 till February 1815. Pop. 4436.

PORTO MAURIZIO, a town of the kingdom of Sardinia, in the division of Nice, on the shore of the Gulf of Genoa, 40 miles E.N.E. of Nice. It stands on a hill projecting into the sea, and separating the bays of Oneglia and St Stefano. The bold and lofty position of the town, with its brilliantly-painted church in the centre; the quiet little port below, crowded with picturesquely-rigged boats; and the mountains which rise in the distance, combine to produce a very beautiful and characteristic picture. The town contains a convent, hospital, theatre, and schools. A trade in oil of good quality is busily carried on here; but the harbour is shallow, and inconvenient. Pop. 6481.

PORTO NOVO, a seaport of British India, in the district of South Arcot, presidency of Madras, at the mouth of the river Vellaur, 116 miles S. of Madras. It was at one time a place of much importance, but it suffered very severely in the wars of the British government against Mysore, and fell into a state of decay. It is now, however, in a more prosperous condition, chiefly on account of the extensive iron-works, which have been established here. The ore is obtained in abundance in the vicinity, and may be made into the finest steel. At Porto Novo, Hyder Ali, with an immensely superior army, was totally defeated by the British under Sir Eyre Coote in 1791.

PORTO RICO, a Spanish possession, one of that group of West India Islands called the Great Antilles, and the smallest of the four in population and extent, but yielding to none in fertility and general importance. It lies between N. Lat. 17. 56. and 18. 20., W. Long. 65. 40. and 67. 20., to the E. of Hayti, Cuba, and Jamaica, being separated on the W. from the first-named island by the Mona Channel, 75 miles in breadth, and having the Atlantic Ocean on the N., with the Caribbean Sea on the S. It is about 100 miles in length from E. to W., by 40 miles in average breadth, and contains an area of 3700 square miles. A chain of lofty mountains intersects it from E. to W.; the highest part, called Lugnilla, at the N.E. extremity of the island, being 3678 feet in height. Valleys, levels of table-land, and gentle declivities, all highly fruitful, are everywhere found embosomed in these mountains, which are themselves susceptible of cultivation to the very tops. To the N. and S. of this interior ridge, between it and the coast, are those richly fertile valleys which produce the chief wealth of the island. They are formed by smaller ridges of hills, which run N. and S. from the principal chain, and they are much more level than the valleys among the loftier mountains. The valleys of the N. and E. coasts are the richest and the most picturesque, the pasturage there being always verdant and luxuriant, from the abundant supply of rain which they receive; whilst those of the S. coast, though more productive of sugar, are often parched by excessive drought. Few countries of the same extent as Porto Rico are watered by so many streams. Seventeen rivers, taking their rise in the mountains, cross the valleys of the N. coast and fall into the sea. Some of them are broad and deep, and navigable for 5 or 6 miles from their mouths, which, however, are much obstructed by bars. These rivers are well stocked with excellent fish, and their banks are nearly all under cultivation. The south, west, and east coasts are well supplied with water, notwithstanding the unfrequency of rain, by several large streams, besides numberless rivulets. The coasts of the island are indented with numerous bays and creeks; and in some places there are lagoons extending to the length of 8 or 10 miles. The climate of Porto Rico is tropical; but it is healthy, and more favourable to Europeans than that of the adjacent islands. There are two rainy seasons here, the first occurring in May and the second in September. In August the atmosphere is oppressively hot, the thermometer being frequently above 90° of Fahrenheit; and during the coldest season it is never below 70° at noon. In September the rains descend like a deluge, and the rivers swell and overflow their banks, completely inundating the low lands. In October the weather becomes cooler, and in the following month the N. and N.E. winds generally set in, diffusing an agreeable coolness through the atmosphere. When the fury of the north wind abates, the most delightful weather is experienced. Hurricanes, the scourge of the West Indies, sometimes visit this island, generally between the months of July and October. The warmth and moisture of the climate foster a luxuriant vegetation. Ebony, cedar, lignum vitæ, mahogany, logwood, and other kinds of timber, grow in the forests; indigo, and many other valuable and medicinal plants, are also found in the island. Porto Rico exhibits a singular scarcity of indigenous animals. There are no venomous snakes or reptiles, no beasts of prey or indigenous quadrupeds of any kind to be found in the forests, scarcely any birds except parrots and water-fowl, and no noxious insects. But rats of an enormous size infest the country in great numbers, and sometimes commit dreadful ravages upon the sugar-canes.

The most valuable mineral productions of Porto Rico are copper, iron, lead, and coal. Gold is obtained from the streams; and there are two productive salt ponds. The principal employment carried on in the island is agriculture, as there are hardly any manufactures, and the mining operations, only recently commenced, attract little attention. Only about one-twelfth of the soil is under cultivation. Coffee, sugar, and tobacco are the crops principally raised; and there are also extensive farms for the rearing of live stock. The commerce of the island is very great. It is chiefly carried on with Spain and the United States; but also to a large extent with the other West Indian islands, with Great Britain and the British colonies. The quantity and value of the chief articles exported from the island in the years 1850 and 1855 were as follows:—

Articles.	1850.		1855.	
	Quantity.	Value.	Quantity.	Value.
Sugar (cwt.)	876,011	L.814.611	792,484	L.633,983
Coffee „	92,060	147,295	106,580	170,526
Cotton „	1,887	7,865	1,855	4,656
Hides „	4,256	10,212	6,271	15,050
Tobacco „	23,228	24,775	19,349	20,650

The total value of the exports was, in 1850, L.1,175,464, and in 1855, L.994,343. For the same years the quantity and value of the principal imports to Porto Rico were as follows:—

Articles.	1850.		1855.	
	Quantity.	Value.	Quantity.	Value.
Wheat flour (brls.)...	50,493	L.131,490	57,864	L.150,606
Cod-fish (cwt.)........	79,755	76,794	91,697	73,554
Cotton fabrics.........	...	135,644	...	183,408
Linen fabrics	...	64,608	...	69,499
Metals	...	159,375	...	60,493

The total value of the imports was, in 1850, L.1,044,406, and in 1855, L.1,157,178. In 1850 there entered the various ports of the island 1206 vessels, tonnage 132,041; and there cleared 1179, tonnage 131,767. In 1855 there entered 1317, tonnage 167,203; and cleared 1276, tonnage 163,477. The dues collected at the custom-houses of the island amounted in 1855 to L.24,674, being an increase of L.9445 over the preceding year. The principal seaports of the island are San Juan de Porto Rico (the capital), Mayagües, Ponce, Guayama, and Arecibo. The government and laws of the island resemble those of the other Spanish possessions in America. The supreme power in military affairs is in the hands of the lieutenant-general, who is also president of the Audiencia Real, the highest court in the island. The military force of Porto Rico consists of a regiment of infantry, a brigade of artillery, and a body of cavalry, besides a militia comprehending seven battalions of infantry and a regiment of cavalry. The religion of the island is Roman Catholic, and it forms the see of a bishop, who resides at the capital. The public revenue in 1854 amounted to L.364,906, and the expenditure to L.356,706.

Porto Rico contains fifty-eight towns and villages. The largest place is San Juan de Porto Rico, the capital. It is finely situated on a small island on the north coast, which is connected with the mainland by a bridge. The streets are straight and regular, and the town is inclosed on every part by strong fortifications, which render it almost impregnable. It is considered one of the best and healthiest towns in the West Indies. Among the public edifices may be mentioned the cathedral, a large mass of building, which has never been finished; four churches, two chapels, three convents, an episcopal palace, and a seminary for the education of the clergy; the royal military hospital, a large stone edifice, and an establishment of the same kind for females; the jail, a house of correction, a large and handsome town-house, a beautiful theatre, a custom-house, an arsenal, and some others. The town has also several public schools, and a society for the promotion of the fine arts. There is an excellent and secure harbour, and a commodious wharf. This town was founded in the year 1514. Within a century afterwards it was twice taken and plundered by the English, who, however, could gain no permanent footing on the island, neither at these times nor at a later period under General Abercromby. The population is estimated at 30,000.

Porto Rico was discovered by Christopher Columbus in 1493, and was supposed at the time to contain 600,000 inhabitants. It was invaded in 1509 by Spaniards from Hayti, and the natives were soon exterminated by them. Towards the end of the seventeenth century the island was captured by the British; but it had to be abandoned soon after on account of the mortality among the troops. In 1820 a revolution was made in Porto Rico, with a view to a separation from the mother-country; but this movement was finally put down in 1823. The island is divided into seven departments, as follows:—

	Pop. (1846).
La Capital	70,861
Arecibo ......,......	54,044
Aguadilla	57,322
Mayagües .....,......	99,895
Pouce	71,168
Humacao	41,593
Guayama	51,756
Total........	446,639

In 1855 the total population amounted to 500,000. More than half of the people are of Spanish descent; the remainder is nearly equally divided between Mulattoes and Negroes, and of the latter about two-thirds are slaves. It has been remarked that in Porto Rico there is none of that antipathy between the black and white races that exists in the United States and other countries.

PORTO SANTO. See Madeiras.

PORT OF SPAIN, or Puerto d'Espana, a town of the West Indies, capital of the island of Trinidad, on its N.W. shore, near the mouth of the Carony, in the Gulf of Paria. It is one of the finest towns in the West Indies, being well built of stone and brick, and having broad and regular streets, some of them adorned with rows of trees. It contains a government-house, court-house, a good market-house, churches belonging to the Episcopalians, Presbyterians, Methodists, and Roman Catholics, several schools, a lunatic asylum, hospital, and jail. In the vicinity of the town are botanic gardens and St James's barracks, which are built in one of the most unhealthy spots in Trinidad. Port of Spain has a large and good harbour, where an active trade is carried on. Pop. 11,693.

PORTPATRICK, a seaport-town and parish of Scotland, in the county of Wigton, built partly on the slope of a hill on the shore of the Irish Channel, 6½ miles S.S.W. of Stranraer, and 109 S.W. of Edinburgh. The principal street extends in a curve along the shore of the bay, and some smaller streets branch off from it. The houses are for the most part well built and slated. There are here an Established church, a Free church, several schools, and a public library. Many of the inhabitants are engaged in cod-fishing. The new harbour, which was constructed by the Admiralty at great expense, is neither safe nor easy of access. Portpatrick has declined very much since the mail packets ceased to ply between this and Donaghadee in Ireland. A submarine telegraph has been laid between these two places. Pop. (1851) 1038.

PORT PHILIP, a large bay of Australia, in the colony of Victoria, about 35 miles in length and as much in breadth, with an entrance not quite 2 miles wide; S. Lat. (of Point Nepean at the entrance) 38. 18., E. Long. 144. 42. On its west side is an inlet, at the head of which the town of Geelong stands; and at its northern extremity the Yarra-Yarra flows into Port Philip, having Melbourne on its banks about 8 miles up. (See MELBOURNE.)

PORTREE, a village and parish of Scotland, in the county of Inverness, at the head of a small loch of the same name, in the Isle of Skye. It contains an Established church, a Free church, and a parish school. The natural harbour is well sheltered on all sides, and is capable of containing a large number of vessels. Steamers ply regularly between Portree, the other towns on the west coast of Scotland, and Glasgow. Cattle, salmon, and other articles are exported from Portree. Pop. of the parish, 3557.

PORT REPUBLICAIN, or PORT-AU-PRINCE, the capital of the empire of Hayti, and the chief seaport in that island, stands at the head of the bay of Gonaives, on the W. coast, N. Lat. 18. 35., W. Long. 72. 18. It is partially fortified towards the land, and there is a battery on a small island that protects the harbour. It has a commanding appearance from the sea; but though the streets are broad and regular, the most of the houses are built of wood, low, and mean in appearance. The chief buildings are,—the palace, court-house, church, arsenal, mint, school, and military hospital; but few of these are of any architectural merit. The surrounding country is swampy and unhealthy. Port Republicain carries on some commerce with Jamaica and the United States. The number of ships that entered the port in 1855 was 182, tonnage 30,530; those that cleared 158, tonnage 26,079: besides the coasting trade, in which were employed 38 ships, tonnage 7241. The harbour is quite safe, except during the hurricanes which occur between August and November. Port Republicain was founded in 1749. It was nearly destroyed by an earthquake in 1770, and has been much injured on various occasions by fire. Pop. 25,000.

PORT ROYAL, a fortified town of Jamaica, once the capital of that island, at the end of a narrow strip of land forming the S. side of Kingston harbour, N. Lat. 17. 56., W. Long. 76. 51. It was once a flourishing and well-built town, but it has suffered once and again from earthquakes and fires, and its public offices have been removed to Kingston. It still contains a naval arsenal, barracks, hospital, and other buildings, and its harbour is a station for British men-of-war. The town is chiefly inhabited by Negroes. Pop. 15,000.

PORT ROYAL, a name celebrated in history, and under which is designated two nunneries, the one situated near Chevreuse, about 5 leagues from Paris; the other in Paris, in the Faubourg St Jacques. Hence the two-fold designation of *Port Royal de Paris* and of *Port Royal des Champs.* The latter is the more ancient title, dating back as far as the time of Philippe-Auguste, who having lost his way while hunting, found in this sequestered valley a shelter or "port" for himself and his attendants. The monastery was founded in 1204 by Mathilde de Garlande, wife of Matthieu de Marli of the family of Montmorency, when he was on the eve of setting out for the Holy Land. The nuns were of the order of St Bernard de Citeaux, and had their own abbess. Pope Honorius III., in 1223, conferred upon it the privilege of affording an asylum to seculars without binding themselves by permanent vows. The abbey became rich, and the rules of St Bernard were forgotten. It was reserved for Marie Jaqueline Angelique Arnauld, sister to the famous Antoine Arnauld, to introduce into this institution a thorough spirit of reform. She was chosen abbess, through family interest, at the premature age of eleven years; and she had hardly attained to the age of seventeen, in 1608, when she began her work of reform. She resolved at once to shut out the world, and this she gradually effected. In less than five years her sister Agnès, who had been educated at St Cyr, joined the young abbess, and found the reform all but complete. The older nuns gave an example of sincere submission, and the younger were willing to learn. The "Mère Angelique" was removed at this juncture to introduce her discipline at Maubuisson, where the notorious Madame d'Etrés had hitherto ruled. She remained there five years; and on her return to Port Royal des Champs, thirty nuns of Maubuisson besought her to allow them to accompany her. A great many ladies from all parts of France were eager for admittance; and such a rapid increase—where an abbey originally designed for twelve nuns was now inhabited by eighty—began to be a serious inconvenience. The monastery was situated in a deep and thickly-wooded valley, watered by two extensive lakes, which from improper drainage had spread in one continued marsh over the vale. The house at length became a complete infirmary. Madame Arnauld, mother to "Mère Angelique," purchased at a very considerable cost a house known as the Hotel Clagny, situated in the Fauxbourg St Jacques, Paris, and presented it to her daughter. She removed her nuns to this house in 1625, calling it *Port Royal de Paris,* while the original *Port Royal des Champs* was deserted by all save a chaplain, who supplied the parish church. In 1630 M. Angelique obtained a royal grant declaring that the abbess should be elected triennially by the nuns, upon which she and her sister M. Agnès resigned their offices. Six of M. Angelique's sisters were nuns at Port Royal, and her three brothers filled distinguished posts in connection with the state.

The house which they had left, Port Royal des Champs, now became occupied by a number of pious and learned men, who wished to live a secluded life according to the spirit of the papal bull of 1223, and who went by the name of "Les Solitaires de Port Royal." The most distinguished among these recluses were Claude Lancelot, the grammarian; Antoine le Maistre, nephew of the Mère Angelique, who at the early age of twenty-nine, had abandoned the profession of advocate which he had already begun in so distinguished a manner. Antoine was soon followed by his two brothers, Séricourt a distinguished officer, and De Sacy, the eminent translator of the Bible. Add to these the names of the two Arnaulds, Pièrre Nicole, Blaise Pascal, and Nicolas Fontaine. The greater number of these were disciples of Du Verger d'Hauranne, abbé de Saint Cyran, celebrated for his connection with Jansenius, who had been his schoolfellow at Louvain, and celebrated no less for his controversies with the Jesuits. The animosity towards the Jesuits, it may be safely assumed, was not a whit diminished in this "solitary" company. These men established a school, which was to consist of five classes of five pupils each; organized with the design of counteracting the lax morality which tainted the education of the Jesuits. The teachers were chiefly Lancelot, Arnauld, De Sacy, Nicole, and Fontaine; known all the world over by the excellent school-books which were published for the use of that institution. There were a *Nouvelle Méthode pour appendre la Langue Latin; Nouvelle Méthode pour appendre la Langue Grecque; Jardin des Racines Grecques; Grammaire Générale; Elémens de Géométrie; La Logique, ou l'Art de Penser,* written conjointly by Lancelot, Arnauld, Nicole, and De Sacy. Among

Port Royal

the pupils who received their education here were Tillemont and Jean Racine.

Meanwhile the nuns of Port Royal exceeded 180. It became necessary once more to divide them, and Port Royal des Champs was fixed upon as their new abode. The recluses having removed to a farm-house called *Les Granges*, which was situated on the top of a neighbouring hill, the monastery was left vacant for the occupation of the nuns, who after a twenty-five years' absence, were received back to their old abode with the greatest joy by the entire neighbourhood. The Mère Angelique, their superior by election, led them to their new residence, and inaugurated their proceedings among the happy peasantry. The double fame acquired by the *solitaires* and by the *religieuses* secretly aroused the envy and hatred of the Society of Jesus, who harboured already an old grudge against the family of Arnauld. In 1594 Antoine Arnauld, the father of Angelique, gained a lawsuit in behalf of the university of Paris against the Jesuits; and this success had become, what it was afterwards phrased, "the original sin of the Arnaulds." Besides, the adversaries of Port Royal witnessed with pain the education of the most distinguished youth of the kingdom pass out of their hands. On the 1st July 1649, Nicolas Cornet led on before the faculty of theology the famous quarrel of the "five propositions" upon grace, contained in the book of Jansenius. Antoine Arnauld, in defence of Port Royal, condemned the five propositions on the ground of their having no existence in the pages of Augustinus. Arnauld was accused of Jansenism; and the nuns of Port Royal, with their abbess at their head, had the courage to declare that they could not see the five alleged heretical propositions in the work of Jansenius. Orders for their dispersion were on the point of being issued, when a miracle occurred to the niece of Pascal which arrested the hand of the executioner, and brought temporary peace to Port Royal. In 1656 a formulary, condemning the five propositions as having a part in the book of Jansenius, was issued by the Archbishop of Toulouse, and imposed upon all religious communities. The Port Royalists refused of course. At last a royal order came in 1660 to disperse them. While this was transpiring, the Mère Marie Jaqueline Angelique Arnauld dispersed in quite a different fashion. She died on the 6th of August 1661, leaving behind her a name not calculated to die. The young ladies continued refractory; and Perefix, Archbishop of Paris, arrested abbess, prioress, and nuns, by a party of police, and distributed them to the care of several monasteries, where they were kept in a state of confinement. In 1669 a compromise occurred between the Pope and the defenders of Jansenius, known as the peace of Clement IX., when the nuns of Port Royal des Champs were restored to their convent. They no longer possessed Port Royal de Paris. This community was severed from the original stock by the order of the king, confirmed by a bull of Clement X. Subsequently disputes arose between the two communities, in which the Jesuits and the Archbishop of Paris played an important part. The upshot of it was, that in March 1708 a bull of Pope Clement XI. shut the convent of Port Royal des Champs, and transferred the property to Port Royal de Paris. D'Argenson, lieutenant of police, was sent from Paris with a body of men to distribute the sisters among several convents, to strip Port Royal des Champs of all its valuables, and level the building with the ground, as a nest of Jansenists and heretics. The bodies of Le Maistre, of Arnauld, of Pascal, of Racine, &c., which lay buried there, were in 1711 exhumed and transported to the cemeteries of Paris. Port Royal de Paris, enriched with the spoils of the House of Champs, continued to subsist without noise or lustre till 1790.

The books that have been written regarding Port Royal are very numerous. The chief are:—*L'Histoire Générale de l'Abbaye de Port Royal*, by Dom Clémencet, 10 vols., Amsterdam, 1755–57; *Mémoires pour servir à l'Histoire de Port Royal*, by Nicolas Fontaine, Utrecht, 3 vols., 1742; *Histoire de l'Abbaye de Port Royal*, by Besonge, 8 vols., 1756; *Mémoires Historique et Chronologique sur l'Abbaye de Port Royal des Champs*, by Guilbert, 9 vols., 1755–58; *L'Histoire de Port Royal*, par Jean Racine, 2 vols., published for the first time in 1767; *Les Ruines de Port Royal*, by Grégoire, 1801; *Geschichte von Port Royal*, by Reuchlin, Hamburg, 1839; *Port Royal* by Saint-Beuve, 3 vols. 8vo, Paris, 1842–43; *Select Memoirs of Port Royal*, by M. A. Schimmelpenninck, 2 vols., 1835, and 3 vols., 1858.

Portsmouth

PORTSMOUTH, the strongest fortified town in England, is situated in the southern part of the county of Southampton or Hampshire, within the hundred of Portsdown, 74 miles from London by road, and 94½ by railway. It stands on an island separated from the mainland by a small creek or arm of the sea. This island, called Portsea, is 3 miles long, and 2½ miles broad, and contains 5568 acres of land of great fertility. It includes, besides the borough of Portsmouth, the town formerly known as Portsmouth Common, but now by the name of the Island, and also the suburbs called Southsea, Landport, and Kingston. Southsea, which takes its name from the castle, built during the time of Henry VIII., is of very recent origin; it owes its prosperity to its beautiful position, and has within the past few years become an important watering-place, and the beach has been pronounced by competent authorities one of the finest in England. A number of mansions and terraces have also been built, and the grounds laid out in a very tasteful manner; so that the place is eminently suited to the wants of a superior class of visitors. A beautiful esplanade extends along the beach from the castle to the king's rooms, a distance of about a mile; and adjoining the rooms are a number of warm, shower, vapour, and other baths: there are also a quantity of bathing-machines ranged along the beach. Near the entrance to the king's rooms are statues of Wellington and Nelson, which were erected at the expense of Major-General Lord Frederick Fitzclarence, late governor of Portsmouth. Landport is peopled for the most part by the dockyard artizans, although it contains a few respectable houses; in it are situated the termini of the Brighton and South Coast, and London and South-Western railways; also the Royal Portsmouth and Gosport Hospital, which is a noble building erected in 1849.

The soil of the island is marshy, and was formerly found to be unhealthy, and the inhabitants suffered much from the scarcity and dearness of good water. But of late years these evils have been remedied by complete drainage, and by the construction of good sewers, which carry the impurities of the town into the sea. Two efficient water companies have been in operation some years; and Portsmouth is now second to no town as far as regards the supply of this indispensable article. Sixty years ago the average number of deaths per annum was above 3 per cent. of the whole population; thirty years since the average was about 2 per cent.; and this is now considerably reduced.

The favourable situation of Portsmouth for a naval arsenal led to the construction of the works that have since distinguished it, at the period when the sovereigns of England first began to form a naval force.

The earliest notice respecting Portsmouth occurs in the *Saxon Chronicle*, in 501, when it is called *Portesmuthe.*

Robert, Duke of Normandy, landed here with a strong army in 1101, during the contest for the throne between himself and his brother Henry I., when the interference of the barons induced him to concur in terms of conciliation. In 1123 it is recorded that Henry I. paid a visit to this place, and passed the season of Whitsuntide. In 1140 the Empress Maud, with her brother the Earl of Gloucester, landed here, and marched from hence to Arundel. In 1193 a charter was granted to the town by Richard I., which conferred upon it various privileges which were at that time enjoyed by the city of Winchester, and which enacted that there should be an annual fair of fifteen days' duration; also a weekly market. The army of Henry III., which was raised for the invasion of France, was mustered here in 1229, and also disbanded. In 1298 King Edward I. granted the inhabitants a charter, conferring on them the privilege of returning members to Parliament. A few years later, during the reign of Richard II., the town was sacked and destroyed by the French. Under Edward IV., Richard III., and Henries VII. and VIII., the fortifications, which at that time were considerable, were greatly extended and improved. In 1545 a French fleet attempted to surprise the town, but to no purpose. Queen Elizabeth added considerably to the defences, in which work she has been followed by nearly every successive sovereign. In the reign of Charles I. the Duke of Buckingham was assassinated by Felton; and in 1756 Admiral Byng was shot on board the Monarque by order of a court-martial. In 1815 Sir E. Cockburn sailed from this town with Napoleon for St Helena.

As the town of Portsmouth is surrounded with walls, the streets are for the most part narrow; nor can it as a whole be represented as a well-built place. The High Street is of moderate breadth, and has a few good buildings; but a part of it is disfigured and contracted by having the market-house running through the middle of it. Some of the buildings are of ancient date; one especially in the High Street is worthy of observation, as having been the dwelling-house in which the Duke of Buckingham was assassinated in the reign of King Charles. It may be remarked that the best buildings in Portsmouth are the inns and hotels, which are numerous, and proportioned to the great number and various descriptions of occasional residents arriving and departing as passengers to and from all parts of the world. There are five barracks,—viz., the royal artillery barracks in Broad Street; those for the marine artillery near the custom-house; and the Cambridge, the Clarence, and the Colewort barracks, for troops of the line. The walk round the fortifications forms a very agreeable promenade; and the grand parade, situated near the King's Bastion, also furnishes an agreeable walk. At the east end of the grand parade is the garrison chapel, the only remaining portion of an ancient hospital founded in 1238, and called the *Domus Dei*.

At the west end of the platform, on an ancient building, which, before the dissolution of the monasteries, had been the government-house, a lofty semaphore has been erected, from which signals are made to the ships in the harbour and at Spithead. It is also connected with a chain of telegraphs, terminating at the Admiralty Office in London, and by which communications are conveyed; so that a message can be sent, and a reply received, in about two minutes. In a niche in a wall of this ancient building is a bust of King Charles I., with an inscription underneath, stating that "after his travels through France and Spain, and having passed many dangers both by sea and land, he arrived here 5th October 1623." This was on his return from the secret journey he made in search of a bride of the Spanish royal family.

The parish church is a venerable object; it was originally erected in 1220, and dedicated to the then recently canonized St Thomas à Becket. The chancel is the only part left of the original building, and affords a contrast, by its numerous pillars, clustered pilasters, and ribbed, pointed arches in the Saracenic style, with the architecture of the nave, built in plain Tuscan style, the pillars of which support circular arches, and carry the roof. Few places of worship in the kingdom are superior to this church in internal beauty, which is chiefly due to the elegance of the chancel, but is increased by a few painted windows over the altar, of modern date. At the west end of the edifice is the tower, added in 1693, and which rises to the height of 120 feet. Over this, in an octagon latticed erection called the lanthorn, is a fine peal of eight bells. Surmounting the whole, as a weather vane, is a gilt model of a ship, 6 feet long, which has a shifting flag on the mizen-mast that moves with the slightest motion of the air, and indicates from what quarter the wind blows, when the breeze is not sufficiently strong to move the hull of the ship.

The walls of this church are adorned with a great variety of handsome ancient and modern monuments; one of the most remarkable of which is that to the memory of the Duke of Buckingham, whose assassination has already been adverted to. In the parish register is to be seen the registration of the marriage of King Charles II. with the Infanta of Portugal, 22d May 1662. This document, in letters of gold on vellum, is highly illuminated in the style of the old missals, and states the marriage to have been performed by Sheldon, Bishop of London. Some doubts have since been suggested, whether any other ceremony was used except a private marriage by a Catholic priest.

Besides this capacious church, there are open to the inhabitants a district church dedicated to St Mary; the garrison chapel, for the worship of the Established Church; and five places of meeting for several sects of dissenters. In the other towns the places of worship are numerous. At Portsea there are, for the Episcopal worship, the parish church of Kingston, the dockyard chapel, St George's church, St John's church, and Holy Trinity church; besides a Catholic chapel, a Jews' synagogue, a Wesleyan, an Independent, and two other meeting-houses. In Southsea are St Paul's and St Jude's churches, with four Baptist chapels. At Landport, formerly known as the Halfway Houses, are All-Saints', St Mary's, and St James's churches, in addition to six meeting-houses of various sects. Almost all these places of worship have Sunday or day schools attached to them; and there are also schools where reading, writing, and arithmetic are taught on the systems of Bell and Lancaster. A philosophical society, founded in 1818, contains a museum of natural history and curiosities; also a choice library, and a number of members: it has weekly lectures, and a reading-room, which is open daily. The mechanics' institute was established thirty years since: it has a large share of public patronage. There is also a beneficial society in Kent Street, and an association in connection with the Established Church. A well-endowed grammar school in Penny Street was founded in 1732, by Dr Smith, himself a native of Portsmouth, for the instruction of fifty boys, sons of the inhabitants, in classical learning. The town-hall, gaol, theatre, custom-house, and other public buildings of Portsmouth, present little or no attraction.

Few markets are better supplied than those of Portsmouth. A large part of the fertile island of Portsea is laid out in kitchen and fruit gardens. No market produces finer meat: large quantities of poultry, hares, partridges, and eggs, are brought from France; and the extensive water communication gives facility to provide hay, corn, flour, and other such articles at very cheap rates. To this cheapness of provisions, combined with the purity of the air, is in a great measure attributed the extension of Southsea, and the number of excellent residences which have lately been erected in that locality.

The public buildings in Portsea, except those belonging to the government, are by no means distinguished; the streets, however, are regularly built, and well paved and lighted, but the general appearance of the houses, with some few exceptions, is mean and despicable, the great majority of the inhabitants being of the lower classes. In Southsea are the king's rooms, in which the balls, soirees, and other such like entertainments are held; they consist of a magnificent suite of rooms, having a frontage to the street of 80 feet: within is the promenade-room, 45 feet long, 35 feet wide, and 17 feet high; besides a number of other apartments, and hot and cold vapour and shower baths, as has already been stated.

It is, however, as the great depot of the British naval power that Portsmouth is most important; and in this view the state of the surrounding water, and of the harbour above the town, become worthy of observation and description. One of the great advantages accruing to this place is that very fine anchorage known by the name of Spithead. It is nearly midway between the mainland and the Isle of Wight, and is protected by the highlands of the island from southerly winds, and from northerly and easterly winds by the mainland. It has an advantageous entrance; for though at the east there are some dangers on what is called the Princessa Shoal, and on the ranges of rocks called Bembridge Ledge and Betty's Ledge, they, as well as the Nab Rock, the Long Rock, the Warner, and Romansland, are so well provided with either floating lights or distinguishing buoys, that there is little risk, except in very dense fogs, when the buoys cannot be seen, nor the leading marks observed on the sea-shore. At this entrance it is a great advantage that at St Helen's, at the east end of the island, there is a good anchorage; so that if the wind takes a vessel short, she can safely ride till the breeze is in her favour. The western entrance to Spithead is by Hurst Castle, and the rocks called the Needles. This passage is always safe in fair winds, on account of the definite track which is shown by the buoys, lights, and landmarks; but it is so hazardous in contrary winds that very few ships attempt to beat through. The passage out by the Needles is used by more vessels than come into Spithead by that way. The anchoring-ground at Spithead is very good for holding, and very clear, except near the wrecks of the Royal George, the Boyne, and the Edgar, around which the tide has formed considerable banks. There is a regular depth of water at every part, varying from 6 to 12 fathoms, and the space is sufficient for the whole navy of England to ride at single or double anchor, without danger of falling on board each other when swinging with the changes of the tide.

Within the smooth water, between the island and the mainland, there are other very good anchorages: of these the Mother-bank is the principal; Stokes Bay is another safe anchorage. Here is the measured mile in which the speed of every new ship is tried.

The great advantages arising from so secure a rendezvous as Spithead, so near to the great national marine arsenal, are too obvious to need any elaborate remarks. The entrance to the harbour of Portsmouth is narrower than the Thames at London Bridge; yet there is sufficient depth of water for the largest man-of-war to enter at any state of the tide. The defences are of the most impregnable character, the channels by which vessels approach the harbour being crowned with forts and batteries, and armed with artillery of the heaviest calibre; so that an enemy's fleet, however strong, would be utterly annihilated before it could reach even the entrance. The interior of the harbour expands into a spacious lake 4 miles long and 2 miles broad, in which those ships of war that are under repair, or preparing for sea, are riding, and some of them lying at the wharves of the dock, which borders the harbour on the eastern side. From thence the harbour extends into the land, and contains, in one part called Rotton Row, the ships that are in ordinary, being with no other crews than a few warrant officers, to prevent them from plunder, or from injury by weather. The water here branches off in various directions, and by the help of the tide is navigable to Fareham, and to Portchester Castle, a pile of antiquity that will reward the curiosity of a visitor. Respecting the defences which envelope the town, it has been stated that, in case of a siege, these fortifications would require a garrison of no less than 14,000 men, all the works being surrounded by moats, which are very wide and deep, and can be speedily filled with water from the sea.

The dockyard of Portsmouth is one of those noble objects in which every Briton feels an interest. The gunwharf, under the ordnance department, is an immense arsenal, consisting of various ranges of buildings for the reception of military and naval stores and artillery. These storehouses are vast piles, and are fitted to contain all kinds of necessaries for the sudden equipment, both of a fleet and an army. Above 3000 men are constantly employed here, although the various operations are conducted by steam-engines, and every improved facility in machinery is adopted. On the wharf is the grand depot for guns, carronades, and mortars, with shot and shells of almost every size and weight, all of which are arranged in gigantic pyramids. Here also, in times of peace, the guns from the ships in ordinary at the port are lodged, each ship's guns being kept in a separate tier, whilst the carriages are deposited away in the same regular manner in the proper storehouses; so that the whole may be easily collected again, and re-embarked. The small armoury is worthy of notice; it contains 25,000 stands of arms, all placed in the same ornamental style as those of a similar description in the Tower of London. The roof of this building is covered with copper, which, being oxidized by exposure to the atmosphere, when viewed on approaching it from the quay gate, conveys to the mind the idea of a green grassy slope, or a still wave of the sea.

The victualling establishment was removed at the commencement of the present century to the opposite side of the harbour, and is now in the town of Gosport. A communication is kept up between Portsmouth and Gosport by a steam floating bridge, which conveys passengers and merchandise at very low rates. The biscuit-bakery, the bread, pork, beef, rum, wine, and clothing stores, are open to the inspection of visitors. One of the greatest curiosities is the machinery substituted for manual labour in making biscuits, whereby every process, in its minutest details, is effected, preparatory to its being ready for the oven, including kneading, rolling, forming, and stamping. As a proof of the superiority of machinery over the old methods, it may be observed that 5 cwt. of dough may be mixed, completely kneaded, and prepared for the oven in seven minutes.

Portsmouth, independent of its naval dockyard, possesses a considerable foreign and coasting trade. The number of sailing-vessels registered at Portsmouth, 31st December 1857, was 251, tonnage 14,867; of steamers 8, tonnage 221. In the year 1857 there entered the port 1581 sailing-vessels, tonnage 144,596; and 36 steamers, tonnage 13,335: and there cleared 908 sailing-vessels, tonnage 35,414; and 74 steamers, tonnage 30,415. Of those that entered, 134,961 tons were engaged in the coasting, and 22,970 in the foreign and colonial trade; and of those that cleared, 76,805 tons were engaged in the former, and 9844 in the latter. The amount of duty received at the custom-house during 1857 was over L.70,000.

The population of the borough has greatly increased during the present century, as appears from the following returns:—

	1811.	1831.	1851.
Portsmouth	7,103	8,083	10,329
Portsea	34,484	42,306	61,767
Total	41,587	50,389	72,096

By far the greater number of these are the families of officers and men of the navy, army, and marines, and of the various dockyard artificers. The limits of the borough contain within them the whole of the town of Portsea. The corporation now consists of fourteen aldermen and forty-two councillors, who elect the mayor. It is divided into six wards, and has justices of the peace appointed by the Crown. The Reform Act confirmed the ancient privilege of returning two members to Parliament, which the town has uninterruptedly enjoyed from the time of Edward I.; the whole of the suburbs being now included in the limits of the parliamentary borough.

PORTSMOUTH, a seaport-town of the United States of North America, state of New Hampshire, stands on the right bank of the Piscataqua river, about 3 miles above its mouth, 54 miles N. by E. of Boston. It occupies a fine situation on a peninsula in the river, and is connected by bridges with Kittery in Maine, on the opposite side. The streets are irregular and narrow, but some of them have handsome buildings, and are lined with trees. There are in the town an arsenal, two market-houses, eleven churches, many of them handsome buildings, numerous schools, an athenæum, with a museum, and a library of 10,000 volumes, a lunatic asylum, &c. The United States navy-yard, which occupies an island near the eastern bank of the river, is one of the most important and interesting establishments in the town. It contains three large ship houses, and a dry dock 350 feet long by 105 broad, constructed at a great expense. The harbour of Portsmouth, which is defended by two forts, is large, deep, and easy of access; so that in stormy weather many vessels take refuge in it. It is said to be capable of containing as many as 2000 ships. Manufactures are actively and extensively carried on in the town; cotton, hosiery, ropes, shoes, iron-castings, &c., are the chief articles produced. Ship-building is also largely carried on; and the tonnage of the port, June 30, 1852, amounted to 16,654 registered, and 8237 enrolled and licensed. During the year ending at that date there entered from foreign countries 78 ships, tonnage 8493; and there cleared for foreign ports 64, tonnage 7466. In the same year the imports amounted to L.20,750, and the exports to L.13,940; and the duties collected to about L.6250. Pop. (1850) 9739; (1853) about 11,000.

PORTSMOUTH, a seaport-town of the United States of North America, in the state of Virginia, on the left bank of the Elizabeth river, opposite the town of Norfolk, 160 miles S.E. of Richmond. It is well and regularly built on level ground, and it contains a large and showy naval hospital, a court-house, six churches, a literary, scientific, and military academy, and other buildings. In the suburb of Gosport there is a government dry dock capable of admitting the largest vessels. Portsmouth is connected by railway with Charlestown in South Carolina; and steamers ply daily between this and Richmond. The harbour is safe and accessible to the largest ships. Pop. 8626.

PORTSMOUTH, a town of the United States of North America, state of Ohio, on the right bank of the Ohio, at its confluence with the Scioto, 115 miles above Cincinnati, and 90 S. of Columbus. It contains a court-house, a bank, six or eight churches, two large schools with 13 teachers and about 700 pupils, two iron foundries, a forge, and a nail factory. Iron, coal, and good building-stone are obtained in abundance in the vicinity. Pop. (1850) 4011; (1853) about 5000.

PORTUGAL.

THE modern kingdom of Portugal embraces a part of, and somewhat more than, the country called *Lusitania* by the Romans. The etymology of the present name is involved in obscurity; for though many conjectures have been put forward, none seems worthy of confidence.

History.

The history of Portugal commences with a story to this effect:—Affonso VI., King of Leon and Castile, being apprehensive that his success in taking the city of Toledo would bring upon him the whole force of the Moors, sent to demand assistance from Philip I. of France, and the Duke of Burgundy, whose daughter he had married. His request was granted by both princes; and a numerous body of troops was speedily collected for his service, having at their head Raymond, Count of Burgundy, and Henry, younger brother of Hugh, Duke of Burgundy. In the year 1087 they arrived at the court of Dom Affonso, where they were treated with all possible marks of esteem; and having, in the course of two or three years, given great proofs of their courage and conduct, the king resolved to bestow his daughter Urraca, then, at most, in her ninth year, upon Raymond, Count of Burgundy, and assigned them the province of Galicia for the support of their dignity. About the year 1095 Dom Affonso, being desirous to express his gratitude to Henry of Burgundy, gave him in marriage a natural daughter of his, named Theresa; and upon this marriage he conveyed in full property the frontier province he had conquered from the Moors. The new sovereign, with the title of Count, fixed his residence at Guimaraens, a town to the north of the Douro, where the remains of an ancient palace belonging to his successors are still to be seen.

Henry of Burgundy the first count of Portugal.

Henry is said to have performed great exploits against the Moors; but the accounts given of them are extremely indistinct and unsatisfactory. He died in 1112, and was succeeded by his son Dom Affonso, then in the third year of his age. In the minority of the latter the kingdom was governed by the queen-mother, Dona Theresa, assisted by two ministers. During their administration differences took place between the queen-regent and Urraca, Queen of Castile, which were not arranged until the death of the latter.

Differences with Castile.

Affonso's wars with the Moors and the King of Castile.

The greatest misfortune which befell Theresa was a quarrel with her own son, Dom Affonzo Enrique. A civil war ensued, in which the queen's forces were totally defeated, and herself made prisoner, a situation in which she continued during the remainder of her life. Enrique having thus attained to the full possession of his dominions, made several attempts upon various places in Galicia, but without success; and he was at last constrained to conclude a peace with Affonso, King of Castile and Leon, who had assumed the title of *Emperor of the Spains*, more especially as his dominions happened to be at that time invaded by the Moors. The number of infidels was so great, that the Count of Portugal had but little hopes of subduing them; but a plague having broken out in the Moorish army, they were obliged to retreat, after which he reduced several places belonging to that nation. In the meantime, the Emperor Dom Affonso having made an irruption into the Portuguese territories, destroyed everything with fire and sword. The King of Portugal surprised and cut off a considerable part of his army. At the intercession of the Pope's legate, however, a peace was concluded, and all places and prisoners taken on both sides were delivered up.

Victory of Ourique.

Meanwhile, the progress of the Christian arms in Spain being reported to Abu-Ali Texefien, the chief of the Moors in Barbary, he directed Ishmael, his lieutenant in Spain, to assemble all the forces in the southern provinces, and to drive the Christians beyond the Douro. The Moors were met by Dom Affonso on the plains of Ourique, near the Tagus, and were totally defeated. The event was an important one in the history of Portugal. It stimulated the imagination of the people, and circumstances were attached to it, as time rolled on, which the historian is compelled to reject, as no more worthy of credit than the legends of Romulus and Remus. It was said that the Portuguese force consisted of no more than 13,000 men, whilst the Moorish army, commanded by five kings, numbered 200,000. The count, half daunted by the superior strength of the enemy, was encouraged to engage in combat by a hermit, who told him to go forth in the morning when the bell should ring for mass, and turn to the east. He did as he was ordered, and then beheld within a circle of clouds the image of Christ crucified, and this promised him victory, with a crown, and a line of sixteen successors to inherit it. Whatever the literal fact may be, the Portuguese look upon the plains of Ourique as the birthplace of the monarchy.

Dom Affonso assumes the title of King.

After this victory, gained in the year 1139, Dom Affonso was proclaimed king by his soldiers, and ever afterwards retained that title, renouncing all kind of subjection to the crown of Spain. Being very desirous, however, of reducing the power of the emperor, he formed a league with Raymond, Count of Barcelona, and regent of the kingdom of Aragon, against that prince. In virtue of this treaty, he entered Galicia with a considerable force on one side, whilst Don Raymond simultaneously invaded it on the other. But neither of these enterprises succeeded. The Portuguese monarch met with a severe check in his expedition into Galicia, where he received a dangerous wound, whilst some of the nobility who attended him were taken prisoners. At the same time, having received intelligence that the Moors had invaded his dominions, he was obliged to retire; but his retreat was not made in sufficient time to prevent the strong fortress of Leiria from falling into their hands. This fortress they demolished, and put the garrison to the sword; but the king caused it to be re-constructed of greater strength than before, and placed in it a more numerous garrison. Yet he undertook nothing farther during this campaign. The war continued with various success till the year 1145, when the king projected an enterprise against Santarem, a strong city, 40 miles from Lisbon. In this he luckily succeeded, and thus gained a considerable tract of country, with a strong barrier to his dominions.

Reduces Lisbon and other cities.

After this success, Dom Affonso caused himself to be crowned king of Portugal before an assembly of the states, where he also solemnly renounced all dependence upon the crown of Spain; declaring that if any of his successors should condescend to pay tribute or to do homage to that crown, he ought to be deemed unworthy of enjoying the kingdom of Portugal. The next year the king undertook to recover Lisbon from the Moors; but there are so many fables related of this expedition, that it is impossible to come at the truth. All that can be gathered from these accounts is, that he undertook the siege with a small army, and was able to make little progress in it, partly from the strength of the place, and partly also from the numerous garrison by which it was defended. At length, fortunately for Dom Affonso, a fleet of adventurers, French, English, Germans, and Flemings, who were on their way to the Holy Land, having anchored at the mouth of the Tagus, he demanded their assistance, as not altogether foreign to their design of making war upon the infidels. His request was readily granted; and, with their assistance, Lisbon was speedily reduced; a conquest which so much enhanced the reputation of this monarch, and brought such numbers to recruit his army, that before the end of the year 1147 he had reduced twelve other considerable cities.

His regal dignity confirmed by the Pope.

War with Don Ferdinand of Spain.

For many years after this, Dom Affonso was successful in all his undertakings. He settled the internal government of his kingdom; procured a bull from Pope Alexander III. confirming his regal dignity; undertook many successful expeditions against the Moors; and became master of four out of the six provinces which compose the present kingdom of Portugal. He was assisted by the counsels of his queen, Matilda, a woman of great capacity, and able to govern the kingdom in her husband's absence. By her he had a numerous offspring, including three daughters, the eldest of whom, Donna Matilda, was married to the King of Aragon; the second, Urraca, to Don Ferdinand, King of Leon; and the third, Theresa, to Philip, Earl of Flanders. In 1166, however, the king thought proper to invade the dominions of his son-in-law Don Ferdinand, and to seize upon Limmia and Turon, two cities of Galicia, in which he placed strong garrisons. The next year he marched with a numerous army towards Badajoz, which he invested. On receiving the news of this attack, Don Ferdinand, who had assembled a large army at Ciudad Rodrigo, marched to its relief; but he arrived too late, whereupon he resolved to besiege his antagonist in his newly-conquered city. Dom Affonso, perceiving his design, endeavoured to draw out his forces into the field. Though at that time upwards of seventy years of age, he placed himself on horseback, and pushing forward at the head of his horse to get out at the gate, struck his leg against one of the bolts with such violence that the bone was shattered to pieces. This accident occasioned such confusion that the Portuguese troops were easily beaten, and Dom Affonso was taken prisoner. He was, however, kindly treated by his opponent, and a peace was concluded between them. Returning to his dominions before his leg was cured, he became lame for the rest of his life; but this did not abate his military ardour. Towards the end of his reign, an opportunity seemed to present itself of obtaining once for all an entire release from the disagreeable pretensions of the King of Leon, who, it seems, had insisted on the King of Portugal doing homage for his kingdom. This was a quarrel between the King of Leon and his nephew Alonso, King of Castile. The latter solicited assistance from the King of Portugal, which was readily granted. But Ferdinand having received intelligence that the infant Dom Sancho, the king's eldest son, was advancing towards Ciudad Rodrigo, assembled his troops with such diligence on that frontier, that, being enabled to attack him unexpectedly, he entirely defeated him.

Dom Sancho's success against the Moors.

Understanding, however, that Dom Sancho was recruiting his forces with great diligence, he suggested that they might be much better employed against the infidels, who remained careless and unprepared, expecting the issue of the contest. Dom Sancho did not fail to profit by this advice; and after some movements intended to amuse the enemy, he made a sudden irruption into Andalusia, penetrating as far as Triana, one of the suburbs of Seville. The Moors assembled their forces, in order to attack him on his retreat, but were entirely defeated; and Dom Sancho returned to Portugal loaded with spoil. In 1184 the King of Morocco having already transported multitudes of men from Barbary, at length followed in person with a prodigious army, and carried all before him as far as the Tagus. He appeared before Santarem; but having exhausted and reduced his army by unsuccessful assaults on that place, he was attacked by the Portuguese, assisted by Ferdinand of Leon, and entirely defeated and slain. By this victory the Portuguese were left at liberty to improve the interior of their country, and to fortify their frontiers; but not long afterwards, that is, in the year 1185, the king died, in the seventy-sixth year of his age.

Sancho I.

Dom Affonso was succeeded by his son Dom Sancho I., who, by steadily applying himself to the work of restoration, in a short time quite changed the appearance of his territories, and acquired the glorious titles of The Restorer of Cities and Father of his Country. In the year 1189, a fleet, composed for the most part of English vessels, but having on board a great number of adventurers of other nations bound for the Holy Land, entered the river Tagus. Dom Sancho solicited them to assist him in a design he had formed of attacking the city of Silvas in Algarve, to which they readily assented. Having joined them with a squadron of his own galleys, and marched a body of troops by land, the place was reduced, and the English, according to agreement, were rewarded with the plunder. But in a short time, the Moors from Africa having once more invaded Portugal, the town was several times taken and retaken, until at last Dom Sancho, sensible of the difficulties of retaining it, caused it to be demolished. His last enterprise was the reduction of Elvas; soon after which he died, leaving the reputation of being the best economist that ever sat on the throne of Portugal. With the character of being rather liberal than avaricious, he had amassed a treasure of more than seven hundred thousand crowns in ready money, besides fourteen hundred merks of silver, and one hundred of gold plate, which he disposed of some time before his death. He was interred, by his own command, in the cathedral of Coimbra; and when his body was taken up four hundred years afterwards, that it might be laid in a new tomb, it was found uncorrupted.

Differences with Castile.

The history of Portugal presents scarcely any event of importance till the year 1289; when, in the reign of Don Diniz, a difference commenced with Castile which subsisted for a long period. Frequent reconciliations took place; but these were either of short duration, or never sincere. At length, in the reign of John I., Don Juan of Castile, who had also pretensions to the crown of Portugal, invaded that kingdom at the head of the whole force of his dominions, and with the flower of the Castilian nobility entered the province of Alemtejo. He besieged Elvas, but without effect; a disappointment which enraged him to such a degree, that he determined the following year to invade Portugal a second time, and lay waste the country before him. Accordingly, having collected an army of thirty thousand men, he invaded Portugal, and took and ruined several places; but the Portuguese in the end were victorious, although with an inferior force, and the Castilians consented to a truce of three years, which was soon afterwards improved into a lasting peace.

The city of Ceuta taken from the Moors.

In 1414 King John undertook a successful expedition against the Moors in Barbary, where he commanded in person, his queen, Philippa, the daughter of John, Duke of Lancaster, having died shortly before. The city of Ceuta was taken from the Moors almost at the first assault. Scarcely had the king left the country, when the princes of Barbary formed a league for the recovery of the place; but they were defeated by the young princes of Portugal. John strengthened the fortifications and augmented his forces there.

Madeira was discovered in 1420, and the Azores in 1432. King John died in 1433, and was succeeded by his eldest son Edward. The latter undertook an expedition against Tangier in Barbary, but the event proved very unfortunate; the Portuguese being so shut up by the Moors that, to obtain leave to return to Portugal, they were obliged to give up Ceuta. Although the king's son Ferdinand was left as a hostage for the delivery of Ceuta, the king and council of Portugal constantly refused to deliver up the place. Preparations were made for recovering the prince by force; but before anything could be accomplished, the king died in 1438.

Passage to the East Indies discovered.

However, the war with Barbary continued at intervals for many years, but with little success on the part of the Portuguese. In the reign of Affonso V. a civil war broke out, the two parties being headed by the king, and Pedro, the recent duke of Coimbra, who was finally defeated and killed at the battle of Alfarrobeira, 1449. The year 1497 was remarkable for the discovery of the passage to the East Indies by the Cape of Good Hope. The enterprising spirit of the Portuguese had, for a considerable time before, prompted them to undertake voyages along the coast of Africa, and when they found in the torrid zone, which the ancients had pronounced to be uninhabitable, fertile countries, occupied by numerous nations, and perceived that the continent of Africa, instead of extending in breadth towards the west, according to the opinion of Ptolemy, appeared to contract itself, and to bend eastwards, they were inspired with hopes of reaching India by continuing to hold the course they had so long pursued. After several unsuccessful attempts to accomplish what they had in view, a small squadron sailed from Belem, on the Tagus, under the command of Vasco de Gama, an officer of rank, whose abilities and courage fitted him to conduct this difficult and arduous enterprise. From ignorance, however, of the proper season and route of navigation in that vast ocean through which he had to steer his course, his voyage was long and dangerous. At length he doubled that promontory which had been descried by Bartolomeo Diaz in 1487, and which, for several years, had been the object of terror and of hope to his countrymen. After a prosperous navigation along the south-east coast of Africa, he arrived at the city of Melinda, and had the satisfaction of discovering there, as well as at other places where he touched, people of a race very different from the rude inhabitants of the western shore of that continent, which alone the Portuguese had hitherto visited. These he found to be so far advanced in civilization and acquaintance with the various arts of life, that they carried on an active commerce not only with the nations on their own coast, but with remote countries of Asia. Conducted by their pilots, who held a course with which experience had rendered them well acquainted, he sailed across the Indian Ocean, and landed at Calicut, on the coast of Malabar, on the 22d of May 1498, ten months and two days after his departure from the port of Lisbon. (See the article GAMA.)

The monarch of the country received them at first with that fond admiration which is often excited by novelty; but in a short time he formed various schemes to cut off Gama and his followers. The Portuguese admiral, however, was not to be overreached by such politics as his. From every danger to which he was exposed he extricated himself with singular prudence and dexterity, and at last sailed from Calicut with his ships, loaded not only with the commodities peculiar to that coast, but with many rich productions of the eastern parts of India. He returned to Portugal in two years after his sailing from the Tagus, but with a great loss of men; for out of one hundred and forty-eight persons who sailed with him, only fifty-five returned. The king received him with all possible testimonies of respect and kindness; created him a count; and not only declared him admiral of the Indies, but also made that office hereditary in his family.

The settlement of the Portuguese in India.

The Portuguese entered upon the new career opened to them with activity and ardour, and made exertions both commercial and military, far beyond what could have been expected from a kingdom of such inconsiderable extent. All these were directed by an intelligent monarch, Dom Manoel the Fortunate, who happily selected a succession of excellent officers to take the supreme command in India, amongst whom Affonso Albuquerque was eminent. Within twenty-four years after the voyage of Gama the Portuguese had rendered themselves masters of the city of Malacca, in which the great staple of trade carried on with the East Indies was then first established. This conquest secured to them great influence over the interior commerce of India, whilst, at the same time, by their settlements at Goa and Diu, they were enabled to engross the trade of the Malabar coast and to obstruct greatly the long-established intercourse of Egypt with India by the Red Sea. In every part of the East they were received with respect; in many they had acquired the absolute command. They carried on trade there without rivalry or control; they prescribed to the natives the terms of their mutual intercourse; they often fixed what price they pleased on the goods which they purchased; and they were thus enabled to import from Hindustan, and the regions beyond it, whatever was useful, rare, or agreeable, in greater abundance, and of more various kinds, than had been formerly known in Europe.

Opposition made by the Venetians.

Not satisfied with this ascendancy which they had acquired in India, the Portuguese sought to exclude all other nations from participating in the advantages of commerce with the East; and they accomplished one-half of what their ambition had planned. In consequence of this the Venetians soon began to feel that decrease of their own Indian trade, which they had dreaded. In order to prevent the farther progress of this evil, they incited the Soldan of the Mamlukes to fit out a fleet in the Red Sea, and to attack those unexpected invaders of a gainful monopoly, of which he and his predecessors had long enjoyed undisturbed possession. The Portuguese, however, entirely defeated this formidable squadron, and remained masters of the Indian Ocean. They continued their progress in the East almost without obstruction, until they established there a commercial empire; to which, whether we consider its extent, its opulence, the slender power by which it was formed, or the splendour with which the government of it was conducted, there had hitherto been nothing comparable in the history of nations. Every part of Europe was supplied by the Portuguese with the productions of the East; and if we except an inconsiderable quantity which the Venetians still continued to receive by the ancient channels of conveyance, our quarter of the globe had no longer any commercial intercourse with India and the regions of Asia beyond it except by the Cape of Good Hope.

Inquisition introduced into Portugal.

In September 1521 Manoel died of a fever, and was succeeded by his son John III. The most remarkable transaction of this prince's reign was the introduction of the Inquisition into his dominions in the year 1525, or, as some say, in 1535. A famine happening to cease in a short time after the Holy Office was introduced, the priests persuaded the ignorant multitude that it was a blessing from heaven on account of erecting such a tribunal.

Solyman the Magnificent.

Conduct and policy of the Portuguese.

In the meantime Solyman the Magnificent, the most enlightened monarch of the Ottoman race, observing the rising power and opulence of the Portuguese, and eager to supplant them, sent orders to the Pasha of Egypt to employ his whole strength against the Christians in the East Indies. The pasha, in obedience to these orders, sailed from the Red Sea with a greater naval force than ever the Mohammedans had employed before, having 4000 Janizaries and 16,000 other troops on board. Yet, by the courage and conduct of the Portuguese officers and soldiers, all this mighty armament was defeated, and their East India possessions were saved from the danger which threatened them. In Africa, likewise, the King of Fez was baffled before the town of Safi; whilst fresh quarrels breaking out amongst the native princes, gave great relief to the Christians, who had long been obliged to carry on a defensive war, and had more than once been on the very brink of ruin. The Moors became more and more formidable; the Portuguese king had reason to deem that the conquest of Barbary was impossible, and therefore limited his ambition to keeping those few fortresses which he had already acquired; a necessary and prudent measure which nevertheless displeased the majority of his subjects.

Brazil.

King John exerted himself greatly in the settlement of Brazil, which had been discovered by Pedro Alvares Cabral in 1501. He caused several strong towns to be erected there, and took all possible methods to encourage the conversion of the natives to Christianity. He also introduced many regulations for the welfare and happiness of his subjects at home. The disputes of the nobility about precedency were frequently attended with disagreeable consequences, which made the king resolve to establish definitive rules. His death happened in June 1557; and he was succeeded by his son Dom Sebastian, an infant of three years of age.

Education of the young king

The administration of affairs was undertaken by the queen grandmother of Sebastian. The Moors, however, supposing that they might be able to dispossess the Christians of such places as they held in Barbary, laid close siege to Mazagan. But the queen-regent speedily sending succour, the Moors, although they brought 80,000 men into the field, were obliged to abandon the enterprise. This was at first extolled as a conspicuous instance of the queen's capacity and wisdom; but, in a short time, the aversion which the Portuguese had to the government of women, together with the prejudice they had against her country, for she was a Castilian, appeared so plainly, and gave her so much uneasiness, that of her own accord she resigned her authority into the hands of the Cardinal Dom Henry, the king's brother.

Sebastian undertakes an expedition against Africa.

After the king had grown up to man's estate, his desire was to distinguish himself against the infidels. He himself intended to conduct an expedition to the East Indies; but the prime minister Alcocova induced him to direct his attention to Africa. This expedition the king entered into in the most inconsiderate and absurd manner. He first sent for a prior, with some hundreds of soldiers; next he carried his principal courtiers with him from a hunting match, and without equipages; he then sent for the Duke of Aveyro, who brought with him such troops as he could collect on so short a warning; and when all these were assembled, the king spent his time in hunting, and slight excursions against the enemy, without doing anything of consequence, except exposing his person upon all occasions. He returned to Portugal, but only for the purpose of arranging another expedition, and it seemed to him that he had a pretence for commencing another campaign in the state of affairs in Morocco. Muley Hamet, King of Fez and Morocco, had been dispossessed of his dominions by his uncle Muley Moloch. At the beginning of this war Dom Sebastian had offered him the Portuguese troops in Africa, a tender which was rejected with contempt; but now being a fugitive, and having in vain solicited assistance from Philip of Spain, Muley Hamet applied to the King of Portugal; and, that he might the more easily succeed, he caused the fortress of Arzila, which his father had recovered, to be restored to the Portuguese. The king was in rapture at this event, and fancied that his glory would exceed that of all his predecessors. The queen-dowager, the cardinal, and all his friends united in their endeavours to divert him from this unfortunate enterprise. Even Philip of Spain, his uncle, attempted to convince him of the absurdity of his proceedings. Muley Moloch himself explained in a letter his own right to the crown of Fez, and showed that he had only dispossessed a tyrant and a murderer, who had therefore no right to his friendship or assistance. The Moorish prince next assured him that he had no reason to fear either the power or the neighbourhood of the Portuguese; and as a proof of this, as well as a mark of his esteem, he was content to make him a present of some 10 miles of arable ground round each of the fortresses he possessed in Africa, viz., Tangier, Ceuta, Mazagan, and Arzilla. But the King of Portugal was deaf to all salutary advice, and disregarded all remonstrances.

New expedition to Africa.

On the 24th of June 1577 he set sail from the bar of Lisbon with a fleet of fifty ships and five galleys, twelve pieces of cannon, and many transports and tenders, making in all nearly a thousand sail. His troops consisted of 9000 Portuguese infantry, 3000 Germans, 700 Italians, commanded by Sir Thomas Stukeley, an English exile, remarkable for his bravery; 2000 Castilians, and 300 volunteers, commanded by Christoval de Tuvara, master of the horse, a man of courage, but without either conduct or experience. He touched first at Lagos Bay, where he remained for four days, and thence he proceeded to Cadiz, where he was feasted for a week by the Duke de Medina Sidonia, who fruitlessly endeavoured to dissuade him from proceeding further in person.

Soon after landing in Africa the king was met by Muley Hamet, who delivered him his son, a boy of twelve years of age, as a hostage, and brought a reinforcement of three hundred Moors. Here it was resolved in a council of war to reduce the town of Larache, but it was disputed whether the troops should proceed thither by land or by sea. Dom Sebastian, who espoused the former opinion, finding himself opposed by Muley Hamet, answered him so rudely that he left his presence in disgust.

Muley Moloch, having received intelligence of this formidable invasion, took the field with 40,000 foot and 60,000 horse, and conducted every thing with the greatest prudence, notwithstanding he was so enfeebled by fever that he could not sit upon horseback. He advanced against the Portuguese army with such celerity that he came in sight of them on the 3d of August at Alcacer Quibir. Finding his disease increase to such a degree that he had no hopes of recovery, he resolved to lose no time in bringing on the battle, that his antagonist might not avail himself of his death. The disposition of the Christian army was, through the care of some old officers in Dom Sebastian's service, regular and correct.

The Portuguese army entirely defeated.

The Christians advanced with resolution, broke the first line of the Moorish infantry, and disordered the second. On this Muley Moloch drew his sword, and would have advanced to encourage his troops, but his guards prevented him, on which his agitation became so great that he fell from his horse. One of his guards caught him in his arms, and conveyed him to his litter, where he immediately expired, having only time to lay his finger on his lips by way of enjoining them to conceal his death. But by this time the Moorish cavalry had wheeled quite round, and attacked the Christian army in the rear; the Portuguese right was broken, and at this time Muley Hamet in passing a river was drowned. In this emergency the Germans, Italians, and Castilians performed prodigies; but the Portuguese, according to their own historians, behaved indifferently. Attacked on all sides, however, they were unable to resist; and the whole army, except about fifty men, were killed or taken prisoners. The fate of the king is variously related. According to some, he had two horses killed under him, and then mounted a third. His bravest officers were killed in his defence; after which the Moors surrounded him, seized his person, stripped him of his sword and arms, and secured him. They immediately began to quarrel about the prisoner, upon which one of the generals rode in amongst them, crying, "What, you dogs, when God has given you so glorious a victory, would you cut one another's throats about a prisoner? At the same time, discharging a blow at Sebastian, he brought the king to the ground, when the rest of the Moors soon dispatched him. Others affirm that one Louis de Brito meeting the king with the standard wrapped round him, Sebastian cried out, "Hold it fast; let us die upon it;" upon which charging the Moors, he was seized, but rescued by Brito, who was himself taken with the standard, and carried to Fez. The latter affirmed, that after he was taken he saw the king at a distance, and unpursued. Dom Louis de Lima met him afterwards making towards the river; and this is the last account of his being seen alive.

Immediately after the battle, the brother of Muley Moloch was proclaimed king by the Moors. The next day, having ordered all the prisoners to be brought before him, the new sovereign gave orders to search for the body of Dom Sebastian. The king's valet-de-chambre brought back a body, which he said was that of his master, but so disfigured with wounds that it could not well be known; and, notwithstanding the most diligent search, this monarch's death could never be properly authenticated. This body, however, was delivered up as the body of the unfortunate Dom Sebastian to Philip, King of Spain. By the latter it was sent to Ceuta, thence transported to Portugal, and buried amongst his ancestors in the monastery at Belem, with all possible solemnity.

By this disaster, the kingdom of Portugal sunk at once into the lowest rank of European states. All the young nobility were cut off or carried into slavery, and the kingdom was exhausted of men, money, and reputation; so that Dom Henry, who assumed the government after the death of his brother Sebastian, found himself in a very disagreeable situation. At his death the crown of Portugal was claimed by three different competitors,—viz., the Prince of Parma, the Duchess of Braganza, and Philip of Spain. Whatever might have been the merits of their respective claims, the power of Philip quickly decided the contest in his favour. He found his schemes facilitated by the treachery of the regents.

Portugal conquered by Philip of Spain.

Philip finding everything in his favour, commanded the Duke of Alva to invade Portugal at the head of 20,000 men; whereupon, after a feeble defence made by Dom Antonio, prior of Crato, who had been placed on the throne by the Portuguese, the whole kingdom submitted.

Terms granted by him to his new subjects.

Philip made his entry into Lisbon as soon as the kingdom had been totally reduced, and endeavoured to conciliate the affections of the people by confirming the terms which he had before offered to the States. These terms were, that he would take a solemn oath to maintain the privileges and liberties of the people; that the States should be assembled within the realm, and nothing proposed in any other States that related to Portugal; that the viceroy or chief governor should be a native, unless the king should give that charge to one of the royal family; that the household should be kept on the same footing; that the post of first president, and all offices, civil, military, and judicial, should be filled by Portuguese; all dignities in the church and in the orders of knighthood confined to the same; the commerce of Ethiopia, Africa, and the Indies reserved also to them, and to be carried on only by their merchants and vessels; that he would remit all imposts on ecclesiastical revenues; that he would make no grant of any city, town, or jurisdiction royal, to any but Portuguese; that estates resulting from forfeitures should not be united to the domain, but go to the relations of the last possessor, or be given to other Portuguese in recompense of services; that when the king came to Portugal, where he should reside as much as possible, he should not take the houses of private persons for his officers' lodgings, but keep to the custom of Portugal; that wherever his majesty resided, he should have an ecclesiastic, a treasurer, a chancellor, two masters of requests, with inferior officers, all of them Portuguese, who should despatch everything relating to the kingdom; that Portugal should ever continue a distinct kingdom, and its revenue be consumed within itself; that all matters of justice should be decided within the realm; that the Portuguese should be admitted to charges in the households of the King and Queen of Spain; that all duties on the frontiers should be taken away; and lastly, that Philip should give three hundred thousand ducats to redeem prisoners, repair cities, and relieve the miseries which the plague and other calamities had brought upon the people.

Treatment of Dom Antonio.

All these concessions, however, failed to answer the purpose; nay, although Philip was to the last degree lavish of honours and employments, the Portuguese were still dissatisfied. Dom Antonio, the exiled prince, still styled himself "King of Portugal." At first he retired to France, where he found so much countenance that, with a fleet of nearly sixty sail, and a considerable body of troops on board, he made an attempt upon Terceira, where his fleet was beaten by the Spaniards. Dom Antonio was constrained to retire, which he did with some difficulty, and going to England, he was well received there. After Philip had ruined the naval power of Portugal, as well as that of Spain, by equipping the Armada, Queen Elizabeth assisted Dom Antonio, and sent Sir John Norris and Sir Francis Drake with a strong fleet and a considerable army to restore him. Upon this occasion Dom Antonio sent his son Dom Christoval a hostage to Muley Hamet, King of Fez and Morocco, who was to lend him 200,000 ducats. But Philip prevented this by surrendering Arzila; which, with the unseasonable enterprise against Coruña, and the disputes that arose between Norris and Drake, rendered the expedition abortive; so that, except carrying the plague into England, it was attended with no consequences worthy of notice. Dom Antonio remained some time afterwards in England; but finding himself disregarded, he withdrew once more into France, where he fell into great poverty and distress; and having at length died in the sixty-fourth year of his age, an inscription was placed on his tomb, in which he was styled "king." He left behind him several children, who, on account of his being a knight of Malta, and having made a vow of chastity at his entrance into the order, were looked upon as illegitimate.

Impostors pretending to be Dom Sebastian.

But Dom Antonio was not the only pretender to the crown of Portugal. The people, partly from love of their prince, and partly from their hatred to the Castilians, were continually feeding themselves with the hopes that Dom Sebastian would appear and deliver them; and in this respect such a spirit of credulity reigned, that they would probably have taken a Negro for Dom Sebastian. This humour induced the son of a tiler at Alcobaça, who had led a profligate life, and at length turned hermit, to give himself out as that prince; and having with him two companions, one of whom styled himself Dom Christoval de Tavora, and the other the Bishop of Guarda, they began to collect money, and were in a fair way of creating much disturbance. But the cardinal archduke caused them to be apprehended, and after leading them ignominiously through the streets of Lisbon, he who took the name of Sebastian was sent to the galleys for life, and the pretended bishop was hanged. Not long afterwards, Gonsalo Alvarez, the son of a mason, gave himself out as the same king, and having promised marriage to the daughter of Pedro Alonso, a rich yeoman, whom he created count of Torres Novas, he assembled a body of about 800 men, and some blood was spilt before he was apprehended. At length, being clearly proved to be an impostor, this person and his intended father-in-law were publicly hanged and quartered at Lisbon. The punishment, however, instead of extinguishing public credulity, served only to increase it.

About twenty years after the fatal defeat of Sebastian, there appeared at Venice a person who created much more trouble. He assumed the name of Dom Sebastian, and gave a very distinct account of the manner in which he had passed his time since that defeat. He affirmed that he had preserved his life and liberty by hiding himself amongst the slain; that, after wandering in disguise for some time in Africa, he returned with two of his friends into the kingdom of Algarve; that he gave notice of this to the king Don Henry; that finding his life sought, and being unwilling to disturb the peace of the kingdom, he returned again amongst the Moors, and passed freely from one place to another in Barbary, in the habit of a penitent; and that after this he became a hermit in Sicily, but at length resolved to go to Rome, and discover himself to the Pope. On the road he was robbed by his domestics, and came almost naked to Venice, where he was known and acknowledged by some Portuguese. Complaint, however, being made to the Senate, he was obliged to retire to Padua. But as the governor of that city also ordered him to depart, he, not knowing what to do, returned to Venice, where, at the request of the Spanish ambassador, who charged him not only with being an impostor, but also with many black and atrocious crimes, he was seized and thrown into prison. In the examinations he underwent, he not only acquitted himself of the crimes which had been laid to his charge, but entered into so minute a detail of the transactions which had passed between himself and the republic, that the commissioners were perfectly astonished; and, moved by his behaviour, they showed no disposition to declare him an impostor. The noise of this was diffused throughout Europe, and the enemies of Spain endeavoured everywhere to give it credit.

The State however refused to discuss the point, whether he was or was not an impostor, unless they were requested so to do by some prince or state in alliance with them. Upon this the Prince of Orange sent Dom Christoval, the son of the late Dom Antonio, to make that demand; and at his request an examination was instituted with great solemnity. But no decision followed; only the Senate set him at liberty, and ordered him to depart from their dominions. By the advice of his friends, therefore, he proceeded to Padua in the disguise of a monk, and from thence to Florence, where he was arrested by the command of the grand duke, who delivered him up to the viceroy of Naples. He remained several years prisoner in the castle Del Ovo. At length he was brought forth, led with infamy through the streets of the city, and declared to be an impostor who assumed the name of Sebastian; at which words he said gravely, "And so I am." In the same proclamation it was affirmed that he was in truth a Calabrian; but as soon as he heard this he said, "It is false." He was next shipped on board a galley as a slave, and carried to San Lucar, whence, after being for some time confined there, he was transferred to a castle in the heart of Castile, and never heard of more. Some persons were executed at Lisbon for their endeavours to raise an insurrection in his behalf.

Bad consequences of the Spanish administration.

The administration of affairs in Portugal, during the reign of Philip, was certainly detrimental to the nation; and yet it does not appear that this proceeded so much from any ill intention in that monarch, as from errors in judgment. His prodigious preparations for the invasion of England impoverished all his European dominions; but it absolutely exhausted Portugal. Yet the government of Philip was so much better than that of his immediate successors that his death was justly regretted, and the Portuguese were taught by experience to confess that, of bad masters, he was the best.

Philip III. and Philip IV.

His son Philip, the second of Portugal and the third of Spain, sat twenty years upon the throne before he paid a visit to Portugal, where the people put themselves to a most enormous expense to receive him. He held an assembly of the States, in which his son was sworn as his successor. The reigns of Philip III. and Philip IV. were characterized by a series of bad measures and worse fortune. All their dominions suffered greatly; Portugal most of all. The loss of Ormus in the East, and of Brazil in the West, together with the shipwreck of a fleet sent to escort one of merchantmen from Goa, brought the nation incredibly low, and encouraged the Conde duke to hope that they might be entirely crushed. These are the heads only of the transactions of forty years. To enter in any degree into particulars, would only be to point out the breaches made by the Spanish ministers in the conditions granted by Philip; which, with respect to the nation, was the original contract and unalterable constitution of Portugal whilst subject to the monarchs of Castile, but which, notwithstanding, they often flagrantly violated.

The very basis and foundation of their privileges was, that the kingdom should remain separate and independent, and consequently that Lisbon should continue as much its

The Portuguese oppressed by the Spaniards.

capital as ever. But so little was this observed, that neither promotion nor justice was to be obtained without journeys to Madrid, which was not more the capital of Castile than it was that of Portugal. The general assembly of estates was to be held frequently, and they were only held thrice in the space of sixty years; two of them being held within the first three years. The king was to reside in this realm as often and as long as possible. Philip I., however, was there but once; Philip II. resided only four months; and Philip III. never at all. The household establishment was suppressed during all these reigns. The viceroy was to be a native of Portugal, or a prince or princess of the blood; yet when any of the royal family bore the title, the power was in reality in the hands of a Spaniard. Thus, when the Princess of Mantua was vice-queen, the Marquis de la Puebla was sent to assist her in council, and she could do nothing without his advice. The council of Portugal, which was to be composed entirely of natives, was filled with Castilians, as the garrisons also were, though the contrary had been provided. The presidents of provinces, or corregidors, were to be natives; but, by keeping those offices in his own hands, the king eluded this article. No city, town, or district was to be given to any except Portuguese; yet the Duke of Lerma had Beja, Serpa, and other parts of the demesnes of the crown, which were formerly appendages of the princes of the blood. None but natives were capable of offices in the courts of justices, in the revenue, in the fleet, or of holding any post civil or military; yet these were given promiscuously to foreigners, or sold to the highest bidder, not excepting the government of castles, cities, and provinces. The natives were so far from having an equal chance in such cases, that no situations in the presidios were ever given to them, and scarcely any in garrisons; and whenever it occurred, in the case of a person of extraordinary merit, whose pretensions could not be rejected, he was either removed, or not allowed to exercise his charge, as happened to the Marquis of Marialva and others. The forms of proceeding, the jurisdiction, the ministers, the secretaries, were all changed in the council of Portugal, being reduced from five to three, then two, and at last to a single person.

A revolution in favour of the Duke of Braganza.

By reason of these and other grievances, the detestation of the Spanish government became universal; and in 1640 a revolution soon took place, in which John, Duke of Braganza was declared king, by the title of John IV. This revolution, as being determined by the almost unanimous voice of the nation, was attended with very little effusion of blood. Several vain attempts were made by the King of Spain to regain his authority. The first battle was fought at Montijo in 1644, between a Portuguese army of 6000 foot and 1100 horse, and a Spanish army of nearly the same number. The latter were entirely defeated; and this contributed greatly to establish the affairs of Portugal on a firm basis. The Portuguese king carried on a defensive war during the remainder of his life; and after his death, which happened in 1655, the war was renewed with great vigour.

Perilous state of Portugal on his death.

This was what the Spaniards did not expect. It would not, indeed, be easy to conceive a kingdom left in more perilous circumstances than Portugal was at this time. The king, Dom Affonso Enrique, was a child not more than thirteen years of age, reputed of unsound constitution both of body and mind; the regency was in a woman, and that woman a Castilian; the nation was involved in a war respecting the title to the crown; and the nobility, some of them secretly disaffected to the reigning family, were almost all of them embarked in feuds and contentions with each other; so that the queen scarcely knew whom to trust or how she should be obeyed. She acted, however, with great vigour and prudence. By marrying her only daughter, the Princess Catherine, to Charles II., King of Great Britain, she procured for Portugal the protection of the English fleets, with reinforcements of some thousands of horse and foot; and at last, in 1665, the war was terminated by the glorious victory of Montesclaros. This decisive action broke the power of the Spaniards, and fixed the fate of the kingdom, though not that of the King of Portugal. Affonso was a prince whose education had been neglected in his youth, who was devoted to vulgar amusements and mean company, and whom the queen for these reasons wished to deprive of the crown, that she might place it on the head of his younger brother Dom Pedro. The Portuguese, however, would not consent to set aside the rights of primogeniture, and involve the kingdom in all the miseries attending a disputed succession.

Dom Affonso obliged to resign the throne.

Affonso was compelled to sign a resignation of the kingdom; and his brother, after governing a few months without any legal authority, was in a meeting of the States unanimously proclaimed regent, and vested with all the powers of royalty. Soon after this revolution, for such it may be called, the marriage of the king and queen was declared null by the chapter of Lisbon; and the regent, by a pontifical dispensation, and with the consent of the States, immediately espoused the divorced lady. He governed, under the title of regent, fifteen years, when, upon the death of the king, he mounted the throne by the title of Dom Pedro II.; and after a long reign, during which he conducted the affairs of the kingdom with great prudence and vigour, he died in 1706.

Dom John V.

Dom John V. succeeded his father; and though he was then little more than seventeen years of age, he acted with such wisdom and resolution, adhered so steadily to the grand alliance formed against France and Spain, and showed so great resources in his own mind, that though he suffered severe losses during the war, he obtained such terms of peace at Utrecht, that Portugal was in all respects a gainer by the treaty. The two crowns of Spain and Portugal were not, however, thoroughly reconciled until the year 1737. In 1750 a treaty was concluded with the court of Madrid, by which Nova Colonia, on the river Plata, was ceded to his Catholic majesty, to the great regret of the Portuguese, as well on account of the value of that settlement, as because they apprehended that their possession of the Brazils would by this cession be rendered precarious. The king died in 1750, worn out by infirmities.

Dom Joseph I.

He was succeeded by his son Joseph I., who ascended the throne of Portugal under very favourable circumstances; but his reign, although short, was marked by great national calamities. The most remarkable event which occurred was the memorable earthquake, which, in November 1755, destroyed one half of the city of Lisbon, and buried thirty thousand people under the ruins. Two hours had scarcely elapsed after this terrible convulsion, when, to aggravate its horrors, flames burst forth from different quarters of the city, and the conflagration raging with terrific violence for three days, Lisbon was completely desolated. The royal family were fortunate enough to escape; but amongst the victims were the Spanish ambassador, and many other persons of distinction. Britain promptly afforded relief to the sufferers; an act of generosity the more honourable to her, as she had every reason to be dissatisfied with the conduct of the King of Portugal. From the commencement of his reign, he had thrown great obstructions in the way of our commerce, evading treaties, and imposing vexatious imposts; and it seemed perfectly clear that his object was to annihilate the commercial intercourse which had for so many ages subsisted between the two countries. The same spirit of humanity was evinced by Spain; but both nations received an unworthy return, although Britain had most to complain of.

Scarcely had the agitation which this calamity gave rise to subsided, when Portugal was again thrown into commotion by an attempt to assassinate the king (3d Sept. 1758), who was wounded one night near his palace at Belem. Suspicion fell on various classes of persons, particularly on certain ecclesiastics, who were said to have been incensed at the reform introduced by Dom Joseph; on the creatures of Spain, who aspired to the reunion of the two kingdoms under one sceptre; on the Jesuits, who were represented as indignant at the restriction of their ancient privileges; and on a prince of the royal family. All that is known with certainty is, that the scaffold flowed with noble blood; and that the Jesuits were stripped of their possessions, whilst their expulsion was decreed by the crown. Another occurrence of this reign was a rupture with the see of Rome, every servant of the Pope being expelled from Portugal, and all intercourse between the two courts suspended for about two years. A more important event was the invasion of the country by Spain. This aggression originated in the refusal of the king to join the alliance of France and Spain against England. War was immediately declared against him, and troops marched to the frontiers of his kingdom. The ally whom he had so long neglected, and even deliberately ill-used, was appealed to, and not in vain. Troops, arms, and all necessary munitions of war, arrived from Britain; and although the invaders succeeded in capturing Miranda, Braganza, and Almeida, their triumphs were speedily put a stop to by the combined forces of Britain and Portugal. At the instance of the British cabinet, the Count de Lippe was brought from Germany to assume the command of the whole army. This commander was ably assisted in his operations by General Burgoyne, and they had soon the glory of freeing the country from the Spanish army. The consequence of this triumph was a peace, solicited and obtained by the two hostile courts, now hopeless of success, and in apprehension of fresh disasters.

The remainder of this king's reign, extending from the year 1763 to 1777, was occupied by the introduction of measures for social, agricultural, and commercial improvement. He laboured to improve the police and judicial administration, and not without success. He founded schools in the large towns, and improved the system of study in the university of Coimbra. He encouraged agriculture, the fisheries, and trade with the colonies; but in attempting to give a stimulus to home manufactures, by laying such duties on articles of British produce as amounted to an almost total exclusion of them from the Portuguese market, he acted with equal short-sightedness and ingratitude. One monument to his honour, more noble than the statue of bronze which his grateful subjects erected to him in Lisbon during his lifetime, remains to be mentioned. This was a decree by which the grandsons of slaves, and all who should be born after the date thereof, were declared free. Although this benefit was confined to Portugal alone, yet, considering the state of matters at the time it was conferred, it must be regarded as an amazing stride in the career of improvement. Joseph I. died in 1777, and was mourned by his people as the best monarch who had swayed the sceptre of Portugal since the days of Philip I. The prosperity of his reign was owing in great measure to the ability of his minister, the Marquis of Pombal, who, from his antipathy to the Jesuits and ecclesiastical tyranny, has been vigorously decried by the papal party ever since. Pombal's diplomatic correspondence and papers relating to the period 1738–47 were obtained for the British Museum in 1855.

Maria.

Joseph was succeeded by his daughter Maria, whom the necessities of state had induced her father to give in marriage to his own brother. Such revolting connections are unhappily far from rare in the modern history of Portugal. Some attempts were made to exclude her in favour of a nephew, but they proved completely abortive. Though the abilities of this queen were limited, yet she was actuated by good intentions. Her administration was feeble, but upon the whole beneficial. She followed the example of her father in encouraging national industry and reforming the administration of justice. She founded the Academy of Sciences, introduced into the convents of friars a compulsory form of general education, endowed several admirable charitable institutions, and went so far in judicial reform as to abolish the law of imprisonment for debt. In short, had her foreign policy resembled her domestic administration, Portugal would have had no reason to complain of her. Maria was forced into a family compact by her powerful neighbours of France and Spain, by which the influence of the latter was strengthened and confirmed, whilst in the same degree that of England was weakened. This alliance was accompanied by a treaty of limits, which fixed the boundaries of Brazil, Paraguay, and Peru, the arrangement being peculiarly favourable to Spain.

In the year 1792 the queen exhibited symptoms of mental alienation, and John Maria Joseph, prince of Brazil, was appointed regent. One of the first acts of his administration was a declaration of war against the French republic, a step which he was induced to take from his connection with England. But commercial distress, the accumulating debt of the country, and the menacing language which France compelled Spain to adopt towards her neighbour, led to a peace in 1797. In 1799 the malady of the queen appearing to be incurable, the prince was confirmed in the regency, with full regal powers; but he made no change in the policy of the government. The same year he was again encouraged to arm against French aggression, in alliance with England and Russia; the victorious career of the revolutionists having received a severe, although, as it proved, only a temporary check. After Napoleon had confirmed his ascendancy, Spain was under the necessity of declaring war against Portugal in the year 1801; but it was soon terminated by the treaty of Badajoz, in consequence of which Portugal was compelled to cede Olivenza to Spain, and likewise to pay a considerable sum of money. After this the prince enjoyed but a mere shadow of power, and at considerable sacrifices maintained a nominal independence, until at last, in 1807, a hostile army under Marshal Junot invaded Portugal, and the House of Braganza was declared by Napoleon to have forfeited the throne. This bold declaration was owing to the prince having refused to seize the English property in his dominions. Having embarked with his family for Brazil, the French general immediately afterwards took possession of his capital, and Portugal sank into the condition of an appendage of France.

Junot issued a proclamation, in which he declared that justice should be duly administered, tranquillity preserved, and the future happiness of the people solicitously guarded. But these professions were far from satisfying a people of whom the lower classes were dying of absolute want, and two-thirds of the merchants were bankrupt. A British force under the Duke of Wellington (then Sir Arthur Wellesley) was promptly despatched to Portugal, where it was joined by a considerable body of national troops, now mustered in the northern provinces, and determined to maintain the struggle for freedom. A Junta was immediately established in Oporto, to conduct the government. After some sharp skirmishing between the two armies, the decisive battle of Vimeiro, which was fought on the 21st of August 1808, overthrew the power of France in Portugal. The severely-censured convention of Cintra followed, and the country was evacuated by the French troops. The immediate consequences of this evacuation were highly beneficial. The government displayed an energy which restored subordination, and was felt all over the kingdom. A levy *en masse* of the whole male inhabitants, from fifteen to sixty years of age, was demanded; but it does not appear that the call was responded to with much alacrity. Towards the close of the year 1808, Madrid having surrendered, and the British army under Sir John Moore having been compelled to retreat through the mountains of Galicia to Coruña, the subjugation of Portugal was again resolved upon by the French. The intelligence of the approaching invasion at first spread consternation and dismay throughout Portugal, for it was in no condition to offer any serious resistance to the force of the enemy that menaced the frontiers. But fresh re-inforcements arrived from Britain, and General Beresford, who had been appointed commander-in-chief of the armies of Portugal, having established a system of subordination and discipline amongst the troops, confidence was in a great measure restored before a blow could be struck.

Marshal Soult entered the kingdom of Portugal at the head of the French army, after dispersing the Spanish force in Galicia. He was feebly opposed by the Portuguese. Their commander, General Freyre, was opposed to a regular engagement; but his unruly troops rose in mutiny and massacred both him and his supporters, under the suspicion of treachery. They were led against the enemy by Baron Eben, a German in the British service, and a battle was fought and lost. Soult then invested Oporto, and although the city had been strongly fortified and garrisoned, it was carried by assault on the 29th of March 1809, after a feeble defence of only three days. Immediately on entering the town, the French soldiery commenced an indiscriminate slaughter of the inhabitants; and although their commander used every effort to repress their fury, the plunder and licentiousness had continued a day and a night before subordination could be restored. The defeat of the Spanish army at Medellin opened an easy road to Lisbon; but the French force was divided into three separate bodies, under three independent commanders, Soult, Victor, and Lapisse, though, from fear of being separately committed, the whole remained inactive, or only engaged in insignificant manœuvres. Each commander appears to have waited for intelligence as to the movements of the others, and by this delay the capital was saved. Such was the situation of affairs when Sir Arthur Wellesley landed at Lisbon on the 23d of April, and assumed the chief command of the armies of England and Portugal. By a series of brilliant manœuvres, the British commander compelled the French to abandon Portugal. But Napoleon being pledged to his people and the world to conquer that country, early in 1810 an army of seventy-two thousand men was assembled in the vicinity of Salamanca, and the command of it intrusted to Marshal Massena. After clearing his way to Portugal, by the capture of several strongly-fortified places, the French general advanced upon Lisbon. But his vigilant enemy had well employed the time afforded him, by preparing a secure asylum for his troops, by which he at once kept his footing in the Peninsula, and defended Lisbon against a greatly superior force. This formidable defensive position is celebrated in military annals by the name of the lines of Torres Vedras. The advance of Massena, the battle of Busaco, the stand made at Torres Vedras, the retreat of the French, and their final evacuation of Portugal, will be found described in the article BRITAIN. It is true, that in the subsequent operations of the war, some parts of the kingdom were included in the theatre of hostilities, yet they never extended much beyond the frontiers. During the remainder of the war, however, the troops of Portugal bore an active and creditable part in almost every encounter with the enemy.

On the death of Maria, John VI. ascended the throne of Portugal and Brazil. The establishment of the court of Lisbon in an American settlement, though productive of little good to the mother-country, led to important results. In the first place, it induced Brazil to withdraw itself from dependence on England; and secondly, it paved the way for that colony erecting itself into a separate state. But the influence of England in Portugal continued, and the condition of the kingdom for the present remained essentially unchanged by the transference. The peace of Paris, concluded in May 1814, which, it was believed, would place everything on a proper basis, did not realize the expectations of the nation. Spain evaded the restitution of Olivenza, which had been provided for by the congress of Vienna; whilst, at the same time, Portugal was required to restore French Guiana to France. The court of Rio therefore took possession of the Banda Oriental; but an account of these transactions has been given in another part of this work (see BRAZIL). These circumstances rendered the condition of Portugal far from tranquil. The country felt that the order of things had been inverted, and the parent state had become a dependent on her colony. A conspiracy of a very extensive nature was discovered in the army, and its progress checked; but the spirit which generated it was not extinguished. In short, everything was ripening for a fundamental change in the administration and constitution of government; and the Portuguese people were soon afforded an opportunity of showing their dislike of the absence of the court, and the predominance of English influence. The continual bickerings between the commander of the forces and the regency induced Marshal Beresford to repair to Rio de Janeiro to obtain fresh instructions, and, it might be, fresh powers from the king; but during his absence that revolution burst forth which completely changed the whole political aspect of the kingdom.

The first symptoms of this revolution were exhibited at Oporto on the 24th of August 1820, both the citizens and the army acting in concert. The soldiers swore fealty to the king, the Cortes, and the constitution which might be adopted, and the civil authorities declared in favour of the measure. A junta of thirteen members was chosen by acclamation; and a declaration was addressed to the nation, stating, that the assembling of the Cortes and the adoption of a new constitution were the only means of saving the state. On the 15th of September, the day on which it was usual to celebrate the deliverance of Portugal from France, the regency in Lisbon, fearing to assemble such a multitude of people as generally met on that day, resolved to omit the ceremony. But the troops and the citizens met and deposed the government, declared for the king, the Cortes, and the constitution, and installed a temporary council as a provisional government. Thus a complete revolution was effected without either violence or bloodshed. The provisional government formed a union with the Junta of Oporto on the 1st of October; and one of the earliest acts of this united body was to despatch Count Palmella, the head of the royal regency, to Brazil, with an account of the transactions which had just taken place, and a petition that either the king or the prince-royal would return to Europe and assume the sovereignty of Portugal. One deputy was chosen for every thirty thousand inhabitants. Clergymen, lawyers, and officers were the sorts of persons who were chiefly elected, few men of wealth or family being chosen. On the 26th of January 1821, the Cortes met and named a regency and ministry, declared the late insurrections legal and necessary, and abolished the Inquisition. On the 9th of March the articles of the new constitution were adopted almost unanimously. By these, freedom of person and property was guaranteed, and the liberty of the press, legal equality, the abolition of privileges, the admission of all citizens to all offices, and the sovereignty of the nation, were secured. One chamber and a conditional royal veto were likewise resolved upon.

John VI. returned from America, leaving his eldest son, Dom Pedro, regent of Brazil. He was under the necessity of acceding to certain restrictions on his power, imposed by the Cortes, before he was permitted to disembark. On landing, he swore to observe the new constitution, and concurred in all the succeeding acts of the Cortes. In May 1822, Dom Pedro accepted the dignity of constitutional emperor of Brazil, and a complete separation took place between the two countries. The constitution of Portugal was finally completed and sworn to by the king on the 1st of October 1822; and, shortly afterwards, the session of this extraordinary Cortes closed. A plot, however, was formed for abolishing the new constitution, at the head of which was the queen, a Spanish Infanta; and several of the nobility and clergy were likewise engaged in it. Dom Miguel violated the promise which he had solemnly given to his father by becoming the leader of the counter-revolutionists, and inviting the nation to rise under the royal standard against the anarchical policy of the Cortes. The greater part of the troops declared for the Infant, and John VI., yielding to the force of circumstances, named a new ministry, and declared the constitution of 1822 null and void. Sixty members of the Cortes protested against this proceeding; but the king, a mere puppet in the hands of his son, was borne along by the force of the current, without being able to give any effectual check to its course.

The object of the queen and the Infant was to induce the king to resume absolute power; but John VI. firmly declared his resolution not to comply. The counter-revolutionists, however, began to act independently of his authority, and various steps were taken to carry out their views. Dom Miguel being appointed commander-in-chief of the army, called the troops to arms, and issued proclamations, in which he declared it to be his intention to emancipate the king from the control of free-masons and others by whom he was surrounded. The ministers and other civil officers, to the number of one hundred persons, were on the same day put under arrest; but when the king ascertained what had occurred, he declared that the whole had been done without his orders. As an excuse for his conduct, the Infant said that he had taken these steps for the purpose of frustrating a conspiracy which had been formed against the king's life. On the representations of the foreign ambassadors, the individuals imprisoned were released; and the king issued a decree commanding an immediate investigation of the pretended treason. John, finding himself in danger of falling a victim to the intrigues of his son, contrived to escape on board of an English vessel which lay in the Tagus. He deprived the Infant of his command, but pardoned him and gave him permission to travel. Portugal and Brazil assumed a hostile attitude, but at length the independence of the latter country was acknowledged. This weak, good-natured monarch died in March 1826, having previously appointed his daughter Isabella regent of Portugal.

Isabella for a short time governed Portugal in the name of the emperor of Brazil, Dom Pedro, who was the legitimate successor to both the European and American possessions of the House of Braganza. On the 23d of April 1826 he granted a constitution to Portugal, which established two chambers, and in some other respects resembled the French charter. Not long afterwards, he surrendered Portugal to his daughter, Donna Maria, as an independent queen, on condition of her marrying her uncle, Dom Miguel. An unsuccessful attempt was then made by the absolutists to overthrow the constitution, and proclaim Dom Miguel absolute king of Portugal. In July 1827 Dom Miguel was appointed by his brother lieutenant and regent of the kingdom. The prince immediately returned to Portugal, having pledged himself to abide by the terms required by Pedro. He arrived in Lisbon in February 1828, and immediately assumed the administration of the government, at the same time taking the oath to maintain the constitution. But oaths were in his eyes a mere formality of state, involving no moral obligation. He assumed the sceptre as absolute king, and took his measures accordingly. But the military in general were unfavourable to his projects. The garrison of Oporto declared for Dom Pedro and the charter; other bodies of troops followed their example, and a corps of 6000 men advanced towards the capital; but they were defeated by a superior force, and the efforts of the constitutionalists were for the present baffled.

The object of Dom Miguel was now to consolidate his power, and get himself proclaimed king. The Cortes met, and all who were likely to oppose him having been imprisoned or exiled, this body unanimously declared Dom Miguel lawful king of Portugal. The pretext by which the Cortes endeavoured to vindicate its conduct was, that as Dom Pedro had become a foreigner, he had neither a right to succeed himself nor to appoint a successor. On the 4th of July 1828, Dom Miguel confirmed the decree of the Cortes, and assumed the title, as he had already done the powers, of royalty. The punishment of those implicated in the Oporto insurrection followed as a matter of course. An expedition was likewise sent against the refractory islands which had refused to acknowledge the usurper; and Madeira and the Azores were, with one exception, reduced.

In the meanwhile, Donna Maria had set sail from Brazil for Europe; but on arriving before Gibraltar, she found that, under actual circumstances, it would be injudicious, if not dangerous, to land at Lisbon, and accordingly steered for the English shores. She remained sometime in London, and during her stay was entertained as queen of Portugal. In August 1829 she returned to Brazil, in which a revolution suddenly deprived her father of his American empire. Having abdicated a crown which he could no longer retain, in favour of his infant son, the ex-emperor sailed for Europe with his daughter, to assert her claims to the throne of Portugal. The usurper still pursued the same course of oppression, and, not content with confining and despoiling his own countrymen, he extended his outrages to British and French subjects. In the year 1830 it was calculated that 40,000 individuals were under arrest for political causes alone; and that 5000 persons were concealed in hiding-places in different parts of the country. How many had been devoted to destruction by being sent to the fatal shores of Africa, and how many had voluntarily exiled themselves, it is impossible to estimate. The British government demanded redress for the acts of violence committed against its subjects, and on this being refused, a British fleet entered the Tagus, and terrified the tyrant into compliance. France acted in a similar manner, and with even more success, demanding an indemnity for the expenses incurred by the expedition. Even the United States despatched a fleet to Lisbon to obtain satisfaction for injuries done to American commerce. But these repeated humiliations wrought no change in the policy of Dom Miguel. But his finances were now falling into inextricable confusion. The revenue scarcely sufficing for the household expenses and the maintenance of the troops, the usurper was driven to all manner of expedients to relieve his necessities. The island of Terceira, one of the Azores, resisted his claims; and here a regency was formally installed, with the Marquis of Palmella at its head. From this spot Dom Pedro issued a decree in favour of his daughter Donna Maria.

Although neither the government of France nor that of England gave open assistance to Dom Pedro, both abstained from opposing any obstacles to his measures of recruiting. Many officers of each nation enlisted in his ranks; and towards the end of December 300 half-pay officers and volunteers sailed for Belleisle on the coast of France, which had been fixed upon as the place of rendezvous. Insurrections took place in Portugal, but were ultimately suppressed. Meanwhile the island of St Michael's was captured by a force from Terceira, under Villa Flor, one of the members of the regency. Afraid that Madeira would be the next object of attack, Dom Miguel sent a small armament for its defence. Dom Pedro now resolved to hazard a descent upon Portugal with the undisciplined troops he had collected together. The expedition sailed from the island of St Michael on the 27th of June 1832. It consisted of two frigates, three corvettes, three armed brigs, and four schooners, besides transports and a number of gun-boats, to cover the landing. An officer who held a commission in the British army undertook the command of the naval department, with the rank of admiral. The whole army on board did not amount to 10,000 men, scantily provided with artillery, and still more scantily with cavalry.

Dom Miguel made every preparation in his power to repulse the threatened attack. On the 8th of July Dom Pedro appeared before Oporto, landed his troops, and took possession of the town, without the loss of a single man. Miguel immediately menaced Oporto from two points. On the 22d of July an action took place, in which his troops were repulsed, and compelled to fall back.

The operations of the naval squadron were attended with little success. Several partial engagements took place between the two fleets, but no advantage was gained on either side. Dom Pedro continued to fortify Oporto; whilst Miguel, with equal industry, was increasing his army, the greater part of which lay on the north side of the Douro. The Miguelites made an attack upon a suburb of Oporto, which they carried; and the possession of this place enabled them to harrass the city greatly. Dom Miguel then made a general but unsuccessful assault upon the works with which Oporto was surrounded. Finding that it was impossible to carry Oporto by storm, Miguel determined to cut off the supplies. By this step Dom Pedro found himself reduced to great difficulties.

The contention continued through 1833. In this year Admiral Napier, then commanding Dom Pedro's fleet, utterly annihilated the enemy's in the neighbourhood of Cape St Vincent. Previously to this achievement, a body of queen's troops had landed at another point of the coast, and in a few days the whole of the Algarves declared for Donna Maria. This small army, under the command of Villa Flor, now Duke of Terceira, marched upon Lisbon, and on the way completely routed a greatly superior force. The capital was deserted by the garrison; the inhabitants rose *en masse*, and declared Donna Maria their lawful sovereign; and the Duke of Terceira, entering Lisbon in triumph, hoisted the queen's colours on the citadel. Dom Pedro instantly set sail from Oporto to assume the government, and no sooner had the intelligence reached France and England, than both immediately acknowledged Donna Maria as queen of Portugal.

Great preparations were made for the defence of Lisbon against the Miguelite army, 18,000 strong, which, under Marshal Bourmont, an experienced general, was now advancing towards the capital. Several attacks were made on the defences during the rest of the year 1833, but the results were unimportant. The first military operation of importance which took place in 1834 was the capture of Leiria, an important town between Lisbon and Coimbra, which capitulated to the queen's troops in February. A battle was lost by the Miguelites near Almoster, where Saldanha was posted; and towns and provinces began to declare for the queen so rapidly that the cause of the usurper became desperate. He shut himself up at Santarem, with a view of keeping up his communications with the frontiers of Spain, whence he expected aid. It was a singular coincidence, that in Spain as well as in Portugal, an infant queen was supporting her cause by favouring popular privileges, with an uncle for her rival, as a representative of more despotic principles of government. The cause of the two queens being so far the same, a community of interest led to an alliance, to which the courts of Britain and France became parties. Each was recognised as lawful successor to the throne to which she aspired, and they both agreed to employ their arms jointly against their two rivals. Don Carlos was compelled to fly from Spain into Portugal, and thither he was pursued by a Spanish army, which proved even more fatal to Dom Miguel than to Don Carlos. The Miguelites, seeing all hope lost, rapidly disbanded, and only the miserable remnant of an army remained attached to the usurper. A suspension of arms was agreed to; and on the 26th of May a convention was entered into, by which Miguel formally consented to abandon the country. The terms granted him were, that he should never again set foot either in Portugal or Spain, nor in any way concur in disturbing these kingdoms; that he should leave the country within fifteen days; that he should have a pension of about L.15,000, and be permitted to dispose of his personal property, after restoring the crown jewels and other articles; and, finally, that, by his command, the troops still adhering to his cause should instantly lay down their arms, and the fortresses surrender to the queen. On the 2d of June he embarked for Genoa, where he had no sooner arrived than he issued a declaration declaring that he had acted under compulsion in relinquishing the throne, and that the transaction was null and void.

The civil war being thus terminated, an extraordinary Cortes was assembled on the 14th of August. The regency was ultimately conferred on Dom Pedro, but he expired on the 22d of September 1834, having, during the latter years of his life, acted a part which the earlier stages of his career gave the world little reason to expect. The queen's marriage with the Duke of Leuchtenberg, the son of Eugene Beauharnois, and the brother of Dom Pedro's wife, was soon afterwards resolved upon. A bill to exclude Dom Miguel and his descendants from the throne of Portugal was passed without one dissentient voice. The budget for the year 1834 showed a considerable deficit, and this formed an excuse for treating the British auxiliaries, to whom they owed so much, with shameful ingratitude.

Prince Augustus of Leuchtenberg, the husband of the young queen, having arrived in Portugal in the beginning of the year 1835, was appointed commander-in-chief of the Portuguese army, a nomination which gave rise to much contention. But death soon cut short the discussion, for the young prince expired on the 28th of March. The chambers, however, did not allow the queen to indulge long in the sorrows of widowhood. The constitutional system depended greatly on a direct succession to the throne, and before the end of the year the queen's second marriage was arranged. The bridegroom selected was Prince Ferdinand of Saxe-Coburg, a nephew of the King of the Belgians.

The prince arrived at Lisbon in April 1836. Government now became extremely annoyed by the question, whether the king should be appointed to the command of the army, when it turned out that this was one of the special conditions of the marriage treaty. The proceeding proved very unpopular, and materially hastened a revolution, in which the ministry and the constitution were shipwrecked together. It does not appear, however, that the government anticipated any serious changes, as the country, although a good deal irritated, exhibited no dangerous symptoms of discontent. Yet the revolutionary plot must have been arranged beforehand, for even the troops of the line were seduced. The queen was compelled to declare the political constitution of the 23d of September 1822 to be in vigour; but it was at the same time agreed that it should undergo such modifications as circumstances had rendered necessary. A new ministry was immediately appointed, and Prince Ferdinand was deprived of his military commission. But neither the great body of the people nor the more influential classes showed any indications of accordance with the remodellers of government. Almost all the nobility, the superior clergy, and many persons holding official situations of greater or of less importance, refused peremptorily to take the oath to the new constitution. The peers, whose existence as a separate legislative assembly was thus abolished, protested to the queen against the measure. The queen, however, was obliged to accede to most of the demands of the liberal party, and thereupon dismissed her ministers.

The principal events which followed these changes were, the economizing of the expenditure, the imposition of a tax for the support of the priesthood, the introduction of a uniform system of duties on vessels sailing from Portuguese harbours, the abolition of the slave trade, and other measures of more or less moment. During the years 1837 and 1838 some provinces of Portugal were kept in constant terror, and, to a certain extent, ravaged by rebel banditti, whose ostensible object was to excite a rising in favour of Dom Miguel. The most noted of these guerilla chiefs, Remechido, was at length taken and shot.

To trace the tangled thread of Portuguese politics, to narrate all the changes of ministry, all the outbreaks of the people, during the last few years, would be tedious and uninteresting. It will be sufficient to mention the principal events. On the 4th April 1838, the nineteenth anniversary of the queen's birthday, she and her husband solemnly swore to maintain the new constitution; and an amnesty was granted towards all political offenders in respect of events that had taken place since the 10th September 1836. Viscount Sa de Bandeira was placed at the head of the new cabinet; and the general election of deputies was proceeded with. On the 31st October the queen was delivered of son, who received the title of Duke of Oporto, and is now the reigning king. During the year 1839 there were two changes of ministry: in the latter Costa Cabral came into power. Early in 1840 the Cortes were suddenly dissolved, and a new Cortes summoned to meet in May. As the year wore away disaffection showed itself in a part of the army, but the insurrectionary spirit was soon put down. About this time a quarrel broke out between the governments of Spain and Portugal as to the navigation of the Douro, which had been declared free to both nations throughout its course by a convention signed in 1835, leaving certain regulations to be settled afterwards. The Portuguese government appearing to hold back, that of Spain threatened to enforce the treaty *vi et armis*, whereupon the former gave way, and the dispute was adjusted.

In January 1842 Costa Cabral, who then held the portfolio of justice, suddenly left Lisbon for Oporto; and there, along with the military commander, proclaimed Dom Pedro's charter of 1826; forming, at the same time, a provisional government in the name of the queen, in the presence of the municipal authorities and the troops of the garrison. It was strongly suspected that the court connived with this proceeding; however the government compelled the queen to dismiss Cabral from his office, and to issue a proclamation against the insurrection. A new cabinet was formed, at the head of which was placed the Duke of Palmella; but the troops at Lisbon and the populace broke out into open revolt, demanding the restoration of the charter, whereupon the newly-appointed ministers resigned, and a royal decree issued proclaiming the charter to be the law of the land. Of the next cabinet the Duke of Terceira was nominal chief, and Costa Cabral came in as minister for home affairs. The Cortes met in July, and the queen told them, with reference to the charter, that their mission was to consolidate it. Matters went on pretty quietly until February 1844, when a regiment mutinied, and the insurrectionary spirit spreading, the Count de Bomfin put himself at the head of about 700 men, and retired to Almeida, where he was besieged by the government forces. The alleged object of the insurgents was to procure the dismissal of the ministers. They made, however, a feeble resistance: the place was surrendered, and the leaders allowed to escape into Spain. After the close of the session ministers did several arbitrary acts under the shelter of royal decrees, for which, however, they were afterwards indemnified by the Cortes. In April or May 1846, the standard of revolt was once more raised. The insurrection commenced in the Upper Minho, the immediate cause being, the imposition of a new tax. Great dissatisfaction with the ministry had existed throughout the nation for some time; the conduct of Costa Cabral especially had excited indignation and disgust, his rapacity and venality being notorious, and his increasing wealth evident. A great part of Portugal was up in arms, and the ministers resigned; whereupon a new ministry was formed, with the Duke of Palmella at its head, and the Marquis of Saldanha and the queen issued a proclamation promising a redress of grievances, including a restoration of the liberty of the press. Cabral (who had been ennobled the previous year by the title of Count Thomar) made his escape into Spain. A royal decree authorized the Bank of Portugal to suspend its cash payments. The Chamber of Deputies was dissolved, and the Cortes assembled for the ensuing 1st of September. At the commencement of October the queen abruptly dismissed her ministry, and at once entrusted Saldanha with the task of forming a new one. The suddenness of the proceeding, and the names of some of the ministers, led a large section of the nation to believe that the crown wished to replace the Cabralista party in power. A considerable body of troops revolted, and placed themselves under the leadership of the Conde das Antas and the Conde da Bomfin; whilst a revolutionary Junta was organized at Oporto. Affairs being in a very alarming position, the British government despatched a special agent to watch the proceedings, and endeavour to effect a reconciliation between the parties; and a British fleet was ordered into the Tagus. In the confusion that ensued, an attempt was made to excite a movement in favour of Dom Miguel, but this utterly failed. Cabral wished to return to Portugal, but the ministers prevented him; giving him, however, the appointment of ambassador at Madrid. On the 23d December an engagement took place at Torres Vedras between the queen's troops, under Saldanha, and the insurgents, under Bomfin, about 4000 men being engaged on each side. Bomfin was completely routed; 1300 of his men were taken prisoners along with the commanders, at a loss to the queen's army of nearly 400 killed and wounded. Saldanha (now a duke) then marched into the north, a small force having been stationed at Estremoz, in the east. He remained inactive for some time in the neighbourhood of Oporto, but being too weak to besiege or attack the place, the insurgents gathered strength and organized their plans. In April 1847, several steamers having fallen into the hands of the insurgents, about 1200 troops under Sa da Bandeira were transferred from the north to the south; where, being augmented by a body of the local militia, they marched in the direction of Lisbon. Troops under the Conde de Mello raised this portion of the insurgent army to about 4000. On the 1st May an engagement took place in the neighbourhood of St Ubes (Setubal), in which 500 of the ante-ministerial troops were killed or wounded. The capital meantime was only kept quiet by the threatening attitude of the British fleet. The queen felt her throne trembling under her, and preparations were made to receive her and the royal family on board a British man-of-war. The government having appealed to the governments of Britain, France, and Spain, active negotiations were set on foot to negotiate with the malcontents, and an amnesty for the past was offered; but the negotiations failed. There had been all along a strong disposition on the part of Spain to send a body of troops to the assistance of the queen. Spanish interference not being desirable for political reasons, it was at length arranged that the three governments should afford the queen the needful assistance; and a protocol was accordingly signed in London on the 21st May. The ministers had previously resigned, and a transition ministry appointed. An amnesty was issued, and the insurgents, seeing that the contest had become hopeless, laid down their arms, and Spanish troops occupied Oporto. The Cortes met, and new ministers were called to power. Through 1848 the country was quiet, Saldanha being at the head of affairs. In March 1849 Cabral had intrigued so successfully that he ousted Saldanha, and continued prime minister until April 1851, when Saldanha broke out into open revolt. He marched northwards with an inconsiderable body of troops, and followed the queen's husband at the head of a strong force. Saldanha denounced the peculations and continued infractions of the constitution committed by Cabral, and he called upon the queen to dismiss him from her counsels. At first Saldanha's movement did not receive much encouragement; at length the city of Oporto declared for him. Cabral resigned, taking refuge on board a British steamer; and Saldanha returned in triumph to Lisbon. He was placed at the head of a new ministry, which continued in power until June 1856. During this period the country remained quiet, but the ministry were guilty of a disgraceful act of bad faith towards the public creditors of the state. The finances for many years had been becoming worse and worse. The credit of the nation was very low, and the annual deficit large. Endeavouring by a vigorous effort to put the national affairs on a better footing, a royal decree, issued on the 18th December 1852, to reduce the rate of interest on the national debt, irrespective of the rate at which the money was borrowed, and without any offer of paying dissentient creditors in full. Large arrears of interest had been previously capitalized after deducting 10 per cent. of the amount. These dishonest acts were almost sufficient to justify the intervention of the British government, since a very large amount of the debt was owing to British subjects. The London Stock Exchange refused to allow any quotation of the funds in their lists; and this continued to be the case until 1856, when the Portuguese government came to an arrangement with its foreign creditors, of dubious advantage to them it is true, but the best that could be made under the circumstances.

Donna Maria died in childbirth on the 15th November 1853, whereupon the king-consort proclaimed himself regent until his eldest son should be of age. At the close of her troubled life she left behind five sons and two daughters. The eldest son quietly ascended the throne, with the title of Dom Pedro V., on the 16th September 1855, the anniversary of his eighteenth birthday. Little occurred during his minority that needs to be chronicled here, save that the deficient harvest of 1854 compelled the government to admit for a time foreign grain free of duty; and that the young king paid a visit to England and part of the Continent, accompanied by his next brother, in pursuance of a wish expressed by their mother. His majesty has lately married a German princess of the House of Hohenzollern. He is said to be of a reserved disposition; but he won golden opinions from the nation by his behaviour during a pestilence resembling yellow fever that carried off nearly 5000 persons at Lisbon in the autumn of 1857. The exciting cause of this fever was the poisonous atmosphere occasioned by defective drainage. Lisbon has long had the character of being the filthiest city in Europe; but if money can be procured, something is now to be done to amend this state of things. The Saldanha ministry having proposed to raise a sum of L.3,000,000, to make a grant to a French company of the right of constructing certain lines of railway, and to impose new taxes, their plans met with strong opposition in the lower chamber of the legislature. This, however, was surmounted; but a still more violent opposition was threatened in the chamber of peers; to avoid which the king was asked to create a number of new peers. As he refused to do this, the Saldanha ministry tendered their resignation in June 1856. The king then empowered the Marquis de Loulé to form a new government, which contented itself with asking for authority to contract a loan of L.330,000. This was given; and the arrangement with the British bond-holders was confirmed. An act was passed in the same session to abolish slavery in the Portuguese colonies on the west coast of Africa.

Here our sketch of the history of Portugal ceases. What the future of the country may be, it is not easy to foresee. The past affords a miserable story; the enormous debt must for a long period cripple the nation. The resources of the country are doubtless great, but they can only be developed by the enlightened and honest conduct of men in power, by a peaceful and law-respecting people, and by capital. This last requisite exists not at present in Portugal itself, nor can it be obtained from abroad as long as there are evidences of dishonest dealings or political disturbance. The conduct of the young king since his accession to the throne affords ground for good hopes, but great tact will be required to reconcile conflicting parties, as well as a firm determination to do justice to all, and to reign for the benefit of the whole body of the people.

List of the Sovereigns of Portugal.

I. *House of Burgundy.*

	A.D.
Henry of Burgundy	1095
Affonso I. (Enrique)	1112
Sancho I	1185
Affonso II. (the Fat)	1211
Sancho II. (Capel)	1223
Affonso III.	1248
Diniz (the Farmer)	1279
Affonso IV	1325
Peter (the Severe)	1357
Ferdinand I.	1367
A regency	1383

II. *House of Avis.*

John I. (the Great)	1385
Edward	1433
Affonso V. (the African)	1438
John II. (the Perfect)	1481
Manoel (the Fortunate)	1495
John III.	1521
Sebastian	1557
Henry (the Cardinal)	1578

III. *Interval of Submission to Spain.*

	A.D.
Philip II.	1580
Philip III.	1590
Philip IV.	1623

IV. *House of Bragança.*

John IV.	1640
Affonso VI.	1656
Peter II. (regent from 1667)	1683
John V.	1706
Joseph	1750
Mary I., and Peter III.	1777
Mary alone	1786
Regency	1792
John VI.	1816
Peter IV.	1826
Mary II.	1826
Miguel I.	1828
Mary II. (restored)	1833
Peter V., the present king	1853

Boundaries and extent.

Portugal, the most westerly kingdom of continental Europe, lies between 36. 56. and 42. 13. N. Lat., and between 6. 15. and 8. 55. W. Long. Its length from N. to S. is 310 geographical miles, and its extreme breadth is 132 miles. It has the figure of an irregular parallelogram, and its superficial extent is estimated at 35,400 square miles. On the N. and E. it is bounded by the Spanish provinces of Galicia, Leon, Estremadura, and Andalusia; on the S. and W. by the Atlantic Ocean, to which it presents a coast-line of nearly 500 miles in length, having only one province, Traz-os-Montes, not washed by the sea. On the N. the coast is low at first, but it afterwards becomes rugged and steep. In Beira it again gets flat, sandy, and marshy; in Estremadura it is in one part steep, and in another almost a dead level, and very insecure; in Alemtejo it is low, being full of rocks and shallows; and although at Cape St Vincent it is high and rocky, as we proceed towards the Spanish frontier the country sinks into low sandy downs. The promontories most worthy of notice are Mondego in Beira, Carvoeiro de Rocha and Espichel in Estremadura, Sines in Alemtejo and San Vicente, and Santa Maria in Algarve. On the low coasts there are inlets of the sea, which afford opportunities for the formation of excellent harbours.

Mountains. Portugal is not separated from Spain by any natural boundaries, and hence in all its physical relations it is to be considered as a westerly continuation of that country. The principal chains of mountains are prolongations of those which traverse Spain. In the N., between the Minho and Douro, the country is intersected in various directions by the southerly and westerly procession of the Galician and Austrian mountain ranges, which terminate at the sea in a steep and broken coast. The provinces situated in this quarter are alternating mountain and high tableland, a continuation of the lofty table-land of Old Castile and Leon. The Serra de Montezinho, near the northern frontier, is a lofty range, on the summit of which snow lies for many months of the year; and indeed the peak of Gaviarra, 7850 feet, which forms part of the Serra de Suajo, is said to be crowned with perpetual snow. This range runs between the rivers Lima and Minho, terminating at the sea under the name of the Serra d'Estrica. On the left bank of the Lima extends the Serra de Gerez, a branch of the last-mentioned range, and declining towards the lower Douro, receives the name of the Serra de Sant Catarina. The highest point of this range attains the altitude of 7360 feet. In the province of Traz-os-Montes is also the Serra de Marão, on the left bank of the Tamega, and stretching down almost to the Douro. To the E. of it is the plateau of Guardo, between 2000 and 3000 feet in height, and which on the N.E. is bounded by the Serra de Montezinho. In the province of Beira, between the rivers Mondego and Zezere, extends the Serra d'Estrella, a continuation of a chain which traverses Leon and Castile. The mountain ridge consists of granite and layers of sandstone. It presents a shattered and savage aspect, is covered with snow during the greater portion of the year, and in its ramifications incloses the river Mondego. Its highest summits are those of Cantaro Delgado and the Malao da Serra. Northwards it declines gently towards the Vouga, and stretches in a westerly direction to the gates of Coimbra, under the name of the Serra de Alcoba. The southerly branch runs through the province of Estremadura, to the mouth of the Tagus, forming the granite mountains of Cintra, which terminate in the sea at the Cabo de Roca (Rock of Lisbon). To the S. of the mouth of the Tagus stretches the Serra d'Arabida, an inferior range. Between the Tagus and the Guadiana the country is elevated, but gradually sinking towards the Spanish province of Estremadura, is bounded on the S. by a continuation of the Sierra Morena of Spain, which mountain chain is here penetrated by the river Guadiana. The Serra de Caldeirao, which afterwards bears the name of the Serra de Monchique, a ramification of the gigantic Sierra Morena, extends in a westerly direction to the sea, where it terminates in Cape St Vincent, and completely incloses Algarve. Its loftiest peaks are Foya (3840 feet) and Picota (3720 feet), near the western extremity of the chain. From this account it will be seen that Portugal is a land of mountains intersected by valleys, many of which contain scenery of great beauty. There are, however, two plains of some extent; one to the S. of the Tagus, of which that of Santarem forms a continuation, and one at the mouth of the Vouga.

Rivers. Portugal receives its principal rivers from Spain. The largest are the Tagus, the Guadiana, the Douro, the Lima, and the Minho. The Tagus originates in the Sierra d'Albaracin, on the borders of Cuença and Aragon, flows at first in a northerly direction, and then turns to the S., but during the most part of its course its general bearing is westerly. After traversing several Spanish provinces, it enters the Portuguese territory near the point where it receives the Sever, separates the provinces of Beira and Alemtejo, and after dividing Portuguese Estremadura into two unequal parts, falls into the Atlantic. It receives the waters collected between two parallel ranges of mountains, flows through a mountainous country, and its current is much broken by rocks and cataracts. Its waters are turbid, and annually overflow and fertilize the extensive plains in the environs of Santarem and Villa Franca. Lower down it forms many marshes of considerable extent, which yield a large revenue. The length of its course is 450 miles. It is affected by the tide a considerable distance above Lisbon, but it is only navigable to Abrantes. Its width is so great near its mouth as to make it resemble a vast lake or arm of the sea; and at Lisbon it forms one of the finest and safest harbours in the world. The tributaries which it receives on the N. are the Elga, the Ponsal, and the Zezere; and those from the S. are the Sever, the Sorraya, erroneously called Zatas in most maps, and the Canha; but none of these are navigable. The rivers worthy of notice which have their source in Portugal are the Cavado, Ave, Vouga, Mondego, Sado, Odemira, Portimão, and Rio Quarteira. The Cavado rises in the Serra de Gerez, and after traversing the province of Minho, discharges itself near Esposenda, being only navigable for 7 miles. The Vouga has its source in Beira, and after traversing this province, enters the ocean below Aveira. The Mondego issues in the Estrella, crosses Beira and the plains of Coimbra, and finally joins the ocean near Figueira and Buareos. This is the largest of the rivers belonging exclusively to Portugal, and it is navigable for 60 miles, except in summer, when its waters considerably diminish. Its sands occasionally yield particles of gold. The Sado has its source in Alemtejo in the Serra de Monchique, and flows with a north-westerly course towards Estremadura. It becomes navigable from Porto de Rey, and enters the ocean by a large bay to the S. of Setubal. The same serra gives rise to the Odemeira and Portimão, the former being navigable to the town of the same name, and the latter as far up as Silves. The Rio Quarteira has its source in the Serra de Caldeirão, and forms at its mouth the small port which bears its name. These rivers, when swollen by the winter rains, overflow their banks, much to the advantage of the country, for the waters leave a rich deposit behind them. In summer they are very low, and many of the smaller rivers of Portugal are dried up during that season. They are in general much obstructed by rocks and bars of sand at their mouths, by which navigation is greatly impeded.

Lakes and springs. Portugal possesses no navigable canals worthy of notice. On the coast, especially in Alemtejo and Beira, there are morasses, lakes, and inferior inland seas, none of them being of great circumference. Several mountain lakes on the Serra d'Estrella are tepid, and throw up bubbles. Portugal is rich in medicinal springs, some of which are used for baths. They consist of gaseous and saline mineral waters, and of sulphureous and chalybeate springs. Thirty-four hot springs are known to exist, and lead to the supposition that volcanic action is still proceeding below the whole country. The most celebrated sulphur and warm baths are the Caldas de Gerez in Minho, those of Rainha and Oeiras in Estremadura, those of Chaves and Anciaes in Traz-os-

Montes, of San Pedro do Sul and Penagarcia in Beira, and of Monchique in Algarve. The best chalybeates are at Torro de Moncorvo in Traz-os-Montes, those of Amaranha and Guimaraens in Minho, and of Villas in Estremadura.

Geology. More than half Spanish Galicia—that is to say, all the western and middle parts of the province—consists of granite, gneiss, mica, schist, and other crystalline rocks; the eastern side being chiefly formed of slate, graywacke, &c., which probably belong to the Silurian and Devonian formations. The mean strike of the slates is about N.N.W. Small patches of secondary red sandstones, and marls of unascertained age, are scattered over the province; whilst now and then a small tertiary deposit occurs; and the bottoms of many valleys contain thick deposits of gravel. The same formations are found in the N. of Portugal. Great part of Minho and the western side of Traz-os-Montes are formed chiefly of crystalline rocks; but the rest of the latter province consists of slates, continuous with those in the E. of Galicia. The crystalline rocks extend, with some interruptions of slate and other rocks towards the S. or S.S.E., in a band of 40 or 50 miles wide, through the whole extent of Portugal, from the province of Minho to the Guadiana. The great mountainous districts of the Serra d'Estrella are included in their range. The granites gradually slope away from the Atlantic, and approach the Spanish frontier; while the slates on their eastern flank slope into Spain. The wine district of the Upper Douro is formed of slate rocks belonging to the Silurian system, being of precisely the same mineral type as those of France and Spain, and including the same fossils. These rise up in highly-inclined and vertical strata, and are nearly surrounded by granitic and syenitic mountains. They are quarried for roofing-slates. In this district is the coal-field of Vallongo, which supplies Oporto with anthracite coal, and geologists with a difficult puzzle. By mineral structure and fossil remains it belongs to the carboniferous era, and yet it is seen to dip under lower Silurian schists with their characteristic fossils. Murchison's explanation of the anomaly is, that the trough containing coal of true carboniferous date, deposited upon Silurian strata, has been dislocated and changed by subterranean movements, so that the original relative position of the beds has been inverted. The great granitic band is flanked on its western side by slaty and schistose rocks. The schists run S.E. from the mouth of the Vouga, keeping on the N. of the river; then turning southward, they run along the Serra de Busaco, pass about 4 miles to the E. of Coimbra, and continue along the small river Deuça; and then down the lower part of the Zezere to the Tagus near Abrantes. The district lying between the schists alluded to and the Atlantic is composed of sandstones of undetermined age, at the base above which are a series of Jurassic beds, a subcretaceous series, and a hippuritic limestone which is equivalent to our chalk. Southward of Abrantes is a great tertiary basin, with an area of between 2000 and 3000 square miles, through which the Tagus and the Sado cut their way to the sea. Lisbon stands in this basin. The most important part of this series is marine, belonging to the miocene period; but there occur some beds of lacustrine limestone. The upper part of this tertiary basin forms a marshy district, consisting probably of quite modern lacustrine and fluviatile deposits. To the N. of Lisbon, basalt, covering a considerable area, sharply separates the secondary and tertiary deposits. To the S. of that basin secondary beds make their appearance in the middle of Alemtejo, and these are probably older than those on the N. of the Tagus. On the S. is a lofty chain of hills, separating Alemtejo from Algarve, and consisting of schists and slates. A little granite, however, occurs at the Cabeça de Monchique. Schists are met with along part of the Alemtejo coast, and syenite at the Cape of Sines. In Algarve a band of secondary rocks lies to the S. of the schistose chain, and these are overlaid by tertiary deposits on the S. coast. Trap has burst forth near Cape St Vincent. Very little is known as to the geology of Portugal, except in regard to the neighbourhood of Lisbon and Oporto. The reader is referred, for further information, to Mr D. Sharpe's Memoirs in the *Transactions of the Geological Society* for 1841; and to the *Journal of the Geological Society*, vols. v. vi. and ix.

Mines. Tin mines appear to have been wrought by the Carthaginians in this part of the Peninsula; and it is affirmed that mines of tin-stone existed in some granitic mountains of Beira. Mines of gold and silver were wrought in this country by the Romans. There are lead mines near Coimbra, a mine of plumbago near Mogadouro, and iron mines near Figueira and Torre de Moncorvo. In Estremadura there are two very old establishments of the same kind, one in the district of Thomar, and the other in that of Figuero dos Vinhos. On the frontier of that province, and of its neighbour Beira, are situated the mines of red oxide of iron by which they are supplied. Iron indeed is one of the most abundant minerals in the country. There is a mine of antimony near Oporto, and the mountains in that neighbourhood everywhere give indications of copper and other ores. All the mines, however, are worked to a very small extent: the mineral riches of the country are great, but capital and enterprise are required to turn them to account. In Portugal there are also mines of tin, mercury, bismuth, and arsenic. Some of the rivers of this country, as well as those of Spain, are washed for the gold which they contain; and it is said that in this way large quantities of the precious metal were formerly collected. The river Tagus was anciently celebrated for the particles of gold which were found mingled with its sands; but its greatest riches are now borne on its bosom. Indeed, none of the streams yields a quantity worth much above the labour of collecting it. There is only one gold-mine in Portugal, situated in a place called Adissa, in the district of Setubal; but its annual produce is a mere trifle, not reaching 20 lb. weight at an average. Two coal-mines exist: one near Figueira, and the other near Oporto; but the coal is of inferior quality, and large importations consequently are made from England. The country abounds with beautiful marbles, but they are comparatively little wrought, from the expenses required to bring them to market. Precious stones are found in Portugal, and also quarries of limestone, gypsum, slate, freestone, millstone, black agate, together with immense beds of pyrites and marcasites, potter's and porcelain clay, and pits of common salt. In 1853, 60,000,000 bushels of salt were produced, of which about seven-twelfths were exported.

Climate and soil. Various causes conspire to produce great differences in the climate of Portugal in different situations, such as inequality of soil, vicinity to the ocean and to mountain ranges, &c. The mountain chains in the northern part of the country are very rugged and cold, the limits of perpetual snow being in this latitude under 8000 feet. This cold region comprises a considerable portion of the provinces of Traz-os-Montes and Beira, and the whole of the northern frontiers of Minho. The sea-coast of Portugal is very warm, the heat of summer, however, being tempered by the sea-breezes. The elevated plains and mountains are sterile, and destitute of wood; but the valleys and other low situations have a mild and agreeable climate, and are for the most part fruitful. A great part of Minho possesses a delightful climate. Estremadura, on the other hand, is very hot in summer and very cold in winter; but the high lands throughout the whole southern portion of Portugal have an agreeable temperature, equally removed from excessive heat in summer and severe cold in winter. Algarve alone has an African climate, but the excessive heat is greatly tempered by the sea-breezes. The warmer parts of Portugal have a short winter and a double spring. The first, which commences in February, is a delightful season. The succeeding months are variable, being in some years hot and dry, and in others cold and rainy. Harvest is gathered in June. Summer commences in the last week of July, and continues till the beginning of September. The heat is then very great, parching up all the vegetation on the plains and sea-coast, so that it is necessary to water plants to preserve them from destruction. Rain begins to fall early in October, and the vegetation of spring immediately succeeds to that of autumn. Winter lasts from the end of November till February, but the cold is seldom excessive, except in very elevated situations. In December heavy rains descend, accompanied by strong winds; it is during this period that the rivers are so liable to overflow their banks. The climate of Portugal, in general, may be pronounced salubrious, particularly along the coasts and on the tablelands. Fevers of various kinds appear to be the diseases most prevalent, but there are disorders peculiar to different localities. In many districts, in the country around Lisbon for instance, earthquakes are not unfrequently felt in harvest and winter. Portugal is rarely visited by violent storms, and thunder is seldom heard except during autumn and winter.

Animals.

Birds are not numerous; vultures and the gray eagle haunt some of the serras, and the red-legged partridge is common. Of wolves, wild cats, wild goats, wild boars, stags, and some other species of large game, there are a few in certain localities. Hares are rare, and rabbits are not so numerous as in Spain. Amphibious reptiles are not common, but vipers and venomous serpents abound in the mountains; the other parts of the country, however, appear to be free from them. There are several species of lizards. The rivers are amply stocked with fish, and the coasts literally swarm with them; but the fisheries are much neglected, and large quantities of salted fish are imported.

Flora.

The indigenous flora is very much the same as that of the rest of the Peninsula. Besides the British species of elm, ash, maple, sycamore, poplar, alder, hazel, and arbutus, there are found species of oak, willow, rhamnus, juniper, and heath, which are not indigenous in our islands, in addition to the species that are. Amongst the oaks, the cork-tree and the kermes oak may be noticed. Here grow also the bay tree, Portugal laurel, Spanish chestnut, two species of Pistacia, three species of Phillyrea, the sumach, carob-tree, *Celtis australis*, *Pinus maritima*, and *P. pinea*. The myrtle, pomegranate, rosemary, lavender, liquorice-plant, as well as *Viburnum Tinus*, *Daphne Gnidium*, *Smilax mauritanica*. Thirty species of Cistus, and many members of the genera Genista, Spartium, and Cytisus, are natives. In the south large plains are covered by *Cistus ladaniferus*, with patches of the dwarf-palm (*Chamærops humilis*). Amongst the filices it is curious that *Davallia canariensis*, a fern only found elsewhere in the Atlantic islands, should grow at Cintra and the neighbourhood of Oporto. Turning to plants which have been introduced, we may mention that, at the latter place, the camellia flourishes in the open air; whilst at Lisbon there grow, unprotected in gardens, the date-palm, the dragon-tree, coral-trees, acacias, and *Phytolacca dioica*. The *Agave americana* has become wild; and this is the case in the extreme south of Portugal with a cactus, the castor-oil plant, and the oleander. Groves of fruitful orange trees and fields of rice also attest the mildness of the climate; and, contrasted with the alpine plants on the mountains of the north, give some idea of its range. Much needs to be done to work out the flora of Portugal, for scarcely anything has been published respecting it since Brotero's *Flora Lusitanica*, which appeared in 1804. In Algarve the carob-tree and fig-tree yield fruits that are not only consumed on the spot, but are largely exported. From the fruit of the arbutus a spirit is extracted; almonds are produced in considerable quantities. The leaves of the dwarf-palm are applied to many useful purposes; and the grass known as Esparto (*Stipa tenacissima*, L.) is made into nets and cordage. There are large forests of Spanish chestnut on the mountains, but the kermes of the *Quercus coccifera* is no longer gathered, its use having been superseded by cochineal. A cactus (*Opuntia*) yields a fruit on the lower grounds which is much esteemed on the spot.

Population

According to the census of 1854, the population of the several provinces of Portugal was as follows:—

	Area in sq. miles.	Population.
Entre Minho e Douro	3,144	851,266
Traz-os-Montes	4,044	314,524
Beira	8,712	1,155,275
Estremadura	7,284	730,629
Alemtejo	10,056	301,062
Algarve	2,160	146,363
Total	35,400	3,499,121

The cities and towns having more than 10,000 inhabitants are—

Lisbon	275,000	Coimbra	15,000
Oporto	90,000	Elvas	12,000
Setubal	17,000	Ovar	12,000
Braga	16,000	Evara	10,000

Government.

The government, once one of the most absolute kind, is now a limited monarchy, altered by an additional act dated 5th July 1852. The existing constitution bears date the 29th April 1826. The crown is hereditary, and may be worn by females as well as males. The person of the monarch is irresponsible. There are two legislative chambers,—that of the peers and that of the deputies,—which are conjunctively named the General Cortes. The peers are named for life by the crown, by whom the president and vice-president are nominated. The deputies are chosen by direct election; the electors must be of full age, and possessed of a yearly revenue of about L.22. The deputies must have an annual income of about L.89, but no property qualification is necessary in the case of the graduates of a learned profession. The number of electoral districts in continental Portugal is 37, and the number of deputies is 133. The deputies elected in Madeira, Azores, and the colonies, amount to 25. Each deputy has a remuneration of about 10s. a day during the session. The annual session lasts three months, and a fresh election must take place at the end of four years. In case of a dissolution a new Cortes must be called together within thirty days. The chamber of peers consists of about 115 members, but the crown has the power of appointing new peers without limit. A peer does not necessarily bear a title; and, in fact, many peers are without titles, as many of those who have been ennobled have no seat in the chamber. There are seven ministers of state, one for each of the departments of the interior, finance, justice, and ecclesiastical affairs; public works, commerce, and industry; naval affairs and the colonies; war and foreign affairs. The deliberations of these ministers, who form, as we would say, "the cabinet," are held in the presence of the president of the council, who is considered the prime minister. Several of the ministers are assisted by administrative boards: for instance, there is a board of public instruction under the minister of the interior.

Knights, royal titles, &c.

There are six orders of knighthood in Portugal, viz.:—The military order of Christ, established in 1319; the order of San Thiago of the sword, founded in 1288; the order of Avis, for military merit, established in 1213; the military order of the Tower and Sword, founded in 1459, and revived in 1805–8; the order of Our Lady of the

Immaculate Conception of Villa Viçosa, for civil merit, founded in 1818; and the female order of Santa Isabel, established in 1804. In 1749 the King of Portugal received from Benedict XIV. the title of *rex fidelissimus;* and his Most Faithful Majesty styles himself "King of Portugal and Algarve, of both sides of the sea in Africa, Lord of Guinea, and of the navigation, conquests, and commerce of Æthiopia, Arabia, Persia, and India." The heir to the throne is styled Prince-Royal; his eldest son Prince of Beira; the other royal children are called Infants and Infantas of Portugal. The present Braganza line of princes commenced with John IV., who was proclaimed king in 1640. The national escutcheon is a silver shield, with five smaller blue shields lying crossways. On each of these are five silver pennies, placed so as to form a St Andrew's cross. There is a red border containing the armorial bearings of Algarve, which are seven golden castles with blue towers. The number of royal palaces, and that of the nobility, are in inverse proportion to the extent and wealth of the kingdom. Of the former there are eleven; and as to the latter there are, according to the *Almanach de Portugal* for 1856, no fewer than 7 dukes, 21 marquises, 79 counts, 102 viscounts, and 106 barons.

Finances.

The finances have been in a bad state for many years. The debt is rapidly increasing, the income being never equal to the expenditure. The national credit has fallen very low, and the nation is greatly impoverished; a state of things which internal troubles, breaches of contract with creditors, unprincipled dealings, and financial blunders, have contributed to form in their several degrees. The public debt was in 1855, L.21,384,538; an enormous amount for so poor a country, the interest of which presses grievously upon the springs of industry. The national revenues arise from—1. Direct imposts; 2. Customs and indirect imposts; 3. Rents and profits of national property. From the first class, consisting of a land-tax, income-tax, percentage on land sold, stamps, &c., there was produced in 1856 about L.650,000. From the second class, which includes the produce of the tobacco and soap monopoly, there was raised about L.1,384,000; and from the third, which includes the profits of the post-office, about L.140,000 was obtained. Besides these sums, L.118,000 was raised chiefly by the sale of national property. The budget for 1858–9 was:—Income, L.2,553,100; expenditure, L.2,894,790; deficit, L.341,690; two-thirds of which it was proposed to make up by various retrenchments and reductions of salaries. The king and royal family receive endowments amounting to L.131,000. The members of the Cortes receive L.17,000. In the budget for 1856–7, the following sums were allotted to the ministers for the expenditure of their several departments:—Finance (in addition to the allowances above mentioned, and to the interest on the national debt), L.160,000; home affairs, L.260,000; justice and ecclesiastical affairs, L.100,000; war, L.64,000; marine, L.186,000; foreign affairs, L.33,000; public works, commerce, and industry (including railways, roads, and post-office), L.231,000.

Justice.

For the administration of justice, continental Portugal is divided into 105 *comarcas*, in each of which there is a judge called *juiz de direito*, the highest judicial authority in the district. From his decision there is an appeal to one of the two superior courts of appeal sitting at Lisbon and Oporto. These judges must not remain more than six years at the same place, and are never appointed to exercise their functions in the district in which they were born. To the court of each *juiz de direito* is attached a public prosecutor, who is appointed by the crown, like the judge himself. Inferior to the *juiz de direito* are three classes of judges, exercising jurisdiction within narrower limits, appointed by the people; they serve two years, and are named *juizes ordinarios, juizes electos*, and *juizes de paz*. Criminals are tried before a jury composed of twelve persons, except in thinly-populated districts, where nine persons may form a jury. Their verdict needs not to be unanimous; it is sufficient if two-thirds are agreed. In civil cases the parties may agree to dispense with a jury, and this is very frequently done, in which case their functions are exercised by the judge. The course of law in civil matters is tedious and expensive; in criminal proceedings the accused frequently lies many months in jail before being brought to trial. The functions of police magistrates are exercised by an officer called *administrador*, appointed by the crown in each *concelho* or district of a municipal chamber.

Army and navy.

The strength of the army for the economic year 1855–6 was fixed by law at 24,000 men of all arms, exclusive of the municipal guards. On the 1st of January 1855 the army actually comprised—infantry, 15,217; cavalry, 2394; artillery, 1563; and engineers, 334. In addition to these there was a militia amounting to 5000 men. The engineers consist of one battallion, the artillery of three regiments, the cavalry of eight regiments, the infantry of eighteen regiments, besides nine battalions of riflemen. Connected with the army are the royal military college at Mafra, the polytechnic school, and the military school, both at Lisbon. Continental Portugal is divided into eight military divisions; the Madeiras and Azores forming two more. At the head of the entire army is the commander-in-chief, who is by law bound to obey the orders of the crown, signified through the secretary of state for war.

The naval force for the same year was fixed by law at 2383 men, distributed amongst one man-of-war, one frigate, three corvettes, four brigs, seven schooners and cutters, and six steamers. Official documents exhibit the fleet as consisting of twenty-six armed sailing-vessels, nine disarmed, four under construction, five armed steamers, and one disarmed, the whole carrying 449 guns. The orders of the crown are communicated to naval officers through the secretary of state for naval affairs.

Clergy and ecclesiastical affairs.

Continental Portugal is divided into three provinces,—viz., Braga, Lisbon, and Evora. Under the Archbishop of Braga, who has the title of primate, are six bishops; under the Patriarch of Lisbon (who is always a cardinal), are five bishops; and in addition the bishops of Augro (Azores), Funchal (Madeira), Cape Verde, St Thomas, and Angola. Under the Archbishop of Evora are three bishops. This hierarchy divides about L.21,300 amongst them. Goa in India is the seat of an archbishop, who has under him seven bishops and a prelate. The number of parishes in continental Portugal is 3769. The conventual establishments were suppressed in 1834, and their property taken by the state. At that time there existed in Portugal 632 monasteries and 118 nunneries, the two classes having 18,000 inhabitants. A few convents, however, are still permitted to exist, but their inmates are in a state of great poverty, and the buildings are gradually falling to ruin. The lower ranks of the priesthood throughout Portugal are poorly educated and badly paid. Roman Catholicism is the religion of the state, but all other forms are tolerated; and there are Protestant chapels at Lisbon and Oporto.

Public instruction.

The affairs relating to public instruction are under the management of the superior council of education, the nominal head of which is the secretary of state for the home department. This council holds its sittings at Coimbra. In Portugal the school is entirely separated from the control of the church; a remarkable fact in a Roman Catholic country. By a law enacted in 1844 it is compulsory on parents to send their children to a place of public instruction, but this law is far from being enforced, and only a very small fraction of the full number really attends a school. There is only one university in the kingdom, that of Coim-

Statistics.

bra, founded in 1290. This has five faculties and forty-six professors and lecturers, who are attended by between 800 and 900 students. In 1854 there were 1136 schools devoted to primary instruction in the kingdom, attended by 33,500 scholars of both sexes, of whom only 1570 were females. The lyceums, which constituted the division of secondary instruction, were 182 in number, and the pupils were 2860. Into the section of superior instruction fall the polytechnic academies and medico-chirurgical schools of Lisbon and Oporto, besides the university of Coimbra; into that of special instruction fall the academies of fine arts at Lisbon and Oporto, and the royal conservatorio of Lisbon for music, declamation, and dancing. As to the education of the clergy, six dioceses have seminaries, and eight have halls of theology. There is a royal military college at Mafra, an army school, a navy school, and a veterinary school at Lisbon. In the building of the extinct monastery of Belem, about 900 orphan and abandoned children of both sexes are supported, educated, and taught various useful arts. Two educational institutions recently established by government at Lisbon are likely, if properly worked out, to be attended with great benefit to the nation. These are the agricultural institute and the industrial school. The first is a college where instruction on the scientific treatment of the soil, cattle, &c., is imparted. In the year 1854–5 eighty pupils matriculated. The second is an institution where various useful arts are taught, as well as the elements of mathematical and physical science. In November 1855 the pupils amounted to 458. There is also an agricultural institute at Oporto. Lisbon has two botanical gardens; Oporto and Coimbra each one. These three cities have likewise observatories, public museums and libraries, and printing establishments. At Lisbon is a national printing establishment supported by the state; but recourse is had to a foreign country when neatly-printed books are required.

Agriculture.

Portugal is behind almost every nation of Europe in agriculture; and improvements are here very slowly introduced. The soil is neither manured nor tilled as it ought to be. The plough is composed of three pieces of wood awkwardly fastened together, and imperfectly aided by wheels. The districts best cultivated are the valleys of the Minho, the Upper Douro, and some portions of Traz-os-Montes and Beira. The total want of roads, and internal circumstances, present a very great check to every kind of production, and to native industry generally. Not one half of the area of Portugal is cultivated, and that in a very insufficient manner. Until lately grain was imported; it is now only beginning to be exported; and yet grain is a staple production, like oil and wine. Finer wheat, finer grapes, finer olives, can nowhere be produced; yet the wheaten bread is not good, the oil is inferior, and proper care is not taken in making the wines. Farmsteads, such as we are acquainted with in England, do not exist. The small occupants keep a few pigs, a goat, and poultry; but the rearing of swine, sheep, and cattle, is almost exclusively confined to the wealthier proprietors of extensive unreclaimed lands at the extremes of the kingdom, or in the vicinity of the Spanish frontier. The cattle in the north are small but fine, many of them having been reared on the fertile pastures of Galicia, and smuggled across the Minho. The southern breed is of great size, and is particularly well adapted for drawing the rude carts of very ancient form, the wheels and axles of which turn round together. The breed of pigs is not good; but as droves usually feed on acorns and chestnuts, the pork and hams are much esteemed. The best breed of sheep is reared on the frontier of Spain; but the mutton is generally very poor. The flocks of the Alemtejo yield the best wool. Milch cows are rare, butter being imported. Cheese is made on the mountains from the milk of sheep and goats; but in the cities the cheese consumed is imported. The milk consumed is chiefly that of goats. The general bread of the people is made from maize, for the cultivation of which grain the climate and soil are well adapted. The straw affords sustenance through the winter to the draught oxen. Rice is grown to a considerable extent in marshy districts in the south. The vegetables chiefly cultivated are beans, gourds, cabbages, onions, garlic, and potatoes. Chestnuts are a considerable item in the food of the people. Beer is almost unknown, wine taking its place. The horses are principally imported from Spain; but the native breed of mules is fine. The quantities of agricultural produce used as food, raised in 1855, were these:—Wheat, 938,100 quarters; maize, 1,714,200 quarters; rye, 651,900 quarters; barley, 271,400 quarters; 68,100 quarters; kidney-beans, 104,700 quarters. Hemp and flax are extensively grown. The average annual production of olive oil may be given at 28,000 pipes; and of this quantity, between 6000 and 8000 pipes are annually exported. Oranges, almonds, figs, and carob-tree fruit are grown and exported. In 1853 the sheep are calculated to have numbered two and a-half millions; the wool produced amounted to nearly four millions of pounds, and the raw silk to 315,000 pounds. Cork bark to the amount of 61,500 cwt. was exported in 1853.

The vine.

Four modes of cultivating the vine are adopted in Portugal,—1*st*, The vine is trained upon pollard or low trees, after the manner in use by the ancients Romans. 2*d*, In the valley of the Douro the vines are planted on terraces, and are not allowed to be higher than about 4 feet. The branches are tied to stakes as the fruit ripens, so that the grape is at least 8 inches above the ground. This is the mode generally adopted in the port wine district, where the ground is turned three times a year by hand labour, it not being possible to use the plough. 3*d*, The vines are planted in rows about 8 feet apart, with the view of admitting the plough between them. The plants are kept low, and resemble gooseberry bushes. 4*th*, In gardens near towns the vines are supported on trellises at a height of 8 or 10 feet above the ground, walks and arbours being formed beneath. In the wine district of the Douro, when the grapes are cut, they are conveyed in baskets to the press, which resembles a large stone trough. The white grapes are separated from the dark ones, but of the latter all varieties are thrown together, to make the wine we know as *port*. The grapes are then trodden by the feet of labourers stepping to the sound of some musical instrument; and when the first gang is tired, another takes its place. The operation is continued for about thirty-six hours. The grapes being fully crushed, fermentation commences in the "must;" and this is allowed to proceed for a longer or shorter time, according to the quality of the grape and the kind of wine proposed to be made. A "must" deficient in saccharine matter becomes wine in a much shorter time than one in which that matter is abundant. To produce a rich wine, the fermentation is checked, and brandy is added; to produce a dry wine, the fermentation is permitted to run its natural course, and only a small quantity of brandy is thrown in. Many varieties of grape are in cultivation, and the wines produced are very numerous. From the Douro district, a mountainous tract about 40 miles from Oporto, we derive port wine. The district within the control of the Oporto Wine Company produced in favourable years about 105,000 pipes; but the production for the last year or two has scarcely been one-fourth of this. A large tract of soil is devoted to the vine beyond this district; but the wine is consumed in the country. Comparatively little of the wine produced on the banks of the Tagus, known in this country as Lisbon wine, comes to England, the chief part of the exportations being taken to Brazil. Buccellas is the best known of these wines. The number of pipes of

Portuguese wine annually exported previously to the appearance of the vine disease was about 60,000, more than one-third of which was taken by Britain, and about one-half by Brazil. The average total quantity of wine annually produced amounted to about 650,000 pipes. In 1853 about 16,500 pipes of brandy were produced.

Manufactures.

The manufactures of the kingdom are of little importance, except in the coarsest fabrics. Not more than about 20,000 persons are employed in manufactures, and all the finest fabrics are imported. Small arms are made at Lisbon and Oporto; porcelain, after foreign designs, at Vista-alegre; cotton goods at Lisbon, Oporto, and Thomar; gold and silver work, iron and tin wares, at the same places; steam-engines and general foundry-work are made at Lisbon and Oporto; pottery, stearine candles, and fine soap are made at Lisbon, where there are sugar-refineries, distilleries, tanneries, &c. There are woollen manufactories at Lisbon, Port-alegre, Covilhão, and Tondão; glass manufactories at Marinha Grande, Terra de Feira, and Vista-alegre. Silk is manufactured in the Algarve; paper at Tojal and Alemquer. That Portugal is advancing, is shown by the increasing use of steam-power and machinery in manufactories, oil-mills, corn-mills, &c.

Trade and commerce.

The foreign trade of the country has been much reduced by the separation of Brazil and political disturbances. The chief articles of exportation are wine, oil, salt, wool, fruits, cork-bark. The chief importations consist of the finer fabrics of silk, cotton, linen, and wool; coals, metal-work, metal ores, tar, pitch, drugs, salt fish, butter, and cheese. Heavy duties are imposed on many manufactured fabrics, and a good deal of smuggling is the consequence. For this reason, and the additional reason, that many goods were imported for the purpose of being smuggled into Spain, where still higher duties were imposed, the official returns are little to be relied on. In 1854 the total value of the imports was, according to official returns, about L.4,044,600; and the total value of exports amounted to L.3,147,500. The following table gives the particulars of imports and exports for that year:—

	Imports.	Exports.
Cotton and cotton goods	L.880,000	L.154,440
Linen goods	124,500	23,110
Woollen goods	237,500	31,150
Silk goods	62,140	14,660
Fats and fatty goods	144,800	45,330
Animals	43,480	53,330
Animal products	127,000	70,660
Fish	148,880	26,660
Colonial produce	419,100	13,330
Grain	100,350	381,220
Wine, spirits, and fermented liquors	8,880	1,460,440
Fruits, seeds, and plants	8,440	248,410
Woods	150,440	87,550
Crockery and glass	29,900	5,700
Metal goods	1,093,550	348,000
Minerals, coal, &c.	973,440	17,770
Paper	27,110	8,440
Chemicals and drugs	153,110	139,330

The extent of the trade between Great Britain and Portugal may be judged of from official returns relating to the year 1854. In that year we received from Portugal produce to the amount of L.2,102,000, and we sent to her foreign and colonial produce to the amount of L.150,000, and home produce to the amount of L.1,370,600; there entered British ports during that year 195 Portuguese vessels with cargo; whilst in the preceding year 558 laden British vessels entered Portuguese ports. In 1854 Great Britain took from Portugal 22,800 pipes of wine; and in 1855, 52,000 qrs. of grain (principally wheat), and 10,430 cwt. of flour. Brazil is the next best customer of Portugal. In 1853 Brazil received from her goods amounting to L.580,000; and sent her produce of the value of L.190,000. There is also commercial intercourse between Portugal and the United States of America, France, Spain, Russia, Sweden, and Norway.

At Lisbon there are two joint-stock banks, and at Oporto one. At these two cities there are several insurance offices, and public companies for working mines, carrying on manufactories, &c. The nominal amount of capital embarked in public companies at the commencement of 1855 was, however, no more than L.3,326,000. The manufactures of tobacco and soap form government monopolies, and are farmed out to companies, whose articles are much complained of. The cities of Lisbon, Oporto, and Coimbra are lighted with gas manufactured by companies. At the two former places many English have settled, who are chiefly engaged in the wine trade.

Portugal is connected with England, France, the Mediterranean ports, and Brazil, by regular lines of steamers. Small steamers also connect Oporto, Lisbon, and ports in the Algarve. The Portuguese government is endeavouring to establish a line of steamers for connecting the Azores with Lisbon, and another line for connecting their West African possessions with the mother-country. In 1852 the ships, boats, &c., of continental Portugal numbered 671, with a tonnage of 71,400, manned by 7387 persons.

Several railroads have been projected, but the only one completed is a line of 22 miles connecting Lisbon with Carregado. Telegraphic lines, worked by electricity, have been established between Lisbon and the Spanish frontier, and Lisbon and Oporto.

The post-office is in the hands of government. The rate of postage has lately been reduced; and a letter not exceeding a quarter of an ounce is now carried any distance within the kingdom for 1¼d., which is paid by a stamp, on our own plan.

Coinage.

The coinage is on the decimal system, and accounts are kept in *reis*, 4500 of which are equal to the pound sterling. The chief silver coins are the *testao* = 100 reis, the *crusado novo* = 486 reis, and the *mil-rei*, or dollar = 1000 reis. There are gold coins of 4800 reis (the *moeda*, or moidore), 5000 reis, and 8000 reis.

Colonies.

The AZORES and the MADEIRAS (see these articles) are termed adjacent isles, and are not considered colonies. The Portuguese exercise sovereignty over the islands of Cape Verde, the islands of Principe, S. Thomé, and Anno Bom, off the African coast, near the equator; have possessions on the Guinea coast; and lay claim to a great region on the west coast of Africa, south of the line known as Angola and Benguela. The area of the country claimed by them in this part amounts to 153,000 square geographical miles, and the inhabitants are said to number 53,000, chiefly Negroes. On the east coast of Africa the Portuguese claim the territory of Mozambique, extending from the Bay of Lourenço Marques, in Lat. 26. S., to Cabo Delgado, in Lat. 10. S. The area is calculated at 216,000 square geographical miles, and the population at 300,000. In Hindustan the Portuguese have settlements at Goa, with a subject population of 350,000; a strip of land at Damão, in the Gulf of Cambay, with 34,000 inhabitants; and the fort of Diu, in Gujerat, with a piece of land inhabited by 11,000 persons. In China, Portugal claims nine square miles at Macao, with a population of 4600. She also claims the islands of Timor and Solor, lying between Australia and Java. These are said to have a population of 92,000.

Language and literature.

The language, like the Italian, may be described as a soft bastard Latin, for the majority of Portuguese words are derived from that tongue. It has a close affinity to the Spanish; so much so, that Spaniards and Portuguese can understand each other; and yet considerable differences have been produced by the separation of the two kingdoms through a long course of years, and by the efforts of the Portuguese themselves, who have always desired to make their language diverge as much as possible from their neighbours. The Spanish tongue is more dignified, stately, and rich; the Portuguese more concise, soft, and fluent, with more conversational aptitude. In the latter tongue is embodied a large number of Teutonic and Arabic words; of words of eastern origin, chiefly Arabic, a list of 1400 has been made out. It has no guttural sounds, but possesses many strongly-marked nasal endings, chiefly *em*, *ão* (formerly written *am*), and *ãa*. *J* and *x* are soft, not guttural, as in Spanish; *ch* is also soft, as in French, not hard, as in Spanish; *h* is silent except in the middle of a word, when it has the liquid sound of *y*; *c* before *e* and *i* is soft, before the other vowels hard, unless marked with the cedilla. Adjectives change their terminal *o* into *a* for the feminine; *s* is the sign of the plural in nouns; and the infinitive mood of verbs ends in *r*. The language is easily acquired by foreigners. The best modern dictionary is F. S. Constancio's *Novo Diccionario Critico e Etymologico da Lingua Portuguesa*, Paris, 1836; its etymological explanations, however, are frequently unsatisfactory.

Literature. The literature of Portugal, almost ignored by the rest of Europe, contains, it must be admitted, no masterpieces, with the exception of *Os Lusiadas* of Camoens; and this poem is much oftener mentioned than read out of Portugal. It has, however, been translated into most European languages, there being no fewer than three into English. The language, lending itself readily to verse, poetry forms a disproportionately large section of the literature; and of this section love poems form the great bulk. Several early kings and members of the royal family composed verses, and thereby gave fashion to the occupation. In the fifteenth century romantic pastorals, the most artificial of all poetical compositions, came into vogue, and this class of poetry has ever since been much cultivated. At the close of the fifteenth century appeared Bernardino Riberio, one of the best of the early poets; and a little later the much-esteemed poems of Sãa de Miranda saw the light, many of them, however, being written in the Castilian language. Camoen's great poem was first printed in 1572. Amongst modern poets the name of Almeida Garrett, only recently dead, is conspicuous. The first classical prose work is a romance entitled *Corte na Aldea*, by Rodriguez Lobo, published towards the close of the sixteenth century; and at the same period the works of Cortereal, another classic writer, saw the light. In the seventeenth century appeared several works of travel, one of which, Mendes Pinto's *Perigrinaçam* (1620), has been translated into most European languages, and has acquired a distinguished reputation for want of veracity. In one of Congreve's plays, a dealer in fictions is thus addressed,—"Mendes Pinto was but a type of thee, thou liar of the first magnitude!"

In the department of history the writers are numerous. The national conquests in the sixteenth century are a favourite theme; and here the *Decads* of Barros (1553), the Livy of the Portuguese, are conspicuous. In the next century Andrade's *Life of Don João de Castro*, fourth viceroy of the Indies, is considered a masterpiece of biographical composition. Almost the only complete history of the kingdom by a native writer is the *Historia de Portugal*, by Lemos, 1786–1804, 20 vols. A valuable history of the kingdom is, however, in progress, and promises, by its critical spirit and elegant style, to form a classical work. We allude to the History of Alexandre Herculano, the royal librarian, of which four volumes have appeared. In a nation which has always boasted of its adherence to Romanism, it is only to be expected that theological and ecclesiastical writings should be numerous, and a glance at any library will show that such is the case. We shall content ourselves, however, with referring to Diniz's *Das Ordens religiosas em Portugal*, 1853.

As to pieces for the theatre, the early dramas of Antonio Ferreira, Camoens, and Gil Vicente, the Plautus of Portugal, were original; then came imitations of the Spanish writers; and of late years the French stage has been the main support of the Portuguese drama. The best comedy in the language is thought by the Portuguese themselves to be the Countess Vimieiro's *Osmia*, which was crowned by the Academy. It is founded on an event in their early history.

In the department of fiction the Portuguese of the present time rely chiefly on importations or translations from other nations, chiefly the French. With regard to periodical literature, there are between forty and fifty newspapers published in the capital, and in the principal towns; they are all of small size, and their circulation is very limited. The leading articles read like translations from the French applied to Portuguese topics. Those who wish to learn more of the literature of Portugal may consult Sismondi's *History of the Literature of the South of Europe*.

Fine arts. In this department Portugal presents us with no name of eminence, with the exception of an old painter who is known as the Gran Vasco, and who in that country takes the rank that Raffaelle takes in the rest of Europe. The events of his life are unknown; the year, even the century of his birth, is a matter of dispute; and all that can be said with certainty is, that he was born either in the fifteenth or sixteenth centuries. A vast number of pictures in different parts of the country are attributed to him, the majority, no doubt, quite erroneously. The best collection of his works is said to be found in the cathedral of Viseu. The wealthier class of Portugal seems to have little taste for the fine arts; a few of the nobility, however, possess small collections. The national collection is deposited in the convent of St Francisco (at present the Academy of Fine Arts) at Lisbon; but not more than half-a-dozen pictures of real value are to be found in it. Exhibitions of the works of living artists occasionally take place here.

The following works may be consulted by those desirous of learning fuller particulars on the subject of Portugal:—Forrester's *Prize Essay on Portugal*, second edition, 1854; *Portugal und Seine Colonien*, von Dr Minutoli, 1855; Murray's *Handbook for Travellers in Portugal*, 1855; and the *Boletin do Ministerio das Obras Publicas*, an official work published at intervals. (J. Y. J.)

PORTUMNA, a market-town of Ireland, in the county of Galway, at the head of Lough Derg, 39 miles S.E. of Galway, and 94 W.S.W. of Dublin. Though at one time a place of some importance, it is now but a poor town There are here a fine parish church in the perpendicular style, with a lofty spire; a Roman Catholic church, court-house, national school, dispensary, workhouse, and jail. The ruins of Portumna castle, and of an old monastery, are also to be seen here. Tobacco is manufactured; and there is some trade. Six fairs are held annually. (Pop. (1851) 1542.

PORTUS, ÆMILIUS, an accomplished Greek critic, was the son of the eminent philosopher Francis Portus, and was born at Ferrara about 1550. Like his father before him, he devoted his life to the promotion of polite learning. From 1581 to 1592, his time was occupied with the duties of Greek professor at Lausanne. He then discharged the same office at the university of Heidelberg. Meanwhile his mind, down to the time of his death in 1610, was also occupied with the composition of commentaries, translations, and original works, all bearing upon his favourite study. He published editions of the *Iliad*, Euripides, Pindar, Aristophanes, Thucydides, and Xenophon. He translated into Latin the *De Theologia Platonis* of Proclus, the *Lexicon* of Suidas, the *History* of Thucydides, and the *Roman Antiquities* of Dionysius of Halicarnassus. At the same time, he gave to the public the following works:—*Oratio de Variarum Linguarum Usu*, 4to, Cassel, 1611; *Dictiona-*

rium Ionicum, 8vo, Frankfort, 1603; *Dictionarium Doricum*, 8vo, Frankfort, 1604; *Pindaricum Lexicon*, 8vo, Hanau, 1604; *De Prisca Græcorum Compotatione*, 8vo, Heidelberg, 1604; and *De nihili Antiquitate et multiplici Potestate*, 4to, Cassel, 1609.

Portus, *Francis*, an eminent philologer, was born in the isle of Candia in 1511, and received his education at Padua. The classical attainments which he now showed were destined to be matured by a long and varied experience as a teacher. He began life by holding for some time the directorship of the school for young Greeks at Venice. He then occupied, for the space of six years, the chair of Grecian literature at Modena. His next post was that of tutor to the sons of the Duchess Renée of France, who was then living at Ferrara. At length, in 1562, he was found at Geneva, a refugee on account of his adherence to Protestant opinions, and the professor of Greek in the university of that city. It was about this time that Francis Portus became known as a philological writer. He published commentaries and annotations upon Pindar, some of the works of Xenophon, Thucydides, Aristotle's *Rhetoric*, Longinus, and some other writers. After his death in 1581, his posthumous works were published by his son Æmilius, in 4to, 1584.

PORUS, an Indian prince who was conquered by Alexander the Great. (See Macedonia.)

POSEIDON. See Neptune.

POSEN, a province of Prussia, lying between N. Lat. 51. 10. and 53. 32., E. Long. 15. 7. and 18. 30.; and bounded on the N. by the province of West Prussia, W. by that of Brandenburg, S. by that of Silesia, and E. by the Russian empire; area 11,348 square miles. The surface is almost entirely level, and large portions of it are occupied by lakes and marshes. The principal rivers are the Warthe and the Netze, both taking their rise in Poland, and flowing westwards,—the former through the middle and south of the province into the Oder, and the latter through the north, and falling into the Warthe. The principal affluents of the Warthe that join it in this province are the Prosna and the Obra, both from the left. The Oder just touches the province at one point on the extreme S.W., and the Vistula washes it for a short distance on the N.E. frontier, and receives here the Brahe, which is connected by the Bromberg Canal with the Netze. The Warthe is navigable all through the province, and the Netze as far as Nackel, where the Bromberg Canal meets it. Of the lakes in Posen, the largest is that of Goplo, on the Polish frontier, which is 10 square miles in extent. The most important marsh is that from which the Obra takes its rise. The soil is in general very fertile, especially on the banks of the Warthe: in other places it is of a sandy nature, and not so good. The minerals found here, consisting of iron, building-stone, saltpetre, &c., are of no great importance. All the ordinary kinds of agricultural produce may be raised; and this is one of the provinces in Prussia most productive of corn. Posen contained, in 1852, 3,649,807 acres of arable land, 515,516 of meadows, 1,348,389 of forests, and 1,144,932 of waste land. Besides corn there are raised here potatoes, pulse, hops, tobacco, hemp, flax, &c. Timber is obtained in large quantities from the forests, and forms an article of export of some importance. The province contained, in 1855, 153,442 horses, 868 asses, 481,418 horned cattle, 2,199,977 sheep, 13,749 goats, and 163,258 pigs. Poultry and bees are also kept, and fish are obtained from the rivers. Manufactures are not carried on here to any great extent. The most important establishments are 303 breweries, 257 distilleries, 13 tanneries, besides manufactories of woollen cloth, cotton, and linen. A considerable trade is carried on in the export of manufactured articles, as well as of corn, timber, cattle, wool, hides, tallow, honey, wax, &c. Education is not in such a good state in Posen as in other parts of the monarchy. It contains, however, 14 gymnasia, with 188 teachers and 4207 scholars; 3 normal seminaries, with 175 pupils; 36 middle schools, attended by 2702, and 1984 public elementary schools, by 212,152 scholars. This province at one time formed part of the kingdom of Poland; but at the first partition in 1772 Prussia obtained all the country north of the Netze, and at the second partition in 1793 all the rest of the present province. An insurrection of the Poles against Prussia took place in this province in 1848; but after suffering several defeats, the insurgents were dispersed, and their leaders apprehended. In the same year, certain portions of Posen, inhabited chiefly by Germans, were incorporated with the German Confederacy; but in October 1851 these were again separated by a treaty. Besides Germans, Posen is inhabited by Poles and Jews, both of which races are more numerous here than in any other part of the kingdom,—the former amounting to about 930,000, and the latter to 74,031 in 1851. In that year there were 447,986 Protestants and 870,574 Roman Catholics in the province. It is divided into the governments of Posen and Bromberg. Pop. (1855) 1,392,636.

Posen (Pol. *Poznan*), the capital of the above province, a strongly-fortified town on both sides of the Warthe, 149 miles E. by S. of Berlin. It is pretty well and regularly built, and is entered by four gates. In the middle of a large market-place stands the town-hall, a Gothic building of the sixteenth century, with a tower erected in 1730, which is the highest in Posen. In the interior there are some curious sculptures, and statues of several Polish kings. Another large and splendid square, the Wilhelmsplatz, contains the theatre and the public library of 26,000 volumes,—the latter occupying a building erected in 1836, with a portico of twenty-four Corinthian columns in front. In the suburb of Wallischei, which lies on the right bank of the river, and is connected with the rest of the town by a wooden and a stone bridge, stands the cathedral, a building of no great pretensions, but containing several ancient monuments,—among the rest that of the Woywoda Gurka and those of the bishops of Posen. The Golden Chapel, added to the main building in 1842, is a richly-decorated specimen of the Byzantine style. The church of St Stanislas is a beautiful building in the Italian style. Numerous other churches, a synagogue, and several convents, are contained in the town. The former Jesuits' college is now used as a government-house. Posen contains two gymnasia, a Roman Catholic normal seminary, and several other educational and charitable institutions. The town was made a fortress of the first rank by the erection in 1828 of Fort Winiary. It stands on a hill to the north of the town, of which, as well as of the hilly and well-watered country round about, it commands a fine view. The manufactures of Posen are numerous, consisting of linen and woollen cloth, chintz, calico, leather, tobacco, sealing-wax, carriages, &c. An active trade is carried on; there are two wool markets, and three much-frequented annual fairs. Posen is said to have been, next to Gnesen, the most ancient city of Poland, and the residence and place of burial of the dukes and kings of that country. It was originally built only on the right bank of the Warthe; but in 1250 that part which lies on the other side was founded. All the finest parts of the town have risen since Posen became a part of Prussia. Pop. (1852) 44,039.

POSIDONIUS, a distinguished Stoic philosopher, was a native of Apameia in Syria, and was the pupil of Panætius and cotemporary of Pompey and Cicero. He was probably born about 135 B.C.; but the date of his birth is not known with exactness. On the death of Panætius at Athens, Posidonius set out on his travels, and first visited Spain. Having collected a variety of information on points of geography and natural history, he next visited Italy, Sicily, Dalmatia, Illyricum, Massilia, Gallia Narbonensis, and Liguria, and fixed his abode at Rhodes. Here he became president of the Stoic school, and took a prominent part in the political affairs of the republic. He was sent on an embassy to Rome, B.C. 86, when he became personally acquainted with Marius. Cicero and Pompey both visited him at Rhodes; and he is reported to have gained much geographical and historical knowledge from the latter. In B.C. 51 Posidonius removed to Rome, where he soon after died. As a physical investigator he was greatly superior to the generality of the Stoics, attaching himself in this respect more to Aristotle. He was a man of very extensive information on almost all departments of human knowledge, and particularly of astronomy and geography. He calculated the diameter of the earth, the distance of the sun and its magnitude, and the influence of the moon on the tides. Of the writings of Posidonius there were in all about twenty-five, none of which has come down to us entire. The relics of his writings have been carefully collected and illustrated by Janus Bake, in a work called *Posidonii Rodii Reliquiæ Doctrinæ*, Lugd. Batav. 1810. (Fabric. *Bibl. Græc.*, vol. iii.; Ritter, *Gesch. der Philosophie*, vol. iii.; Smith's *Dictionary of Greek and Roman Biog. and Myth.*)

PÖSING, a town of Hungary, in the county of Pressburg, on a small affluent of the Danube, 12 miles N.E. of Pressburg. It has a castle, churches, a monastery, and a synagogue. There are here celebrated mineral baths. Paper, saltpetre, and other articles are manufactured. In the vicinity granite is quarried; and vines are extensively grown. Some trade in timber is carried on. Pop. 4950.

POSITIVISM, or "*Positive Philosophy*," is the name given to that new philosophy inaugurated by the late Auguste Comte, and which is to be found developed both in principle and in details in his *Cours de Philosophie Positive*, 6 vols., Paris, 1830–42. It lays claim to present a doctrine which is *positive*, because elaborated from the sciences, and yet possessing all the desired generality of metaphysical doctrines. It puts aside as futile all inquiry into causes and essences, and restricts itself to the observation and classification of those *laws* which regulate all phenomena. Comte advances three initial conceptions, two of which relate to method, one to history.

The first conception is, that philosophy and science are identical; that every science, of whatever kind, is but a branch of the positive philosophy; consequently, that one method must be followed in all investigations, whether they relate to physics, to psychology, to ethics, or to politics.

The second conception is, that of classification, whereby this philosophy resolves itself into five fundamental sciences, of which the succession is determined by a necessary subordination, founded on a comparison of corresponding phenomena, the simpler being studied first, are converted into instruments for the better prosecution of those which succeed. Thus mathematics becomes the instrument of astronomy and physics; chemistry becomes the instrument of biology, and biology the instrument of sociology. There are two classes of phenomena to be signalized,—*inorganic physics* and *organic physics*. In inorganic physics we separate the general phenomena of the universe from the less general terrestrial phenomena, and obtain thereby *celestial physics*, or *astronomy*, and *terrestrial physics*. Astronomy, as the most general and simple in its phenomena, demands the first place in our studies. Terrestrial physics is divided into the two classes of *physics* proper and *chemistry*. Organic physics requires a similar division into *biology* and *sociology*, as the phenomena relating to mankind are more complex than those relating to the individual man.

The third conception refers to the fundamental law of evolution. Humanity has three stages of development,—the theological, the metaphysical, and the positive. In the history of individuals, in the history of nations, we find that speculation originates with supernatural explanations, advances to metaphysical, and finally rests in positive explanations. In the theological state, man is disposed to regard all effects as supernatural, as so many signs of the pleasure or displeasure of some being or beings adored and propitiated as a God. The lowest condition of this stage is Fetishism, the highest is Theism. The metaphysical stage, which is properly but a modification of the Theological, is equally important as the Transitive stage. In it the supernatural agents give place to abstract forces, supposed to inhere in the bosom of substances, and capable of producing phenomena. In the Positive stage the mind, convinced of the folly of inquiring into causes and essences, applies itself to the discovery of those laws which regulate effects. It tries to discover those invariable relations of succession and similitude which exist throughout nature. The pretension to absolute knowledge is disavowed, since everything beyond the senses is futile. The discovery of laws becomes the great aim of mankind.

Such is a brief view of the positive philosophy, possessing great merits and very great defects. The attempts of the author to found a social doctrine and a new religion will not tend to smooth down what is harsh in his philosophy.

Positivism finds an advocate in George H. Lewes. See his chapter on "Auguste Comte," in his *History of Philosophy*. He has likewise written a volume to expound it, entitled Comte's *Philosophy of the Sciences*, 1853. Harriet Martineau has given us a condensed translation of the *Cours de Philosophie Positive*.

POSSESSIVE. See GRAMMAR.

PÖSSNECK, a walled town of Saxe-Meiningen, Hildburghausen, in the principality of Saalfeld, on the Kerschau, 11 miles E.N.E. of Saalfeld. It is an active manufacturing town, producing cloth, leather and porcelain. Pop. 4200.

POST, a word derived from the Latin *positus*, set or placed. It is used in several different meanings, but all of them referring either immediately or remotely to this primitive sense of *position*. Thus the word *post* signifies a stake, or piece of timber set upright; a station, particularly a military station; an office or employment; an operation in book-keeping; a conveyance for letters or despatches; a particular mode of travelling.

POSTERN, in fortification, a small gate usually made in the angle of the flank of a bastion, or in that of the curtain, or near the orillon, and descending into the ditch, by which the garrison can march in and out unperceived by the enemy, either to relieve the works or to make sallies. The word is also used in general for any small door or gate.

POSTH (Lat. *post*, after; It. *postilla*; Sp. *postila*), a name anciently given to a note in the margin of the Bible, and afterwards to one in any other book posterior to the text.

POSTLIMINIUM, amongst the Romans, the return of one who had gone to sojourn elsewhere, or had been banished or taken by an enemy, to his own country or state.

POST-OFFICE.

Introduction.

It has been usual to trace the origin of posts to a remote antiquity, certain establishments, having something in common with the modern post system, being found to have existed at an early period of the world's history. Herodotus and Xenophon mention that, among the ancient Persians, stations were appointed at intervals along the great roads of the empire, where couriers were constantly kept in readiness to bear despatches and intelligence. Similar institutions, as we learn from Suetonius, were maintained amongst the Romans in the time of Augustus, and some such probably existed much earlier. But although the *name* of the *post* may be traced to this source (from the Latin word *positus*, whether as applied to the accommodation and means of transport *placed* at intervals for the service of the couriers, or to the couriers themselves, placed or *posted* at the several stations), such institutions obviously bear but a vague resemblance to the post-office of the present times. The couriers were mere State messengers, the communication only to and from the seat of government; nor, so far as appears, was there any regular machinery for the receipt and delivery of letters, so essential to the idea of a modern post establishment. The posts which were first instituted in the kingdoms of modern Europe, as those by Charlemagne and Louis XI. of France, the Emperor Charles V., and some other sovereigns, differed little, if at all, from those now described. It is indeed probable, that whenever the posts or couriers were appointed to perform their journeys at stated periods (which, as soon as the occasions for employing them became frequent, would be found at once the most economical and effective mode), such a convenient means of conveying correspondence, though primarily intended only for State purposes, would soon come to be used by individuals. Houses of call for the receipt and delivery of letters would in process of time be established by custom, if not by regular appointment; and in this way the modern post system might grow up. The earlier posts instituted in Europe, however, were in general but of temporary duration; their existence being dependent sometimes on occasion, sometimes on the disposition or policy of particular monarchs. In our own country, the insular position of which made our sovereigns less anxious about intelligence from their frontier, nothing of the nature of a public post establishment can be proved to have existed (or with an immaterial exception in the reign of Edward IV.) till that after the modern form was introduced; to explain the rise of which, however, is matter of no difficulty. The conveyance of letters, indeed, is what must inevitably become, in the course of human transactions, as much matter of necessity, as the conveyance of persons or of commodities; and the same circumstances which generate the formation of roads and bridges, and give existence to the trade or occupation of carrier, shipmaster, or innkeeper, must necessarily lead to the employment of the post messenger, under greater or less degrees of system and regularity. History, more attentive to record the transactions of monarchs than the steps by which communities effect their advancement and improve their conveniences, furnishes little beyond an incidental notice of the modes by which the circulation of correspondence was conducted before it became matter of State regulation. The conveyance and delivery of letters was often part of the usual occupation of travelling pedlars and others, whose business led them to perform stated or frequent journeys. When commerce began to advance, regular conveyances for correspondence were established between some of the principal trading cities, either by the municipal authorities, or by concert of private individuals or associations.

British Post-Office.

A permanent establishment of messengers for the conveyance of letters was attached to the university of Paris from the beginning of the thirteenth century, and indeed was not abolished until the year 1719, long after a general post had been settled in France. Other universities were similarly provided. In some instances powerful and opulent individuals established posts, either as a mercantile speculation, or for the convenience of any district in the prosperity of which they took an interest. But although the conveyance of correspondence was thus brought to some degree of system, or rather prevailed under a variety of systems, even in places where the State authorities had not yet provided any public establishment for this purpose, it is easy to see that communication, especially between distant places, must have been slow, irregular, and insecure. The advantage and even necessity of having a uniform and legalized system of post conveyance could not have failed to present itself to the eyes both of subjects and rulers; although it may be a question whether the sovereigns who first established such systems in their dominions were in general moved so much by large and enlightened views of public benefit, as by the wish to create, according to the practice so usual in that age, a lucrative trading monopoly in behalf of some of their favourites.

The establishment of the modern post system, then, in some of the principal countries of Europe, is not properly to be viewed as of the nature of a political or civil invention, being merely the assumption, on the part of the State, of the conduct of a particular department of human affairs which had grown up with the progress of society, but was now fast outgrowing the means and appliances of private enterprise, and presenting tempting possibilities of aggrandisement to official persons. Everywhere the transmission of letters, and more especially of government despatches, was at first connected with the furtherance of ordinary travel; and (as we shall see hereafter) in many parts of Europe the connection still continues. Our historical review begins at home. After narrating the successive proceedings which have gradually made the British post-office the best in the world, we shall describe its existing regulations and mechanism. It will then remain to give such account of the postal systems of other countries as our limitations may permit.

I. HISTORY OF THE BRITISH POST-OFFICE.

History of the British post-office.

As early as the middle of the thirteenth century, entries occur in the wardrobe accounts of the kings of England of payments to royal messengers for the conveyance of letters to various parts of the country. In entries of the same year (*e.g.*, 1252) these messengers are variously designated. Sometimes the term used is *cokinus*, sometimes *nuncius* or *garcio*. The same three words occur, half a century later, in the wardrobe accounts of Edward I., two of them being employed in the title of the chapter relating to such payments,—*Titulus de Expensis Nunciorum et Cokinorum Regis Edwardi filii Regis Henrici*, &c. In the supervision of these royal messengers lies the germ of the office of postmaster-general.

The first of such officers of whom we can give a distinct account is Sir Brian Tuke, who is described in the records as *Magister Nunciorum, Cursorum, sive Postarum*, "both in England and in other parts of the king's dominions beyond the seas." Thomas Cromwell wrote to him, in August 1533, complaining of "great default in conveyance

Postal system in England under Henry VIII.

of letters," and signifying the king's pleasure "that posts be better appointed." Tuke, in reply, assures the secretary that the cause of the mischief is the insufficiency of the sums assigned for the payment of men and horses. "The king's grace," he writes, "hathe no moo ordinary postes, ne of many days hathe had, but bitwene London and Calais; and they in no wages, save the post of London in 12d., and Calais 4d., by day; but riding by the journey, whereof most part passe not two in a moneth; and sens October last the postes northewarde, every one at 12d. by day. Thise in wages be bound but to on horse, which is inough for that wages, albeit some of them have moo. I never used other ordre, but to charge the towneshippes to lay and appoint such a post, as they wol answer for." After some other explanations, the postmaster-general proceeds thus:—"Sir, ye knowe well that, except the hakney horses bitwene Gravesende and Dovour, there is no such usual conveyance in post for men in this realme as is in the accustumed places of France and other partes; *ne men can kepe horses in redynes withoute som way to bere the charges, but when placardes be sent for such cause, the constables many tymes be fayn to take horses oute of plowes and cartes, wherein can be no extreme diligence.* But, sir, not taking upon me to excuse the postes, I wol advertise you that I have knowen in tymes past folkes whiche, for their owne thanke, have dated their letters a day or two more before they were writen, and the conveyers have had the blame." In 1545 Sir Brian Tuke was succeeded by Sir William Paget and John Mason, Esq., as joint postmasters-general, under letters-patent, which grant the office to them during their lives and the life of the survivor, under the same designation as that borne by Sir Brian Tuke, "together with the wages of L.66, 13s. 4d. a year," in addition to the expenses incurred in the conveyance of letters, of which accounts were rendered from time to time.

But long subsequent to this appointment of a postmaster-general, the details of the service were frequently regulated by proclamations and by orders in council. Thus, in the curious collection of royal proclamations in the library of the Society of Antiquaries, there is one of Philip and Mary (undated, but apparently of 1555), which regulates the supply of horses for the conveyance of letters to Dover. Again, in July 1556, the Lords of the Council order "that the postes betweene this and the Northe should eche of them keepe a booke, and make entrye of every lettre that he shall receive, the tyme of the deliverie thereof unto his hands, with the parties names that shall bring it unto him." Sir John Mason was succeeded in 1567 by Thomas Randolph, and he by Sir John Stanhope (afterwards Lord Stanhope of Harrington) in 1591.

Regulation of the English post-office in 1591.

In the year last named appeared "A Proclamation for redresse of disorders in postes which convey and bring to and out of the parts beyond the seas packets of letters." It recites previous attempts to redress such disorders, and "particularly to prevent the inconveniences, both to our own service and the lawfull trade of honest merchants, by prohibiting that no persons whatsoever should take upon them, publicly or privately, to procure, . . . bring in, or carry out, any packets or letters to or from the countries beyond the seas, except such our ordinary posts and messengers for those parts as, either by our master of the posts, or the masters of the posts-general of those countries reciprocally, should be found nominated for that kind of service." This prohibition is renewed in more stringent terms, and command is given to all mayors, sheriffs, justices, officers of customs, and officers of the post, "to make diligent search of all mails, budgets, and other carriages of all such disavowed carriers, messengers, or suspected persons, . . . and all such so discovered to apprehend and stay."

Postal arrangements in Scotland; and in Great Britain after accession of James I.

The accession of James I. to the English throne, by necessitating a more frequent communication between London and Scotland, led to some improvements in the postal service. Some years earlier, special posts had been established by the magistrates of some Scottish towns for the conveyance of their despatches to and from the court. Thus, in 1590, a messenger was appointed by the magistrates of Aberdeen with the title of "council post," and with a dress of blue cloth bearing the town arms.[1] The new royal orders of 1603, "for thorow posts and carriers riding in post in our affaires," direct (1.) that "in all places where posts are laid for the packet, they also . . . shall have the benefit and pre-eminence of letting . . . of horses to all riding in post (that is to say) with horn and guide, by commission or otherwise; and to that end shall keep . . . or have in readiness . . . such . . . sufficient post-horses . . . as their own abilities will bear, or that the contributory provision of the towns . . . shall enable them unto;" (2.) that "it shall be lawful for the posts or the owners of the horses to demand for the hire of each horse, after the rate of twopence-halfpenny the mile, besides the guides' groats, of all such as ride on public affairs. But of all others riding post with horn and guide about their private businesses, the hire and prices are left to the parties' discretion, to agree and compound within themselves." Finally, it is directed that every post shall keep at least two horses for the express conveyance of government letters, shall forward such letters within a quarter of an hour of their receipt, and shall travel at the rate of not less than seven miles the hour in summer and five miles in winter.[2]

Appointment of a postmaster-general for foreign parts (1619).

In 1619 a new office of "postmaster-general of England for foreign parts, being out of our dominions," was created by letters-patent of James I., in favour of Matthew de Quester,[3] and Matthew de Quester the younger, the former of whom, it is recited, "had humbly petitioned us in respect of his many years' service in sending packets in foraine parts, and for that he had beene often occasioned to send speciall messengers beyond the seas in matters of more importance," &c. The new office was regarded by the existing postmaster-general, Charles, Lord Stanhope (who had succeeded his father) as an infringement of his own patent. On a reference to the council, it was declared that "both grants might well stand together, being of distinct places," but the dispute, as we shall see, lasted for many years, and had curious consequences.

After a trial in the King's Bench, which had no definite result, the matter came repeatedly before the Lords of the Council. In 1626 the Council ordered that, "as most of the foreign posts were now well settled by the labour and industry of the said De Quester, . . . the Marchants Adventurers and other marchants should attend the board, and show cause why he should not be likewise employed by them for their dispatches into foreign parts without the king's dominions." But on a hearing, "liberty was given as well to all other companies of merchants as to the Merchants Adventurers, to send their letters and dispatches by messengers of their own choosing." A year afterwards this liberty was revoked, except as regarded the Company of Merchants Adventurers only. Lord Stanhope, however, continued by his agents to carry letters abroad, and obtained a warrant prohibiting De Quester from interfering. Sir John Coke, writing to his fellow-secretary, Lord Conway, deplores "the audacity of men in these times, and that Billingsley, a broker by trade (the deputy of Lord Stanhope), should dare to attempt thus often to question the King's service, and to derive that power of foreign letters unto merchants, which in all States is a branch of regal authority. Neither can any place in Christendom be named where merchants are allowed to send their letters by other bodies or posts than by those only which are authorized by the State." Billingsley was imprisoned; but the House of Commons addressed the King for his release.[1] It strikingly shows the confusion of postal affairs at this period to find a statement addressed to the Privy Council by "all the posts of England, being in number ninety-nine poor men," that divers of them "lie now in prison, . . . by reason of their great debts which they are in, for want of their entertainment, they being unpaid ever since the last day of November 1621 till this present time, June 1628;" the arrears amounting to L.22,626. In 1632 the foreign postmastership was assigned by the De Questers to William Frizell and Thomas Witherings.

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[1] Kennedy, *Annals of Aberdeen*, vol. i., p. 262.

[2] *Book of Proclamations*, p. 67 (State-Paper Office); *Report from the Secret Committee on the Post-Office*, 1844, Appendix, pp. 38-40.

[3] Or "De l'Equester," as he is called in Latch's *Reports of King's Bench Cases*, p. 87.

The substitution was approved by the King, and was notified by a royal proclamation in July 1632. Amongst other recitals, this document sets forth the King's consideration "how much it imports his state and this realm, that the secrets thereof be not disclosed to foreign nations, which cannot be prevented if a promiscuous use of transmitting . . . foreign letters and packets should be suffered, which will also be no small prejudice to . . merchants in their trading."[2] Here we get a glance at one of the motives of the jealous monopoly of postal communication,—a motive which found still plainer expression in Sir John Coke's letter to Lord Conway, cited above, when he wrote, "Your Lordship best knoweth what account we shall be able to give in our places of that which passeth by letters in or out of the land, if every man may convey letters, under the covers of merchants, to whom and what place he pleaseth." Coke seems to have solved the difficulty in his own fashion, for, a few years afterwards, an English letter-writer tells his correspondent in Scotland, "I hear the posts are waylaid, and all letters taken from them and brought to secretary Cooke."[3]

Inland Letter Office, established in 1635.

In June 1635 Witherings submitted to the king a proposition (still preserved in the State-Paper Office), "for settling of staffets or pacquet-posts betwixt London and all parts of his Majesty's dominions, for the carrying and re-carrying of his subjects' letters," which contains some curious incidental notices of the then state of the internal communication of the kingdom. The nett charge to the Crown of the existing posts is stated to be L.3400 per annum. Letters, it is said, "being now carried by carriers or footposts 16 or 18 miles a day, it is full two months before any answer can be received from Scotland or Ireland to London. If any of his Majesty's subjects shall write to Madrid in Spain, he shall receive answer sooner and surer than he shall out of Scotland or Ireland." By the new plan it is proposed that all letters for the northern road, for example, "be put into one portmantle that shall be directed to Edinburgh, and for all places of the said road, . . . with particular bags directed to such postmasters as live upon the road near to any city or town corporate." The postage is to be, according to distance, "3d., 4d., 6d., and to Scotland more." The journey from London to Edinburgh is to be performed within three days; so that, says the proposer, "the posts being punctually paid, the news will come sooner than thought." The scheme was approved of on the 31st July 1635 by "a proclamation for the settling of the letter office of England and Scotland." This proclamation provides for eight main postal lines—namely, the Great Northern Road; to Ireland by Holyhead; to Ireland by Bristol; to the marches of Wales by Shrewsbury; to Plymouth; to Dover; to Harwich; and to Yarmouth. The postage of a single letter is fixed at 2d., if under 80 miles; 4d., if between 80 and 140 miles; 6d., if above 140 miles; 8d., if to Scotland. And it is signified to be his Majesty's pleasure that from the beginning of this service no other messengers or foot-posts shall carry letters to any places so provided, "except common known carriers, or a particular messenger to be sent on purpose with a letter by any man for his own occasions, or a letter by a friend;" on pain of exemplary punishment.[4] In February 1638 another royal proclamation ratified an agreement between Witherings and M. Denoveau, "postmaster to the French King," for the conveyance of the mails into France by Calais, Boulogne, Abbeville, and Amiens.[5]

The post-office during the civil wars.

But in 1640 the active postmaster is accused of "divers abuses and misdemeanours," and his office is sequestrated into the hands of Philip Burlamachi of London, merchant, who is to execute the same under the inspection of the principal secretary of state.[6] Witherings then assigns his patent to Robert Rich, Earl of Warwick. A long contest ensues in both Houses of Parliament. Lord Stanhope petitions the House of Lords, and asserts that his surrender of his prior patent was compulsory, he having been summoned to the council table, and obliged, before he was suffered to depart, to subscribe somewhat then penned upon your petitioner's patent by the lord keeper Coventry." These complaints and debates gave repeated occupation to both Houses during the memorable period from 1641 to 1647, and were diversified by several affrays, in which violent hands were laid upon the mails; "one Mr Prideaux," afterwards attorney-general, actively assisting on one occasion in the seizure of that from Plymouth, as it was being carried into the post-office which had been opened by the Earl of Warwick, "near the Royal Exchange." On another occasion the Chester mail, according to the depositions of the earl's officers, was met at the foot of Highgate Hill by five persons "on great horses, with pistols, habited like troopers, who demanded of these deponents, Who had the letters? saying they must have them;" and who kept their word. These incidents occur in 1642. In 1644 the Lords and Commons, by a joint ordinance, appoint Edmund Prideaux "to be master of the posts, messengers and couriers." In 1646 the opinion of the judges is taken on the validity of Witherings' patent (assigned to Lord Warwick), and they pronounce "that the patent of the Inland Letter Office was well created; that the clauses of restraint in the said patent are void and not good in law; that, notwithstanding these clauses be void, the patent is good for the rest."[7] It is evident, therefore, that any prohibition to carry letters must be by act of Parliament, to have force of law.

The post-office under the Commonwealth

In 1650 an attempt was made by the Common Council of London to organize a new postal system on the great roads, to run twice a week. This scheme they temporarily carried into effect as respects Scotland. But Mr Attorney-General Prideaux speedily obtained the intervention of the Council of State. He drew up a paper in which he thus summed up his own proceedings in postal matters:—"By authority of the Parliament, I erected postages for the service of the State. For defraying the charges of the several postmasters and easing the State of it, I published that there should be a weekly conveyance of letters into all parts of the nation. With the benefit which came by the postage of letters, I have taken off from the State the charge of the postmasters of England (except Dover road), which is above L.7000 by the year." Prideaux seems to have been especially wroth with the Common Council of London for their audacity in having "employed a natural Scott into the North." He urged on the Council of State, that if the new enterprise be permitted, "besides intrenching on the rights of the Parliament, it will distract that course which is now settled, ... and another way must be thought on for payment of the postmasters." Both Houses resolved: (1.) "That the offices of postmasters, inland and foreign, are, and ought to be, in the sole power and disposal of the Parliament. (2.) That it be referred to the Council of State to take into consideration all existing claims in relation thereto. Of these there were no less than five under the various patents which had been granted and assigned. Ultimately, the posts, both inland and foreign, were farmed to John Manley for L.10,000 a year, by an agreement made in 1653. The rates of postage and the rights and duties of postmasters were settled, under the Protectorate, by an act of Parliament of 1657, c. 30. In 1659 the item, "By postage of letters in farm, L.14,000," appears in a Report on the Public Revenue.[1]

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[1] *Journals of the House of Commons*, i. 891-918.

[2] *A Proclamation concerning the Postmaster of England for Forraigne Parts*, 19th July, 1632; in Rymer's *Fœdera*, xix. 385.

[3] Lang, *Historical Summary of the Post-Office in Scotland*, 4.

[4] Rymer, *Fœdera*, xix. 649.

[5] Rymer, *Fœdera*, xx. 192.

[6] Ibid., xx. 429.

[7] *Journals of the House of Commons*, ii. 81, 82, 95, 470, 493, 500, 501, 658, seq.; *Journals of the House of Lords*, v. 343, 387, 450, 469-473, 500, seq.; *Report from Secret Committee on the Post-Office*, Appendix, 60-69.

Settlement of the post-office under Cromwell.

During the rule, both of Parliament and of Protector, the practice of opening letters, on suspicion of plots, continued. Foreign mails were repeatedly stopped, and committees nominated to open and read letters. On one occasion, a message having been sent to the Lords, the answer was returned, "that they did yield to the opening of letters, but it would be very inconvenient if often used." On another occasion a formal complaint against the practice was made to the Lords by the Venetian ambassador; and the House resolved, "that four members of this House be forthwith sent to the ambassador to disavow the action, and to endeavour to give him all satisfaction, by declaring how sensible they are of it, as tending to the breach of public faith and the law of nations." Nevertheless, the act of 1657 expressly enumerates among the advantages of a post-office, that "it hath been found by experience, ... the best means . . . . to discover and prevent many dangerous and wicked designs which have been, and are daily contrived, against the peace and welfare of this Commonwealth, the intelligence whereof cannot well be communicated but by letter of escript."[2] And the numerous "intercepted letters" which appear amongst the Thurloe State Papers, sufficiently show how extensively those advantages were turned to account.

The government of the Restoration continued to farm the post-office upon conditions very similar to those imposed by the act of 1657, but for a larger sum. Henry Bishop was the first postmaster-general, and he contracted to pay to the King a yearly rent of L.21,500. The new arrangements were embodied in the act 12 Charles II., c. 35, entitled "An Act for Erecting and Establishing a Post-Office." A clause proposing to frank all letters addressed to or sent by members of Parliament during the session was carried, on a division, after considerable debate, in the course of which Sir Heneage Finch characterized it as "a poor mendicant proviso, and below the honour of the House." Even the Speaker, on putting the motion from the chair, paused to say, "I am ashamed of it." The Lords struck it out of the bill, and the Commons agreed to their amendment.[3] But the indenture enrolled with the letters-patent contains a proviso for the free carriage of all letters to or from the King, the great officers of state, "and also the single inland letters only of the members of the present Parliament during the continuance of this session of this Parliament." It is also provided that the lessee shall permit the secretaries of state for the time being, or either of them, from time to time, to have the survey and inspection of all letters at their discretion. Bishop was succeeded by Daniel O'Neile in 1662, on similar terms. In the consequent "proclamation for quieting the postmaster-general in the execution of his office," which was issued, as usual, on the 25th May 1663, it is commanded "that no postmasters or other officers that shall be employed in the conveying of letters, or distributing of the same, or any other person or persons, . . . *except by the immediate warrant of our principal secretaries of state*, shall presume to open any letters or pacquets not directed unto themselves."

By an act of the 15th Charles II. ("An Act for Settling the Profits of the Post-Office on H.R.H. the Duke of York, and his Heirs-Males"); and by a subsequent proclamation issued in August 1683, "for prevention of treasonable correspondences and other inconveniences arising by the infringement of the said act," it is directed that the postmaster-general shall "take effectual care for the conveyance of all bye-letters, by establishing correspondences . . . in all considerable market-towns with the next adjacent post-stage, and all persons whatsoever, other than the postmaster-general, are warned that they presume not to prepare or provide any horses or furniture to let to hire, ... where any post-roads are or shall be settled or established, unless the postmaster or his deputies shall first fail to provide and furnish the persons riding post with sufficient horses and furniture within half an hour after demand."

Establishment of the London penny post.

It was during the possession of the post-office profits by the Duke of York that a London penny post was established by the enterprise of William Dockwra, who is described as a London merchant. A suit was commenced against him at the duke's instance, and a verdict, casting him in damages, was obtained in the King's Bench. Soon after the Revolution he was one of the multitude of petitioners for redress at the hands of the House of Commons, by whom his case was recommended to the king, who, in 1690, granted him a pension of L.500 a year for a limited term, and in 1697 appointed him "comptroller of the penny post." But in the following year a long list of charges was exhibited against him by the "officers and messengers," which led to his removal. At this time parcels were carried as well as letters. One of the allegations against Dockwra runs thus:—"Hee stops under spetious pretences most parcells that are taken in, which is great damage to tradesmen, by loosing their customers, or spoiling their goods, and many times hazard the life of the patient when phisick sent by a doctor or apothecary."[4] Dockwra's example was imitated in 1708 by Mr Povey, who took "upon himself to set up a foot-post under the name of the 'halfpenny carriage,' appointed receiving-houses, and employed several persons to collect and deliver letters for hire within the cities of London and Westminster, and borough of Southwark, ... to the great prejudice of the revenue," as was represented by the then postmaster-general to the Lords of the Treasury. Povey was compelled to desist.

The Scottish post-office from the Restoration to the reign of Queen Anne.

At this period the postal system of Scotland was distinct from that of England. It had been so re-organized early in the reign of Charles II., who, in September 1662, had appointed Patrick Grahame of Inchbrakie to be postmaster-general of Scotland for life, at a salary of L.500 Scots. But it would seem, from the proceedings of the Scottish Privy Council, that the rights and duties of the office were ill defined; for immediately after the appointment of Grahame, the Council commissioned Robert Mein, "merchant and keeper of the letter-office in Edinburgh," to establish posts between Scotland and Ireland; ordained that Linlithgow, Kilsyth, Glasgow, Kilmarnock, Dumboag, Ballintrae, and Portpatrick, should be stages on the route, and granted him the sum of L.200 sterling, to build a packet-boat to carry the mail from Portpatrick to Donaghadee."[1] And in 1665 we have a privy seal by which the postmaster of Haddington, William Seton, is granted a salary exceeding that of the postmaster-general, namely, L.600 Scots a year.[2] The rate of speed at which ordinary correspondence travelled in those days may be estimated from the fact, that the express conveying intelligence of the death of Charles II., on the 6th of February, was received in Edinburgh at one o'clock on the morning of the 10th. In 1695 the Scottish Parliament again re-organized the post-office, and fixed the rates of postage at 2d. for a single letter to Berwick, or any place within 50 miles of Edinburgh; 3d. from 50 to 100 miles; 4d. to any place in Scotland above 100 miles; and also established a weekly post between Scotland and Ireland. In 1698 Sir Robert Sinclair of Stevenson had a grant from King William of the whole revenue of the Scottish post-office, in addition to a pension of L.300 per annum, "to keep up the post." But he speedily resigned the grant.[3] Six years later, however, we find George Main, jeweller in Edinburgh, accepting a lease of that revenue at a yearly rent of L.1194 sterling, subject to certain deductions for the conveyance of public expenses, and also to an allowance of L.60 a year for the Irish packet. Main appears to have paid to the postmaster at Haddington, L.50; to him in Canongate, L.35; to him at Cockburnspath, L.50; and to the clerk to the post-office, L.25. His lease was for three years, and would seem not to have invited renewal, as we find him acting in 1708 at a yearly salary of L.200 sterling. At this date the Edinburgh post-office employed seven persons, and its entire cost was L.364 a year (postmaster, L.200; accountant, L.50; clerk, L.50; clerk-assistant, L.25; three letter-carriers, each L.13).

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[1] *Journals of the House of Commons*, vii. 627.

[2] Scobell, *Acts and Ordinances*, 1656, p. 511.

[3] *Commons' Journals*, viii. 217, 223; xxiv. 262; *Parliamentary History*, xxiii. 56.

[4] "The Case of the Officers of His Majesty's Penny Post-Office, 1698" (printed in *Ninth Report of the Commissioners on the Post-Office Department*, Appendix, 72, 73).

The postal arrangements of the British colonies.

Our colonial post-office at this period was naturally more rudimental still. Perhaps the earliest official notice of it is to be seen in the following paragraph from the records of the General Court of Massachusetts in 1639:—"It is ordered that notice be given that Richard Fairbanks his house in Boston is the place appointed for all letters which are brought from beyond the seas, or are to be sent thither to be left with him; and he is to take care that they are to be delivered or sent according to the directions; and he is allowed for every letter a penny, and must answer all miscarriages through his own neglect in this kind." That court, in 1667, was petitioned to make better postal arrangements, the petitioners alleging the frequent "loss of letters whereby merchants, especially with their friends and employers in foreign parts, are greatly damnified; many times the letters are imputed (?) and thrown upon the Exchange, so that those who will may take them up; no person, without some satisfaction, being willing to trouble their houses therewith." In Virginia the postal system was yet more primitive. The colonial law of 1657 required every planter to provide a messenger to convey the despatches as they arrived to the next plantation, and so on, on pain of forfeiting a hogshead of tobacco for default. The government of New York in 1672 established "a post to goe monthly from New York to Boston," advertising "those that bee disposed to send letters; to bring them to the secretary's office, where, in a lockt box, they shall be preserved till the messenger calls for them; all persons paying the post before the bagg be sealed up."[4] Thirty years later this monthly post had become a fortnightly one, as we see by the following paragraph in the *Boston News-Letter*:—"By order of the postmaster-general of North America. These are to give notice, That on Monday night, the 6th of December, the Western Post between Boston and New York sets out once a fortnight, the three winter months of December, January, and February, and to go alternately from Boston to Saybrook, and Hartford, to exchange the mayle of letters with the New York Ryder; the first turn for Saybrook, to meet the New York Ryder on Saturday night the 11th currant; and the second turn he sets out at Boston on Monday night the 20th currant, to meet the New York Ryder at Hartford, on Saturday night the 25th currant, to exchange Mayles; and all persons that sends letters from Boston to Connecticut from and after the 13th inst., are hereby notified first to pay the Postage on the same."[5]

This office of postmaster-general for America had been created in 1692. The rates of postage were,—for 80 miles or under, 4½d.; from New York to Philadelphia, 9d.; to Virginia, 12d. For a long time the expenses of the office exceeded the income. Until after 1704 there was no regular post further east than Boston, or further west than Philadelphia. In that year Lord Cornbury, writing to the government at home, says,—"If I have any letter to send to Virginia or to Maryland, I must either send an express, who is often retarded for want of boats to cross those great rivers they must go over, or else for want of horses; or else I must send them by some passengers who are going thither. The least I have known any express to take hence to Virginia has been three weeks.[6] Shortly after the date of this letter stage-coaches were established between Boston and New York, and Boston and Philadelphia; but no post-office was established in Virginia until 1732; nor did any postal revenue accrue to Great Britain from the colonies until 1753.

Consolidation of the British post-office by 9 Anne, c. 10.

We have now traced the postal communications of different portions of the British empire from their earliest beginnings until the eve of the passing of that act of the 9th of Queen Anne, which consolidated them into one establishment, and which, as to organization, continued to be the great charter of the post-office until the advent of Mr Rowland Hill. This act largely increased the powers of the postmaster-general. It re-organized the chief letter-offices of Edinburgh, Dublin, and New York, and settled new offices in the West Indies and elsewhere. It established three rates of single postage,—viz., English, 3d. if under 80 miles, and 4d. if above; and 6d. to Edinburgh or Dublin. It continued to the postmaster-general the sole privilege "to provide horses to persons riding post." And it gave, for the first time, parliamentary sanction to the power, formerly questionable, of the secretaries of state with respect to the opening of letters, by the following clause:—"And whereas abuses may be committed by wilfully opening, embezzling, detaining, or delaying letters or packets, to the great discouragement of trade, commerce, and correspondence; for prevention thereof be it enacted . . . . that from and after the 1st day of June 1711, no person or persons shall presume . . . to open, detain, or delay . . . any letter or letters . . . after the same is or shall be delivered into the general or other post-office, . . and before delivery to the persons to whom they are directed, or for their use, *except by an express warrant in writing under the hand of one of the principal secretaries of state, for every such opening, detaining, or delaying.*"

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[1] Lang, *Historical Summary of the Post-Office in Scotland*, 4, 5.

[2] *Register of the Privy Seal of Scotland*, i. 331 (ibid.)

[3] Lang, ut supra, 8.

[4] Miles, "History of the Post-Office" (*Banker's Magazine*, N. S., vii. 358, seq.)

[5] Buckingham, *Specimens of Newspaper Literature* (Boston, 1850), i. 16, 17.

[6] Miles, ut supra.

Nine years after the passing of this act, the cross-posts were farmed to a Mr Allen, who made great improvements in their management, upon an agreement that the new profits so created should be his own during his lifetime. His schemes were so successful that he is said to have netted during forty-two years an average profit of nearly L.12,000 a year. The nett revenue for the post-office, which, as we have seen, had been L.10,000 in 1653, and L.21,500 in 1663, had increased in 1685 to L.65,000. For the succeeding ten years it was almost stationary. At the passing of the act of Anne it had reached L.90,223, the gross income being L.111,426. In twelve years (1724) the latter had increased to L.178,071, but the nett revenue was only L.96,339. Then followed a series of supplementary enactments having for their object the increase of postal rates, the regulation of franking, and the prevention of illicit conveyance. Very little attention seems to have been bestowed on the increase of postal facilities, and the results corresponded. In 1754 the gross income was but L.214,300, and the nett revenue L.97,365. The falling in of Allen's lease in 1764 gave a considerable increase (the nett produce rising from L.116,182 to L.157,571), but after five years this was followed by a decrease, which, with slight intermission, continued until the introduction of the mail-coach system of John Palmer in 1784. The precise figures will be shown by the following table, which we abridge from the parliamentary returns of 1808:—

Tabular view of the post-office revenue from 1724 to 1784.

Post-Office of Great Britain; gross and nett income, 1724–83.

Decennial Periods.	Gross Produce of the First and Last Year. L.	s.	d.	Nett Revenue of the First and Last Year. L.	s.	d.	Average Nett Yearly Revenue of the Decennium. L.	s.	d.
1724–33	178,071	16	9	96,339	7	5	96,022	11	2
	171.283	18	5	92,146	6	8			
1734–43	176,334	3	1	91,701	11	0	93,173	7	4
	190,626	5	1	88,441	5	10			
1744–53	194,461	8	7	85,114	9	4	89,716	5	2
	206,636	5	1	98,148	9	11			
1754–63	214,300	10	6	97,365	5	1	87,911	0	9
	278,999	5	10	97,833	15	10			
1764–73	225,326	5	8	116,182	8	5	157,247	0	7
	310,126	11	9	167,176	11	4			
1774–83	313,032	14	6	164,077	8	4	150,808	7	1
	398,624	6	4	159,625	1	1			

Pensions charged upon this revenue.

The system of burdening the post-office revenue with pensions, nearly all of which had not the slightest connection with the postal service, was begun in characteristic fashion by Charles II., who granted to Barbara, Duchess of Cleveland, L.4700 a year, and to the Earl of Rochester L.4000 a year, out of that revenue. The example was followed, until, in 1694, the list of pensions so chargeable stood thus:—

Post-Office of Great Britain.—Pensions Charged on Revenue.

Earl of Rochester	L.4,000
Duchess of Cleveland	4,700
Duke of Leeds	3,500
Duke of Schomberg	4,000
Earl of Bath	2,500
Lord Keeper	2,000
William Dockwra (until 1697)	500
Total	L.21,200

Queen Anne granted a pension of L.5000 to the Duke of Marlborough, charged in like manner. For many years past the amount of these pensions has been L.10,307 a year. In 1856 it was L.29,310, but of that sum L.19,003 was expended in the purchase of part of the pension enjoyed by the heirs of the Duke of Schomberg. In March 1857 the existing pensions ceased to be payable by the post-office, and became chargeable to the Consolidated Fund.

The mail-coach system of John Palmer.

The first important and enduring impulse to the development of the latent powers of the post-office, both as a public agency and as a source of revenue, was given by the shrewdness and energy, not of a postmaster or other official person, but of the manager of the Bath theatre, Mr John Palmer. Mr Palmer's notice was attracted to the subject in October 1782. His avocations had made him familiar with that great western road which was still in such peculiar favour, alike with people of fashion and with the gentlemen of the highway. No road in England was so much travelled by the wealthy, and on none were they eased of their superfluities with so polite an air. In the intervals of this more agreeable department of their calling, the highwaymen relieved their ennui by a sedulous attention to the mails. So habitual were the robberies of the post, that they came to be regarded by its officials as among the necessary conditions of human affairs. They urged on the public the precaution of sending all bank-notes and bills of exchange in halves, and pointed the warning with a philosophical remark, that "*there are no other means of preventing robberies with effect*, as it has been proved that the strongest carts that could be made, lined and bound with iron, were soon broken open by a robber." Another functionary, who had reflected on the matter still more deeply, suggested that "when desperate fellows had once determined on a mail robbery, the consequence would be murder in case of resistance."

At this period, in addition to the recognised perils of the roads, the postal system was characterized by extreme irregularity in the departure of mails and delivery of letters; by an average speed of about three miles and a half in the hour; and by a rapidly-increasing diversion of correspondence into illicit channels. As our table shows, the nett revenue, which had averaged L.157,000 during the ten years ending with 1773, averaged but L.150,000 during the ten years ending with 1783. Yet when Mr Palmer suggested that by building mail-coaches of a construction expressly adapted to run at a good speed, by horsing them liberally, and attaching an armed guard to each coach, the public would be greatly benefited, and the post-office revenue considerably increased, one official person expressed his regret "that the author of the plan should not first have been informed of the nature of the business," and boldly asserted that the constant endeavours which had long been directed towards the improvement of postal affairs, "in all situations and under all circumstances, has made them now almost as perfect as can be, without exhausting the revenue arising therefrom." Another predicted that the new methods, if adopted, "will fling the whole commercial correspondence of the country into confusion, and will justly raise such a clamour as the postmaster will not be able to appease."

At one time this pertinacious opposition seemed likely to succeed. But, through the intervention of Lord Camden, the plan was brought under the personal notice of Mr Pitt. No sooner was the minister convinced of its merits than he insisted on its being tried. The experiment was made in August 1784. In the following year Mr Palmer, writing to Mr Pitt, says (and his assertion is fully borne out by the documents subsequently submitted to Parliament):—"In the progress of this business I have had every possible opposition from the office." Yet its success exceeded all anticipation. The following table will show the rapid progress of the revenue under the new arrangements:—

Tabular view of the growth of the postal revenue under Palmer's system.

Post-Office of Great Britain.—Gross and Nett Income, 1784–1808.

Year.	Gross Income.			Nett Revenue.		
	L.	*s.*	*d.*	L.	*s.*	*d.*
1784......	420,101	1	8	196,513	16	7
1785......	463,753	8	4	261,409	18	2
1786......	471,176	8	1	285,975	15	11
1787......	474,347	9	7	278,599	14	11
1788......	509,131	15	8	296,980	12	1
1789......	514,538	4	3	318,610	5	8
1790......	533,198	1	9	331,179	18	8
1791......	575,079	3	10	355,999	6	6
1792	585,432	10	10	366,959	19	8
1793......	627,592	19	0	391,508	15	11
1794......	715,608	0	0	431,980	18	1
1795......	745,238	0	0	414,548	11	7
1796......	811,539	0	0	479,487	6	9
1797......	863,624	0	0	541,883	14	11
1798*.....	950,476	0	0	613,280	11	8
1799......	1,012,731	0	0	657,388	6	5
1800......	1,083,950	0	0	720,981	17	1
1801......	1,144,900	0	0	755,299	17	2
1802*.....	1,289,197	0	0	880,069	14	3
1803[1].....	994,970	0	0	721,349	15	4
1804......	1,320,585	0	0	924,839	0	9
1805......	1,317,842	0	0	944,382	8	4
1806*.....	1,506,841	0	0	1,066,397	19	10
1807......	1,568,106	0	0	1,129,285	7	4
1808......	1,552,037	0	0	1,100,606	0	0

The three years in this instructive table to which asterisks are affixed convey a special lesson, which seems to have passed unheeded at the time, although it has since been turned to good account. In each of those years additional rates of postage were imposed, and in each of the succeeding periods the estimated produce of the additional tax failed to be realized. The revenue, indeed, continued to increase with the growth of trade and population, but the *proportional* rate of that increase was checked. It had been at first proposed to reward Mr Palmer by a grant for life of two and a half per cent. on a certain proportion of the increased nett revenue, which would eventually have given him some L.10,000 a year; but this proposition fell through, in consequence either of technical difficulties created by the Post-Office Act, or of the opposition of the post-office authorities. Mr Pitt, however, appointed Palmer to be "Comptroller-General of Postal Revenues," an office which was soon made too hot for him to hold. He obtained a pension of L.3000 a year; and ultimately, by the act 53 Geo. III., c. 157, after his case had received the sanction of five successive majorities against government, an additional sum of L.50,000. Every sort of obstruction was placed in the way of his reward—the claim to which was pending in Parliament during six years—in exact harmony with the course which had been pursued at the outset of the scheme. And this was done in the face not alone of nearly a million annually added to the public revenue, but of the fact, that during a quarter of a century the mails had been conveyed over an aggregate of some seventy millions of miles without the occurrence of one mail robbery throughout the period.[2]

Comparison of postal affairs in Scotland and Ireland at end of 18th century.

Scotland shared in the advantages of the mail-coach system from the first. Shortly before its introduction, the local penny post was set on foot by the keeper of a coffee-shop in the hall of the Parliament House, Peter Williamson by name. He employed four letter-carriers, in uniform, and provided them with bells; appointed receivers in various parts of the town; and established hourly deliveries.[3] The officials of the post, when the success of the plan had become fully apparent, gave Williamson a pension, and absorbed his business, the acquisition of which was subsequently confirmed by the act 34 Geo. III., c. 17. A dead-letter office was established in 1784. The entire staff, which, as we have seen, consisted in 1708 of seven persons, now comprised twenty-five, at a cost of L.1406. In 1796 the number of functionaries had increased to forty, and the cost to L.3278.[4] But in Ireland the old state of things continued until the present century. In 1801 only three public carriages in the whole country conveyed mails. There were, indeed, few roads of any sort, and none on which coaches could travel faster than four miles an hour.[5] At this period the gross receipts of the Irish post-office were L.80,040; the charges of management and collection were L.59,216, or at the rate of more than 70 per cent.; whilst in Scotland the receipts were L.100,651, and the charges L.16,896, or somewhat less than 17 per cent.[6]

The post-office in America prior to the Revolution

In the American colonies postal improvements may be dated from the administration of Franklin, who was virtually the last colonial postmaster-general, as well as unquestionably the best. In one shape or other he had forty years' experience of postal work, having been appointed postmaster at Philadelphia as early as October 1737. He notified his appointment in his own newspaper in these words:—"Notice is hereby given, that the post-office of Philadelphia is now kept at B. Franklin's in Market Street, and that Henry Pratt is appointed riding postmaster for all stages between Philadelphia and Newport in Virginia, who sets out about the beginning of each month, and returns in 24 days, by whom gentlemen, merchants, and others may have their letters carefully conveyed," &c.[7] When appointed postmaster-general in 1753, Franklin bestirred himself for the improvement of his department, in that practical painstaking way with which he was wont to guide any plough he had once put his hand to, whatever the ground it had to work in. He visited all the chief post-offices throughout Pennsylvania, New Jersey, New York, and New England, looking at everything with his own eyes. His administration cannot be better summed up than we find it to be in a sentence or two which he wrote soon after his dismissal. Up to the date of his appointment, he says,—"The American post-office had never paid anything to that of Britain. We (*i.e.*, himself and his assistant) were to have L.600 a year between us, if we could make that sum out of the profits of the office. To do this, a variety of improvements were necessary: some of these were inevitably, in the beginning, expensive; so that in the first four years the office became above L.900 in debt to us. But it soon after began to repay us; and before I was displaced by a freak of the minister's, we had brought it to yield three times as much clear revenue to the crown as the post-office of Ireland. Since that imprudent transaction, they have received from it—not one farthing."

The Reports of the Commissioners of Inquiry into Post-Office Revenue, 1826-30.

The interval between the development of Mr Palmer's improved methods (as far as that development was permitted by the authorities), which we take to be pretty nearly contemporaneous with the parliamentary settlement of his claims, and the still more important reforms introduced thirty years afterwards by Mr Rowland Hill, is chiefly marked by the growth of the packet system, under the influence of steam navigation, and by the elaborate investigations of the revenue commissioners of 1826 and the following years. Undoubtedly, the inquiries of these commissioners attracted a larger share of public attention to the management of the post-office than had theretofore been bestowed on it; but if anything had been wanted to throw into bolder relief Mr Hill's intelligent and persevering exertions, these reports supply the want in ample measure. The lucubrations of the commissioners have the merit of repletion,—they fill three large folios; but the most friendly critic could scarcely find in them any other. Clumsy in arrangement, resilient in the treatment of the various branches of the service, and crowded with petty details, they afford the best possible contrast to the lucid order and vigorous reasoning of Mr Hill's *Post-Office Reform.* Nor is it the least curious infelicity of the Revenue Reports of 1826–30, that whilst the functionaries of the post-office are criticised in them with a keen severity, which is so salient as to wear an appearance at times of almost personal hostility, the truth, that a liberal increase of public facilities would be likely to benefit the revenue much more materially than small economies in salaries and perquisites, does not seem once to have dawned on the minds of the commissioners. Even in dealing with a new accommodation actually provided,—that of the money-order office,—whilst taking just exception to the unofficial character of its management, they incline rather to its abolition than its reform.

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[1] In this year, from an alteration in the mode of stating the public accounts, three quarters only are comprised.

[2] *Debates of both Houses of Parliament in* 1808 *relative to the Agreement for the Reform and Improvement of the Post-Office*, passim.

[3] Lang, *Historical Summary of the Post-Office in Scotland*, 15.

[4] *Appendix to Seventh Report from Select Committee on Finance* (1797), reprinted in collective series of Reports, xii. 209.

[5] *Minutes of Evidence before Select Committee on Taxation of Internal Communication* (1837), evidence of Sir Edward Lees, 397.

[6] *Report &c., of Select Committee on Postage.*

[7] Miles, in the New York *Bankers' Magazine*, vii. 360.

Postal packet system.

As early as 1788 the cost of the packets employed by the post-office attracted parliamentary attention. In that year the "Commissioners of Fees and Gratuities" reported that, in the preceding seventeen years, the total cost of this branch had amounted to L.1,038,133; and they naturally laid stress on the circumstance, that "many officers of the post-office were owners of such packets, even down to the chamber-keeper." At this time part of the packet service was performed by hired vessels, and part by vessels which were the property of the crown. The commissioners recommended that the latter should be sold, and the entire service be provided for by public and competitive tender. The subject was again inquired into by the Finance Committee of 1798, which reported that the recommendation of 1788 had not been fully acted upon, and expressed its concurrence in that recommendation. The plan was now to a considerable extent enforced. But the war rapidly enhanced the expenditure. The average, L.61,000, of 1771–87 had increased, in 1797, to L.78,439; in 1810 to L.105,000, in 1814 to L.160,603. In the succeeding years of peace the expense fell to an average of about L.85,000. As early as 1818 the Rob Roy plied regularly between Greenock and Belfast; but no use was made of steam navigation for the postal service until 1821, when the postmaster-general established crown packets. The expenditure under the new system, from that date to 1829 inclusive, was thus reported by the Commissioners of Revenue Inquiry in 1830:—

Post-Office of Great Britain.—Cost of Packet Service, 1820–29.

Year.		L.
1820	(last year of exclusive sailing-packets)	85,000
1821	(first year of steam-packets)	134,868
1822		115,429
1823		93,725
1824		116,062
1825		110,838
1826		144,592
1827		159,250
1828		117,260
1829		108,305[1]

The general administration of postal affairs, during the period now under review, was still characterized by repeated advances in the letter-rates, and the last twenty years of it by a stationary revenue. The following table will show the gross receipts, the charges of collection and management, and the nett revenue (omitting fractions of a pound). We repeat the figures for the year 1808 for the purpose of comparison:—

Post-Office of Great Britain.—Gross and Nett Income, 1808–1837.

Year.	Gross Income.	Charges of Collection, &c.	Rate per cent of Charges.	Nett Revenue.	Population of United Kingdom.
	L.	L.		L.	
1808	1,552,037	451,431	29	1,100,606	...
1815–1816	2,193,741	594,045	27	1,526,527	19,552,000
1818–1819	2,209,212	719,622	31½	1,489,590	...
1820–1821	2,132,235	636,290	28½	1,495,945	20,928,000
1824–1825	2,255,239	655,914	26½	1,599,325	22,362,000
1826–1827	2,392,272	747,018	28½	1,645,254	...
1836–1837	2,206,736	609,220	27½	1,511,026	25,605,000
1838–1839	2,346,278	686,768	29	1,659,510	...

The history of governmental interference with correspondence resumed.

Before passing to the reform of 1839, we have now to revert to that important feature in postal history,—the interference with correspondence for judicial or political purposes. We have already seen,—(1.) That this assumption had no parliamentary sanction until the enactment of the 9th of Queen Anne; (2.) That the enactment differed from the pre-employed royal proclamations in directing a special warrant for each opening or detention of correspondence. It is a significant gloss on the statute to find that for nearly a century (namely, until 1798 inclusive) it was "not the practice to record such warrants regularly in any official book."[2]

Atterbury's case.

Of the use to which the power was applied, the State Trials afford some remarkable instances. At the trial of Bishop Atterbury, for example, in 1723, certain letters were offered in evidence which a clerk of the post-office deposed on oath "to be true copies from the originals, which were stopped at the post-office, and copied, and sent forward as directed. Hereupon Atterbury very naturally asked this witness, "If he had any express warrant under the hand of one of the principal secretaries of state for opening the said letters." But on this question the lords, after debate, resolved,—"That it is the opinion of this House that it is inconsistent with the public safety, as well as unnecessary for the prisoner's defence, to suffer any further inquiry to be made, upon this occasion, into the warrants which have been granted by the secretaries of state for the stopping and opening of the letters which should come and go by the post, or into the methods that have been taken by the proper officers at the post-office in obedience to such warrants." Twenty-nine peers recorded their protest against this decision. But the inflamed majority went the further length, when it was proposed to cross-examine the Rev. Edward Willes, one of his Majesty's post-office decipherers, of again resolving,—"That it is the opinion of this House, that it is not consistent with the public safety to ask the decipherers any questions which may tend to discover the art or mystery of deciphering.[3]

Proceedings of the House of Commons in relation to opening of letters in 1735.

The practice thus sanctioned appears to have been pushed to such lengths as to elicit in April 1735 a strong protest and censure from the House of Commons. In the preceding February "Complaints were made by several members that their letters were not only charged at the post-office, but that they were often broke open and perused by the clerks; that the practice of breaking open letters was become frequent, and was so publicly known that the very end for which that liberty was given to the postmaster was entirely disappointed; for the intention being at first to discover any treasonable correspondence that might be carried on against the government, that intention was rendered altogether vain, because, by the practice of opening letters being so frequent and so well known, it was certain that no man would carry on any treasonable correspondence by means of the post-office; so that the liberty given to break open letters . . . . could now serve no purpose but to enable the idle clerks about that office to pry into the private affairs of every merchant and of every gentleman in the kingdom."[1] A committee of inquiry was appointed, and after receiving its report, the House resolved: "That it is an high infringement of the privileges of the . . . Commons of Great Britain in Parliament for any postmaster, his deputies, or agents, in Great Britain or Ireland, to open or look into, by any means whatever, any letter directed to or signed by the proper hand of any member, without an express warrant in writing under the hand of one of the principal secretaries of state for every such opening and looking into; or to detain or delay any letter directed to, or signed with the name of any member, unless there shall be just reason to suspect some counterfeit of it, without an express warrant of a principal secretary of state for every such detaining or delaying." That the expressions used in debate were fully borne out by post-office practices there is abundant evidence.[2] In the subsequent proceedings of the famous "Committee of Secrecy on the conduct of Robert, Earl of Orford, "it appeared by the testimony of the secretary of the post-office, that within ten years only there had been paid by the government to that officer, without voucher or account, the sum of L.45,675, and that "the greatest part of this money is for defraying the expense of a private office for the inspecting foreign correspondence. . . . . That the annual expenses of this office are as follows:—To the chief decipherer, Dr Willes, for himself and his son, L.1000; to the second decipherer, Mr Corbiere, L.800; to the third decipherer, Mr Lampe, L.500; to the fourth decipherer, Mr Zolman, L.200; to the chief clerk, L.650; to four other clerks, L.300 each; to the comptroller of the foreign office, L.60; and to the doorkeeper, L.50. There are incidental charges for seals, &c.," it is added, "which may amount to L.100; . . . . the overplus, which may amount to L.90, is divided between the two postmasters and the secretary."[3] For his twenty years' services in this "private office" the Rev. Dr Willes was rewarded, first, with the deanery of Lincoln, and afterwards with the bishopric of St David's.

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[1] *Twenty-second Report of the Commissioners of Revenue Inquiry,* 4–6.

[2] *Report of Secret Committee on the Post-Office* (1844), p. 9.

[3] *Lords' Journals,* xxii. 183–186; Howell's *State Trials,* xvi. 540, seq.

Staff and salaries of the decipherers' department

As must always happen in like cases, the example spread downwards. So little attention was paid to the requirements of the act of Queen Anne, or the warnings of the House of Commons, that the very bellmen took to scrutinizing the letters given them for their bags. "When I have got all my letters together," deponed one of these functionaries at the trial of Dr Hensey in 1758, "I carry them home and sort them. In sorting them, I observed that the letters I received of Dr Hensey were generally directed abroad, and to foreigners; and I, knowing the Doctor to be a Roman Catholic, . . . advised the examining clerk at the office to inspect his letters." This witness, in answer to the questions, "How came you to know Dr Hensey was a Roman Catholic? What had you to do with his religion?" clinched his evidence thus:—"We letter-carriers or postmen have great opportunities to know the characters and dispositions of gentlemen . . . from their servants, connections, and correspondents. But, to be plain, if I once learn that a person who lives a genteel life is a Roman Catholic, I immediately look on him as one who, by education and principle, is an inveterate enemy to my king, my country, and the Protestant religion."[4] Sometimes the political motives for examination were diversified by merely polite acquiescence in the wishes of a friend. Thus, in 1741, "at the request of A., a warrant issued to permit the eldest son of A. to open and inspect any letters which the youngest son of A. might write to either of two females, one of whom that youngest son had imprudently married.[5] What remains to be said of the more recent contents of this discreditable chapter in our postal history will be found in a subsequent page. The incidents of 1844 are yet fresh in memory.

The post-office reform of 1839.

Mr Rowland Hill's pamphlet of 1837 took for its starting-point the fact, that whereas the postal revenue showed for the past twenty years a positive, though slight, diminution, it ought to have showed an increase of L.507,700 a year, in order to have simply kept pace with the growth of population; and an increase of nearly four times that amount, in order to have kept pace with the growth of the analogous though far less exorbitant duties imposed on stage-coaches. The population in 1815 was 19,552,000. In 1835 it had increased to 25,605,000. The stage-coach duties had produced in 1815, L.217,671. In 1835 they produced L.498,497. The nett revenue arising from the post-office in 1815 was L.1,557,291. In 1835 it had decreased to L.1,540,300.

Postal statistics in 1837.

In 1837 there did not exist any accurate account of the number of the letters transmitted through the general post-office. Mr Hill, however, was able to prepare a sufficiently approximative estimate from the data of the London district post, and from the sums collected for postage. He thus calculated the number of chargeable letters at about 88,600,000; that of franked letters at 7,400,000, and that of newspapers at 30,000,000, giving a gross total of about 126,000,000. At this period the total cost of management and distribution was L.696,569. An analysis of the component parts of this expenditure assigned L.426,517 to cost of primary distribution, and L.270,052 to cost of secondary distribution and miscellaneous charges. A further analysis of the primary distribution expenditure gave L.282,308 as the probable outgoings for receipt and delivery, and L.144,209 as the probable outgoings for transit. In other words, the expenditure which hinged upon the *distance* the letters had to be conveyed was L.144,000, and that which had nothing to do with distance was L.282,000. Applying to these figures the estimated number of letters and newspapers, 126,000,000, passing through the office, there resulted a probable average cost of $\frac{84}{100}$ths of a penny for each, of which $\frac{28}{100}$ths was cost of transit, and $\frac{56}{100}$ths cost of receipt, delivery, &c. Taking into account, however, the much greater weight of newspapers and franked letters as compared with chargeable letters, the apparent average cost of *transit* became, by this estimate, but about $\frac{9}{100}$ths, or less than the tenth of a penny.

A detailed estimate of the cost of conveying a letter from London to Edinburgh, founded upon the average weight of the Edinburgh mail, gave a lower proportion still, since it reduced the apparent cost of transit, on the average, to the thirty-sixth part of penny. Mr Hill inferred that if the charge for postage be made proportionate to the whole expense incurred in the receipt, transit, and delivery of the letter, and in the collection of its postage, it must be made *uniformly* the same, from every post-town to every other post-town in the United Kingdom, unless it could be shown how we are to collect so small a sum as the thirty-sixth part of a penny. And, inasmuch as it would take a ninefold weight to make the expense of transit amount to one farthing, he further inferred that, taxation apart, the charge ought to be precisely the same for every packet of moderate weight, without reference to the number of its inclosures.

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[1] *Parliamentary History*, ix. 842, seq.

[2] *Commons' Journals*, vol. xxii., 26th Feb., 16th April, 25th April, 1735. The committee's Report will be found at p. 462.

[3] Ibid. xxiv. 298.

[4] *State Trials*, xviii. 1369.

[5] *Report from Secret Committee*, 12.

At this period the rate of postage actually imposed (beyond the limits of the London district office) varied from 4d. to 1s. 8d. for a single letter, which was interpreted to mean a single piece of paper not exceeding an ounce in weight; a second piece of paper or any other inclosure, however small, constituted a double letter. A single sheet of paper, if it at all exceeded an ounce in weight, was charged with fourfold postage. The average charge on inland general post letters was nearly 9d. for each letter. Apart from the evils of an excessive taxation, with its multifarious results in checking communication, hampering trade, and creating an illicit traffic in letters which involved systematic deception, the effects upon the postal service itself were most injurious. On the one hand, a complicated system of accounts, involving both great waste of time and great temptation to fraud in their settlement; on the other, a constant invitation to the violation of that first duty of postal officers, respect for the sacredness of correspondence, by making it part of their daily work to expose letters to a strong light expressly to ascertain their contents.

These mischiefs it was proposed wholly to remove by enacting "that the charge for primary distribution,—that is to say, the postage on all letters received in a post-town, and delivered in the same or in any other post-town in the British Isles,—shall be at the uniform rate of one penny for each half-ounce; all letters and other papers, whether single or multiple, forming one packet, and not weighing more than half an ounce, being charged one penny; and heavier packets, to any convenient limit, . . . being charged an additional penny for each additional half-ounce." And it was further proposed that stamped covers should be sold to the public at such a price as to include the postage, which would thus be collected in advance.[1]

Post-office opposition to the plan.

By the public generally, and pre-eminently by the trading public, the plan was received with great favour. By the functionaries of the post-office it was at once denounced as ruinous, and ridiculed as visionary. Lord Lichfield, then postmaster-general, said of it in the House of Lords,—"Of all the wild and visionary schemes which I have ever heard of, it is the most extravagant."[2] On another occasion he assured the House that if the anticipated increase of letters should be realized, "the mails will have to carry twelve times as much in weight, and therefore the charge for transmission, instead of L.100,000 as now, must be twelve times that amount. The walls of the post-office would burst; the whole area in which the building stands would not be large enough to receive the clerks and the letters."[3]

The Report of the Select Committee on Postage of 1838.

But in the course of the following year (1838) petitions were poured into the House of Commons. A select committee was appointed, which held nearly seventy sittings, and examined eighty-three witnesses, in addition to the officers of the department. Its report (one of the most instructive and best arranged works of its class, as the report of the revenue commissioners was one of the worst), after carefully stating the questions which had to be considered, and the course of inquiry which had been pursued, thus proceeded:—"The principal points which appear to your committee to have been established in evidence are the following:—(1.) The exceedingly slow advance and occasionally retrograde movement of the post-office revenue during the . . . last twenty years; (2.) The fact of the charge of postage exceeding the cost in a manifold proportion; (3.) The fact of postage being evaded most extensively by all classes of society, and of correspondence being suppressed, more especially among the middle and working classes of the people, and this in consequence, as all the witnesses, including many of the post-office authorities, think, of the excessively high scale of taxation; (4.) The fact of very injurious effects resulting from this state of things to the commerce and industry of the country, and to the social habits and moral condition of the people; (5.) The fact, as far as conclusions can be drawn from very imperfect data, that whenever on former occasions large deductions in the rates have been made, these reductions have been followed in short periods of time by an extension of correspondence proportionate to the contraction of the rates. And, as matters of inference from fact and of opinion—

(i.) That the only remedies for the evils above stated, are a reduction of the rates, and the establishment of additional deliveries, and more frequent despatches of letters.

(ii.) That owing to the rapid extension of railroads, there is an urgent and daily-increasing necessity for making such changes.

(iii.) That any moderate reduction in the rates would occasion loss to the revenue, without in any material degree diminishing the present amount of letters irregularly conveyed, or giving rise to the growth of new correspondence.

(iv.) That the principle of a low uniform rate is just in itself; and when combined with prepayment and collection by means of a stamp, would be exceedingly convenient and highly satisfactory to the public.

The new postal law of 1839.

During the session of Parliament, which followed the presentation of this report, about 2000 petitions in favour of penny postage were presented to both Houses, and at length the chancellor of the exchequer brought in a bill to enable the Treasury to carry it into effect. The measure was carried in the House of Commons by a majority of 100, and became law on the 17th August 1839. A new but only temporary office under the Treasury was created to enable Mr Hill to superintend (although, as it proved, under very inadequate arrangements) the working out of his plan. The first step taken was to reduce, on the 5th December 1839, the London district postage to 1d., and the general inland postage to 4d. the half-ounce (except as respected places to which letters were previously carried at lower rates, those rates being continued). On the 10th January 1840 the uniform penny rate came into operation throughout the United Kingdom; the scale of weight advancing from 1d. for each of the first two half-ounces, by gradations of 2d. for each additional ounce, or fraction of an ounce, up to 16 ounces. The postage was to be prepaid, or charged at double rates. Parliamentary franking was abolished. Postage stamps were introduced on the 6th May following. The facilities of despatch were soon afterwards increased, especially by the establishment of day mails.

But on the important point of simplification in the internal economy of the post-office, with the object of reducing its cost without diminishing its working power, very little was done. In carrying out the new measures, the officers were, as the chancellor of the exchequer (Mr Baring) expressed it on one occasion, "unwilling horses." Nor need a word more be said in proof of the assertion than is contained in a naïve passage of Colonel Maberly's evidence before the Postage Committee of 1843:—"My constant language to the heads of the departments was,—'This plan we know will fail. It is your duty to take care that no obstruction is placed in the way of it by the heads of the department, and by the post-office. The allegation, I have not the least doubt, will be made at a subsequent period, that this plan has failed in consequence of the unwillingness of the government to carry it into fair execution. It is our duty, as servants of the government, to take care that no blame eventually shall fall on the government through any unwillingness of ours to carry it into proper effect.'" And, again,—"*After the first week*, it was evident, from the number of letters being so much below Mr Hill's anticipations, that it must fail, inasmuch as it wholly rested upon the number of letters; for without that you could not possibly collect the revenue anticipated." Very formidable are the prophets who can scarcely, under the limitations of average humanity, avoid promoting in their daily avocations, the fulfilment of their own prophecies.

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[1] *Post-Office Reform*, 27, seq.

[2] *Mirror of Parliament*, debate of 15th June 1837.

[3] Ibid., debate of 18th Dec. 1837.

Impediments to the proper working of the new plan.

The plan then had to work in the face of rooted mistrust on the part of the workers. Its author was (for a term of two years, afterwards prolonged to three) the officer, not of the post-office, but of the Treasury. He could only recommend measures the most indispensable through the chancellor of the exchequer; and when Mr Goulburn succeeded Mr Baring, the chancellor was very much of Colonel Maberly's way of thinking. It happened, too, that the trial of Mr Hill's scheme had to be carried through at a period of severe commercial depression.

Results of the first two years.

Nevertheless, the results actually attained in the first two years were briefly these:—(1.) The chargeable letters delivered in the United Kingdom, exclusive of that part of the government correspondence which theretofore passed free, had already increased from the rate of about 75,000,000 a year to that of 208,000,000; (2.) The London district post letters had increased from about 13,000,000 to 23,000,000, or nearly in the ratio of the reduction of the rates; (3.) The illicit conveyance of letters was substantially suppressed; (4.) The gross revenue, exclusive of repayments, yielded about a million and a half per annum, which was 63 per cent. on the amount of the gross revenue in 1839, the largest income which the post-office had ever afforded. These results at so early a stage, and in the face of so many obstructions, amply vindicated the policy of the new system. But by its enemies that system was loudly declared to be a failure, until the progressive and striking evidence of year after year silenced opposition by an exhaustive process.

The inquiry of 1844 into the opening of letters at the post or home offices.

In the summer of 1844 public attention was aroused in a remarkable manner to a branch of post-office administration which theretofore had been kept almost wholly out of sight. The statement, that the letters of a political refugee, long resident in England, and highly respected by all who knew him, whether sympathizing or not in his plans and aspirations, had been systematically opened, and their contents communicated to foreign governments, by Sir James Graham, then secretary of state for the home department, aroused a storm of indignation throughout the country. Men of all parties felt that this was an abuse of power, and a national degradation. The tragedy of Cosenza made a thorough investigation into the circumstances a public necessity.

The consequent parliamentary inquiry of August 1844, after retracing the earlier events connected with the exercise of the discretional power of inspection which Parliament had vested in the secretaries of state in 1710, elicited the fact, that in 1806, Lord Spencer, then secretary for the home department, introduced for the first time the practice of recording in an official book all warrants issued for the detention and opening of letters; and the additional fact, that from the year 1822 downwards, the warrants themselves had been preserved. The whole number of such warrants issued from 1806 to the middle of 1844 inclusive, was stated to be 323, of which no less than 53 had been issued in the years 1841-44 inclusive, a number exceeding that of any previous period of like extent, even in the days of Sidmouth and Castlereagh. It further appeared that the whole recorded number of warrants from the beginning of the century was 372, and that they affected the correspondence of 724 persons. The committee further stated, that eight of the warrants so issued "applied each to some particular object, but were *not restricted to any definite number of persons*." In plainer words, those eight warrants were in flagrant violation of the express words of the statute.

The 372 warrants of the period 1799-1844 the committee proceeded to classify under the following heads:—

Post-Office of Great Britain.—Classification of the Subject-Matters in relation to which Warrants were issued for the Opening of Letters, 1799-1844.

Bank of England	13	Letters returned to writers	7
Bankruptcy	2	Address copied	1
Murder, theft, fraud, &c.	144	Forged frank	1
Treason, sedition, &c.	77	Uncertain	89
Prisoners of war	13		
Revenue	5	Total	372[1]
Foreign correspondence	20		

The reader will not omit to observe that, within a period scarcely co-extensive with the official career of some living persons, eighty-nine warrants for the violation of correspondence had been issued by British secretaries of state for "uncertain" objects. The humiliation of such a record is complete when we place beside it a passage in one of the letters addressed to Mazzini by Attilio Bandiera, not the least memorable of the Neapolitan victims at Cosenza:—"*Fidando sempre sulla* nota lealtà delle poste inglesi, *potete indirizzar qui al mio nome le vostre lettere*."[2] It will need better regulations on this head than yet obtain to make the "noted integrity" of the English post-office again an article of European faith.

Further classification of the warrants for opening letters.

The committee of 1844 proceeded to report, that "the warrants issued during the present century may be divided into two classes:—1*st*, Those issued in furtherance of criminal justice, and usually for the purpose of obtaining a clue to the hiding-place of some offender, or to the mode or place of concealment of property criminally abstracted. . . . . . 2*d*, Those issued for the purpose of discovering the designs of persons known or suspected to be engaged in proceedings dangerous to the State, or (as in Mazzini's case), *deeply involving British interests*, and carried on in the United Kingdom, or in British possessions beyond the seas. *With regard to both these* classes of warrants, the object in issuing them has been, in many cases, to ascertain the views, not of the party receiving, but of the party sending the letter. In issuing these warrants, the mode of proceeding is as follows:—(1.) In the case of criminal warrants, they do not originate with the Home Office. The application is made in the first instance to that one of the two under-secretaries of state who is of the legal profession; and the usual course is for the applicant to state the circumstances in writing; but if the case be very urgent, owing to the time being too short before the departure of the post, to draw out a written statement, that condition is sometimes dispensed with. . . . . . If the under-secretary accedes to the application, he submits the case to the principal secretary of state, with whose approval a warrant is drawn by the head clerk of the domestic department under the instructions of the under-secretary, and is then signed by the principal secretary. A record of the date of the warrant is kept under lock and key, in a private book, to which the two under-secretaries and the above-mentioned head clerk have access. To the applicant information is given, according to circumstances, of the post-mark or address merely, or of the contents of the letters detained, or, if the case require it, the original letter is put into his hands. (2.) In the case of warrants of the second description, they originate with the Home Office. The principal secretary of state, of his own discretion, determines when to issue them, and gives instructions accordingly to the under-secretary, whose office is then purely ministerial. The mode of preparing them, and keeping record of them in a private book, is the same as in the case of criminal warrants. *There is no record kept of the grounds on which they are issued*, except so far as correspondence preserved at the Home Office may lead to infer them. . . . . . The letters which have been detained and opened are, unless retained by special order, as sometimes happens in criminal cases, closed and re-sealed, without affixing any mark to indicate that they have been so detained and opened, and are forwarded by post according to their respective superscriptions."[1]

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[1] *Report from the Secret Committee on the Post-Office* (1844), p. 11.

[2] *Ricordi dei fratelli Bandiera e dei loro compagni di martirio in Cosenza* (Parigi, 1844), p. 47.

The committee of 1844 made no propositions for the regulation or control of this power. Its members content themselves with repeating the remark made a century before, as to the improbability that evil-intentioned persons, knowing that the secretary of state has occasionally recourse to the opening of letters, will venture to communicate their plans by post, but they make a different application of it. They acknowledge that, if this opinion be well founded, the importance of retaining the power as a measure of detective police is diminished. They suggest, however, that to withdraw the power would be to advertise "every criminal and conspirator against the public peace" that he may use the post-office with unhesitating confidence. They also suggest that to regulate the power might perhaps "have an indirect effect in giving an additional sanction to the power in question, and thereby possibly extending its use;"[2] with many other remarks of the like see-saw tendency. Our own clear conviction is, that the documentary evidence in this report is conclusive of the duty of the legislature to do at least these three things:—(1.) To enact that no warrant whatever shall issue except on written information upon oath; (2.) To enact that every such information shall be recorded in the secretary of state's office, with the date of the warrant, the period during which it remained in force, and *the results obtained.* (3.) To require a yearly statement of the number of warrants issued, and their respective grounds, with such reservations as to names and details as a wise discretion may dictate (without violating the spirit of the requirement), to be laid before Parliament. These precautions would, at all events, enable us to dispense with those platitudes about "deeply-involved British interests," and the like, which are better calculated for the meridian of Naples than for that of London.

History of the Money-Order Office.

No department of the post-office has advanced more rapidly of late years than has its "money-order office.' This branch of the business was for more than forty years the private enterprise of three post-office clerks, who were known as "Stow and Company." It was commenced in 1792, with the more especial object of facilitating the safe conveyance of small sums to soldiers and sailors, but was soon extended to all classes of small remitters, although still on a very humble scale. The postmaster-general sanctioned the scheme without interposing in the management. Each of the three partners advanced L.1000 to carry it on; and each of them seems, during the greater portion of the period, to have derived about L.200 a year in profit. In 1830 the amount of remittances from London was but about L.10,000.[3] The percentage was eightpence in the pound, out of which had to be defrayed the salaries of clerks, the commission to the country postmasters, and the profits of the partners. On the 6th December 1838 the office became an official department under the postmaster-general; the then partners receiving due compensation. The commission was reduced to a fixed charge of 1s. 6d. for sums exceeding L.2 and under L.5, and of 6d. for all sums not exceeding L.2. In 1840 these rates were reduced to 6d. and 3d. respectively. The number and aggregate amount of the orders issued in each year since the re-organization are as follows:—

Post-Office of Great Britain—Number and Amount of Money-Orders.

Years.	Number of Orders Issued.	Aggregate Amount of Orders Issued.
1839	188,921	313,124
1840	587,797	960,975
1841	1,552,845	3,127,507
1842	2,111,980	4,337,177
1843	2,501,523	5,112,840
1844	2,806,803	5,695,395
1845	3,176,126	6,413,361
1846	3,515,079	7,071,056
1847	4,031,185	7,903,177
1848	4,203,651	8,151,294
1849	4,248,891	8,152,643
1850	4,439,713	8,494,498
1851	4,661,025	8,880,420
1852	4,947,825	9,438,277
1853	5,215,290	9,916,195
1854	5,466,244	10,462,411
1855	5,807,412	11,009,279
1856	6,178,982	11,805,562
1857	6,389,703	12,180,273

The following table will show the amount of money-orders issued and paid in the principal towns of the kingdom, individually, in the year 1857:—

Post-Office of Great Britain.—Money-Orders Issued and Paid in Certain Towns.

Name of Town.	Population (1851).	Amount Issued.	Amount Paid.
		L.	L.
1. London	2,362,336	1,684,524	3,016,547
2. Liverpool	375,955	364,472	367,068
3. Manchester	316,213	278,506	380,550
4. Birmingham	232,841	182,744	305,661
5. Bristol	137,328	124,666	204,022
6. Newcastle-on-Tyne	87,784	100,018	84,879
7. Leeds	273,613	98.969	135,199
8. Sheffield	135,310	86,778	93.959
9. Hull	84,690	82,467	109,671
10. Nottingham	57,407	76,995	69,503
11. Portsmouth	72,096	74,466	62,541
12. Southampton	35,305	70,974	66,394
13. Bath	54,240	63,284	63,458
14. Plymouth	52,221	62,395	64,936
15. York	40.359	54,446	56,279
16. Cheltenham	35,051	52,499	41,562
17. Wolverhampton	119,748	50,355	33,919
18. Leicester	60,584	46,916	48,101
19. Bradford (Yorkshire)	149,543	45,874	43,599
20. Derby	40,609	45,327	40,228
21. Norwich	68,195	44,906	57,865
22. Exeter	40,688	44,030	57,992
23. Preston	69,542	40,412	36,237
24. Coventry	36,812	35,140	24,084
25. Macclesfield	39,048	16,840	11,948
26. Newcastle (Staff.)	10,569	15,795	8,752

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[1] *Report* of 1844, *ut supra*, 14–17.

[2] Ibid., 19.

[3] Evidence of Mr Robert Watts (1829), 612–14; *Eighteenth Report of Commissioners of Revenue Inquiry*, 85, 86.

Post-Office of Great Britain:—Scotland and Ireland.—Money-Orders Issued and Paid in certain Towns.

Name of City or Town.	Population.	Amount Issued.	Amount Paid.	Name of City or Town.	Population.	Amount Issued.	Amount Paid.
		L.	L.			L.	L.
1. Dublin	258,361	274,905	217,846	1. Edinburgh	160,302	132,635	210,329
2. Belfast	100,300	40,946	45,693	2. Glasgow	329,097	164,920	200,024
3. Cork	86,485	31,213	34,633	3. Dundee	78,931	33,660	29,659
4. Limerick	55,268	15,721	19,251	4. Aberdeen	71,973	33,451	42,720
5. Waterford	26,667	13,135	11,154	5. Perth	23,835	18,209	18,037
6. Londonderry	......	9,480	12,584	6. Stirling	12,837	11,751	14,395
7. Drogheda	16,876	5,338	7,878				

In 1848 the money-order office involved a loss of L.5,745 by excess of expenses over the amount of poundage. In 1849 a profit accrued of L.322, which has gradually increased, year by year, until in 1857 it amounted to L.24,175.

History of the postal revenue from 1839 to 1857.

The increase in the number of postal deliveries, and in that of the receiving-houses and branch-offices, together with the numerous improvements introduced into the working economy of the post-office, when Mr Rowland Hill at length obtained the means of fully carrying out his reforms by his appointment as secretary, speedily gave a more vigorous impulse to the progress of the nett revenue than had theretofore obtained. During the seven years, 1845–51 inclusive, the average was but L.810,951. During the seven years, 1852–57 inclusive, the average was L.1,166,448. The following table shows the details for the entire period from 1838, the last complete year of the old rates of postage, to 1857 inclusive:—

Post-Office of Great Britain.—Number of Letters; Gross and Nett Income, 1838–57.

Estimated No. of Chargeable Letters.	Year Ending	Gross Income.	Cost of Management.	Nett Revenue.	Postage charged on Governt.
		L.	L.	L.	L.
...	Jan. 5, 1838	2,339,737	687,313	1,652,424	38,528
...	„ 1839	2,346,278	686,768	1,659,509	45,156
75,908,000	„ 1840	2,390,763	756,999	1,633,764	44,277
168,768,344	„ 1841	1,359,466	858,677	500,789	90,761
196,500,191	„ 1842	1,499,418	938,168	561,249	113,255
208,434,451	„ 1843	1,578,145	977,504	600,641	122,161
220,450,306	„ 1844	1,620,867	980,650	640,217	116,503
242,091,684	„ 1845	1,705,067	985,110	719,957	109,232
271,410,789	„ 1846	1,887,576	1,125,594	761,982	101,190
299,586,762	„ 1847	1,963,857	1,138,745	825,112	100,354
322,146,243	„ 1848	2,181,016	1,196,520	984,496	121,290
328,830,184	Jan. 5, 1849	2,143,679	1,403,250	740,429	115,902
337,399,199	„ 1850	2,165,349	1,324,562	840,787	106,923
347,069,071	„ 1851	2,264,684	1,460,785	803,898	109,523
360,647,187	„ 1852	2,422,168	1,304,163	1,118,004	167,129
379,501,499	„ 1853	2,434,326	1,343,907	1,090,419	124,977
410,817,489	„ 1854	2,574,407	1,400,679	1,173,727	134,112
443,649,301	Dec. 31, 1854	2,701,862	1,506,556	1,195,306	185,236
456,216,176	„ 1855	2,716,420	1,651,364	1,065,056	173,560
478,393,803	„ 1856	2,867,954	1,660,229	1,207,725	154,229
504,421,000	„ 1857	3,035,713	1,720,815	1,314,898	135,517

Summary of progress, 1839–57.

Briefly, under the penny rate the number of letters has become *sixfold* what it was under the exorbitant rates of 1838. When the change was first made the increase of letters was in the ratio of 122·25 per cent. during the year. The second and third years showed an increase on each preceding year respectively of about 16 per cent. During the next fourteen years the average increase was at the rate of about 6 per cent. per annum; and this rate is still maintained. And although this enormous increase of business, coupled with the increasing preponderance of railway mail conveyance, invaluable but costly, has carried up the post-office expenditure from L.757,000 to L.1,720,000, yet the nett revenue of 1857 is within L.300,000 of the nett revenue of 1839. These are the direct results. The indirect advantages which have attended postal reform are beyond calculation.

During the year 1857 the number of newspapers delivered in the United Kingdom was about 71,000,000; and that of book packets (the cheap carriage of which is one of the most serviceable and praiseworthy of the recent improvements) about 6,000,000.

Under this head it only remains to show, as concisely as possible, the extent of postal correspondence between Great Britain and the principal British colonies and foreign countries, individually. The following table, for the year 1856, will afford this information as nearly as it is yet attainable:—

Post-Office of Great Britain.—Statistics of Colonial and Foreign Correspondence, 1856.

Name of Colony or State.	Letters Outwards.	Letters Inwards.	Letters Inwards and Outwards.	Newspapers and Books Outwards.	Newspapers and Books Inwards.	Newspapers and Books Inwards and Outwards.
African, West Coast of	28,800	22,836	51,636	22,884	4,632	27,516
Australia	913,733	...	...	1,342,466	...	...
Belgium	325,811	250,564	576,375	202,740	185,460	388,200
Brazils	66,252	80,076	146,328	123,408	60,084	183,492
Bremen	57,166	49,538	106,704	19,608	...	...
Canada	358,284	396,915	755,199	908,028	424,416	1,332,444
Ceylon	28,722	37,542	66,264	114,084	22,122	136,206
East Indies	610,482	647,800	1,258,282	979,068	220,687	1,199,755
France	2,184,916	2,021,610	4,206,526	718,296	614,304	1,332,600
German Postal Union	911,957	635,145	1,547,102	586,968	184,380	771,348
Hamburg	385,445	257,649	643,094	149,592	127,868	277,460
Holland	233,632	179,827	413,459	81,636	44,808	126,444
Hong Kong	72,522	78,228	150,750	105,930	59,228	165,158
Lisbon, Oporto, and Gibraltar	171,846	161,088	335,934	75,402	4,860	80,262
Mauritius	20,730	16,530	37,260	43,164	26,250	69,414
Mediterranean	234,786	175,056	409,842	92,802	9,420	102,222
Sweden	26,015	17,253	43,268	4,776	3,264	8,040
United States	1,733,745	1,547,054	3,280,799	1,063,584	872,664	1,936,248
West Indies and Pacific	322,716	281,700	604,416	572,412	122,496	694,908[1]

[1] Miles, *History of the Post-Office*, ut supra, 349.

British Post-Office.

II. ORGANIZATION AND MECHANISM OF THE BRITISH POST-OFFICE.

The principal acts which regulate the management of the post-office of the United Kingdom, are those of 1 Vict., c. 32–36, "An Act to Repeal the several Laws relating to the Post-Office;" "An Act for the Management of the Post-Office;" "An Act for Consolidating the Laws relative to Offences against the Post-Office," &c.; and 2 Vict., c. 98, "An Act to provide for the Conveyance of the Mails by Railways;" 3 and 4 Vict., c. 96, "An Act for the Regulation of the Duties of Postage;" 7 and 8 Vict., c. 49, "An Act for the better Regulation of Colonial Posts;" 10 and 11 Vict., c. 85, "An Act for giving further facilities for the Transmission of Letters by Post, and for the Regulating the Duties of Postage thereon, and for other purposes relating to the Post-Office;" and 11 and 12 Vict., c. 88, "An Act for further Regulating the Money-Order Department of the Post-Office." The briefest possible analysis of these acts would claim a large space. It must here suffice to enumerate the existing staff and expenditure; to indicate the chief branches of the office, and its methods of working; and to detail the principal regulations which concern the public in the practical business of correspondence.

Staff of the post-office.

On the 31st December 1857 the entire staff of the post-office comprised 23,731 persons of all ranks. Of this number, 23,545 were employed in the British Isles, 125 in the colonies, and 61 in foreign countries as agents for the collection of postage, &c. Of the 23,545, about 2000 were attached to the chief office in London. Exclusive of the letter-carriers, they may be classified thus:—

Post-Office of Great Britain.—Staff of Chief Office, 1858.[1]

	No. of Persons.
Postmaster-general	1
Secretary and assistant secretaries	3
Private secretary to postmaster-general	1
Secretary's office,— 1 chief clerk; 51 clerks (in three classes); 20 supplementary clerks; 4 paper-keepers	76
Surveyors' department,— 13 surveyors; 25 clerks; 13 stationary clerks; 38 clerks in charge	89
Mail office,— 1 inspector-general; 1 deputy inspector-general; 1 chief clerk; 13 clerks; 3 inspectors of mails; 1 supervisor of mail-bag apparatus	26
Railway department of mail-office,— 1 superintending clerk; 60 clerks	61
Solicitor's office,— 1 solicitor; 4 clerks; 1 inspector-general	6
Medical department	2
Receiver and accountant-general's office,— 1 receiver-general; 1 chief examiner; 1 cashier; 1 book-keeper; 48 clerks	52
Money-order office,— 1 comptroller; 1 chief clerk; 149 clerks	151
Circulation department,— 2 comptrollers; 10 deputy do.; 219 clerks; 1 inspector-general of letter-carriers; 35 inspectors; 3 officers in charge of Indian mails; 1 surveyor; 3 surveyor's clerks	274

Inland service.

The number of post-offices in the United Kingdom, on the 31st December 1857, was 11,101. Of these, 810 were head post-offices, and 10,291 sub-post-offices. The number of street and road letter-boxes was 703. The distance over which mails are daily conveyed within the United Kingdom is, in the aggregate, 129,480 miles: of which distance, 30,172 miles are performed by railway, at an average charge of 9¼d. per mile; 32,997 by coach, omnibus, or mail-cart, at an average of 2⅓d.; 63,432 on foot, at an average of 1½d.; and 2879 miles by packet and boat, at maximum charges varying from 5s. 6¼d. in England, to 5¼d. in Ireland, per mile. The details are thus stated:—

Post-Office of Great Britain—Conveyance of Mails, 1857 (*Inland Service*).[2]

Countries.	Mails Conveyed by Railways.		Mails Conveyed by Coaches.		Mails Conveyed on Foot.		Inland Mails Conveyed by Packets and Boats.		
	No. of Miles per Week-day.	Average Charge per Mile.	No. of Miles per Week-day.	Average Charge per Mile.	No. of Miles. per Week-day.	Average Charge per Mile.	No. of Miles per Week-day.	Maximum Charge.	Minimum Charge.
England	23,620	0s. 8¼d.	19,097	2½d.	46,643	1½d.	1451	5s. 6¼d.	⅛d.
Ireland	2,850	1s. 4d.	8,603	2d.	6,721	1d.	52	0s. 5¼d.	¼d.
Scotland	3,702	0s. 10⅛d.	5,297	2¼d.	10,068	1½d.	1376	1s. 1¾d.	⅓d.
United Kingdom	30,172	0s. 9¼d.	32,997	2⅓d.	63,432	1½d.	2879	5s. 6¼d.	⅛d.

The post-office expenditure for 1857 was as follows:—

Post-Office of Great Britain.—Expenditure, 1857.

Heads of Service.		Amount in 1857.	Amount in 1856.
		L.	L.
1. Salaries, pensions, &c.		948,573	909,094
2. Hereditary pensions by statute		1,573	29,310
3. Buildings		29,367	33,330
4. Conveyance of mails—			
By railways	L.422,943		
By coaches, &c.	167,823		
By mail packets and private ships	12,298		
		603,064	553,509
5. Manufacture of postage stamps, &c.		28,566	26,164
6. Rents, taxes, clothing expenses, law expenses, and miscellaneous expenses		109,672	108,822
		1,720,815	1,660,229[3]

The fifth item in this abstract—"Manufacture of postage stamps"—has been of late years reduced (relatively to the number consumed), and the process much improved, by the perforating machine invented by Mr Henry Archer, and purchased of him for the public, in pursuance of the recommendation of a select committee of the House of Commons which sat in 1852. That committee reported its inability to decide on the conflicting evidence which had been offered to it, "as to the greater or less security against forgery afforded by copper-plate engraving than by surface printing; but it adopted the opinion which had been previously expressed by the Commissioners of Inland Revenue, "that the application of the perforating machine would afford additional security against forgery, inasmuch as the accurate perforation of counterfeit sheets would be a work of great difficulty, and sheets not accurately perforated would at once excite suspicion if offered for sale."[4]

The item "Salaries and pensions" is necessarily, and wisely, an increasing one. As respects a large proportion of the staff, there is an annual increment of salary, and an annual expenditure in defraying the cost of substitutes during the absence of the officers on their regular holiday, or on account of ill health. On this recently-established practice of annual vacations there is an instructive passage in a report addressed in 1857 to the postmaster-general by Mr Bokenham, comptroller of the circulation department:—"The attendance of the clerks during the year," writes this officer, "has been good, and an improvement has shown itself in their general health. This is highly satisfactory, and the decreased amount of absence from illness may, I think, greatly be traced to the good effects the annual holiday has produced upon them, in the temporary relaxation which it gives from their labours. The Saturday half-holiday, too, has not been without its influence. The duty certainly has not suffered by the establishment of that measure. Both for the ordinary business of the week, and for any extra work that has required to be done (and in the district branch the pressure has been very great), the officers have cheerfully attended beyond the regular official hours, in order that no arrears might accrue. The privileges are felt to be most valuable, and every effort will be made by the officers to retain them."

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[1] *Fourth Report of the Postmaster-General* (1858), p. 15.

[2] *Fourth Report*, ut supra, 15.

[3] Ibid. 27.

[4] *Report from Select Committee on Postage Label Stamps* (1852), iv.

Railway post-offices.

No improvement of detail has tended more importantly to accelerate the delivery of letters than has the establishment of "railway post-offices,"—now a familiar sight, although still a subject of public curiosity as to their methods of working. By Mr Ramsay's ingenious apparatus, letter-bags are dropped into a net attached to the official carriage, without checking the speed of the train, and their contents are rapidly assorted into the range of boxes or "pigeon-holes" appropriated to the respective towns on the line, and thence into the proper bags, which in many cases are left, as they were received, whilst the train continues at full speed. Plans for sorting letters on board ship were long impeded by technical difficulties; but in 1857 these were surmounted, and the object was successfully attained in the packets which convey the Australian mails between Alexandria and Southampton. It has since been adopted in other lines of packets, and will doubtless become general.

Acceleration of postal deliveries.

By the new arrangements for sorting letters on their journey, and by other improvements in postal economy still more recent, a remarkable acceleration has taken place in the deliveries in almost all parts of the kingdom, as well as in London. The extent of this acceleration in the metropolis will be briefly and strikingly shown by the following percentage table:—

Post-Office of Great Britain.—Acceleration of Metropolitan First Morning Delivery, 1856–58.

Delivery completed	First Six Weeks of 1856. (Delivery commenced 7.55 A.M.)	First Six Weeks of 1857. (Delivery commenced 7.28 A.M.)	First Six Weeks of 1858. (Delivery commenced 7.4 A.M.)
A.M.	Per Cent.	Per Cent.	Per Cent.
At (or before) 9.0	5	65	93
Between 9.0 and 9.15	14	18	6
" 9.15 " 9.30	25	10	1
" 9.30 " 9.45	23	5	...
" 9.45 " 10.0	16	2	...
" 10.0 " 10.15	8	...	...
" 10.15 " 11.0	9	...	...
	100	100	100

The cities and towns of the United Kingdom which yield a postal revenue next in importance to that of the English metropolis are Liverpool, Manchester, Glasgow, Dublin, Edinburgh, Birmingham, and Bristol. The details in the years 1856 and 1857 were respectively as follows. The staff and local expenses are those of 1854:—

Post-Office of Great Britain.—Local Statistics, 1856–57.

Cities and Towns.	Population in 1851.	No. of Clerks, Receivers, &c.	No. of Letter-Carriers.	Local Expenses.	Postal Revenue.	
					1856.	1857.
1. London (1857)............	2,362,336	3200		...	L.834,927	L.833,952
2. Liverpool..................	375,955	149	82	L.14,029	100,379	104,865
3. Manchester................	316,213	160	123	12,765	85,301	89,765
4. Glasgow....................	329,097	123	134	10,096	63,441	68,877
5. Dublin......................	258,361	124	109	19,930	55,103	60,391
6. Edinburgh..................	160,302	82	74	11,043	56,270	59,177
7. Birmingham...............	232,841	90	64	7,364	38,849	42,107
8. Bristol......................	137,828	117	53	6,158	29,967	31,264

The metropolitan offices of Scotland and Ireland.

During the inquiry into the organization of the post-office which was instituted by the Treasury in 1854, a proposition was brought under consideration for discontinuing the metropolitan offices at Edinburgh and Dublin, and placing the Scottish and Irish business immediately under the central office. But it was clearly established, on careful investigation, that the proposed change was an undesirable one, for these reasons amongst others:—(1.) The management of remittances and accounts requires that receivers should be stationed in Edinburgh and in Dublin respectively; (2.) A dead-letter office is requisite in those capitals, inasmuch as the delay of transmission to London and the probable deficiency of local knowledge at the chief office would be alike prejudicial to the public service. (3.) The existing plan admits of the settlement of many questions arising in the ordinary course of business more expeditiously, and therefore more satisfactorily, than could be effected in London.[1]

Rules as t appointments in the post-office service.

On the general question of appointments in the service of the post-office, the Treasury committee of 1854 reported its opinion "that the postmaster-general should lay down strict rules for the examination of all candidates for admission, either into the class of clerks, or into that of sorters and letter-carriers, in order to test their capacity; . . . . that the limits of age for admission should be seventeen and twenty-three, in the case of all candidates for letter-carrierships, sorterships, or clerkships, who have not previously been in the service of the department;" and that "a medical examination should also take place in order to ascertain that the candidate has no physical or mental defect or disease which is likely to incapacitate him for the public service." They also proposed that the appointment of local postmasters should be transferred from the Treasury to the postmaster-general. Many other changes and rearrangements were recommended, which it is not needful here to notice.

Most of the recommendations of the committee received the approval both of the Lords of the Treasury and of the

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[1] *Report* [to the Treasury] *upon the Post-Office* (1854), pp. 33–35.

Treasury minute on the report of 1854.

postmaster-general, and have been carried into effect. But, on the proposed limit of age for admission to the service of letter-carriers and sorters, the Treasury minute observed that it was too low:—"My lords advert first to the trustworthy character of the duty, requiring, at least, considerable steadiness of character and habits, which may not be easily secured at so early an age; and they also advert to the fact, that the limit of age for admission into other parts of the public service for which the officers are drawn from similar classes of society, and where the duties are not of a character requiring so much trust, extends to the age of thirty. My lords are therefore of opinion that it is desirable that a latitude should be given to the postmaster-general in the selection of this class of officers up to the age of twenty-seven.

"The only other point in the report," continues the minute, "which my lords desire to modify is that which proposes to transfer the appointment of local postmasters from this board to the postmaster-general. My lords entirely concur with the committee that it would be beneficial to the public service, and advantageous to the post-office department, that the postmaster-general should have an opportunity of rewarding meritorious servants by promoting postmasters to more important towns where vacancies occur, and by appointing deserving officers in country post-offices, as well as in the chief office in London, to the charge of local post-offices. But it appears to my lords that this principle can only be applied with advantage to a class of post-offices where, from their importance and the amount of the emolument, the office is held as a separate and distinct employment, and that it would be inapplicable in all cases where the post-office is held in conjunction with a private business or profession, in which case it is obviously necessary that the appointment must be conferred upon a local person. In the latter cases, my lords are of opinion that it is for the public interest that the appointments should continue to be made as at present, after consulting, through the recommendation of the member for the county or town, the convenience and wishes of the population." For these reasons it was decided that the Treasury should continue to appoint provincial postmasters in places where the nett income shall not exceed L.175 a year, and that in all other cases the appointment shall lie with the postmaster-general.

Existing rates of postage.

The existing rates of postage and public regulations of the department stand thus (February 1859):—

1. *All inland letters must be paid in advance by postage stamps*, as follows:—For a letter weighing not more than ½ oz., 1d.; more than ½ oz., but not exceeding 1 oz., 2d.; more than 1 oz., but not exceeding 2 oz., 4d.; more than 2 oz., but not exceeding 3 oz., 6d.; and so on, 2d. being charged for every additional ounce. Inland letters which are posted *wholly* without stamps are returned to the writers. This compulsory regulation came first into operation on the 10th February 1859.

2. If insufficiently stamped, the deficient postage is charged with an additional rate of one penny. Thus, an inland letter, weighing more than half an ounce, but not more than an ounce, and bearing a single stamp, is charged twopence. But in the case of letters which have to be *re-directed*, the unpaid additional postage is charged at the ordinary rate. Unless three-quarters at least of the postage of a letter *exceeding four oz.* be prepaid, the letter is not forwarded.

etitions.

3. *Petitions* and *addresses* to her Majesty, forwarded direct, are exempt from postage; and such petitions and addresses, as also petitions to either House of Parliament, if sent to a member of either house, are also exempt, provided they do not weigh more than 2 lb., and are without covers, or in covers open at the sides or at the ends.

ewspa- rs and riodicals.

4. All *periodical publications*, including *newspapers*, published in the United Kingdom, at intervals not exceeding thirty-one days, and which bear an impressed stamp denoting stamp-duty of the value of 1d. at least, may be transmitted and re-transmitted through the post free of postage; but the stamp must be exposed to view; the cover must be open at the ends; it must contain no inclosure or writing of any kind; and, in case of a second transmission, the previous address, if written on the paper, must be cut off. For transmission abroad newspapers must be registered at the post-office, and the postage must be prepaid in postage stamps; the impressed stamp counts for nothing beyond the British Isles.

Parliamentary papers

5. *Parliamentary papers*, open at the ends, are carried within the United Kingdom at the rate of 1d. for every 4 oz. or fractional part thereof, whether prepaid or not; but they must be marked "parliamentary proceedings" on the cover.

Book-packets.

6. *Book packets*, open at the ends or sides, are charged at the like rate of 1d. for 4 oz., and 2d. not exceeding 8 oz.; but the rate proceeds by half-pounds, 2d. being charged for 8 oz., or fractional part of 8 oz. A book packet may contain any number of separate books or other publications (including *printed* letters and printed matter of every kind), prints, or maps, and any quantity of paper, parchment, or vellum. And the books, &c., may be either printed, written, or plain, or any mixture of the three. All legitimate mounting, binding, or covering, is allowed, as also rollers in the case of prints or maps; but no book packet may contain any letter or communication in the nature of a letter otherwise than wholly *in print*, nor anything which is sealed or otherwise closed against inspection, nor must it exceed 2 feet in length, width, or depth.

Registration.

7. *Registration* of inland letters or book packets may be made by the prepayment in stamps of a fee of 6d., in addition to the ordinary postage. Such registration makes it practicable to trace a letter from receipt to delivery. A receipt must be obtained by the sender at the post-office window, and a receipt is required from the receiver by the letter-carrier on delivery.

Responsibility of the post-office.

It is held by the post-office authorities that even registration does not render the postmaster-general responsible to the sender, but leaves intact the old legal doctrine, that the responsibilities of common carriers do not extend to postmasters, as was decided in the case of *Lane* v. *Cotton*. The post-office establishment is regarded as a branch of the public police, created by statute, and controlled by the government. Postmasters enter into no contract with individuals, and receive no hire, like common carriers, in proportion to the risk and value of the letters under their charge, but only a general compensation from government. The same doctrine was asserted in the case of *Whitfield* v. *Lord Le Despencer*, which was an action to recover the value of a bank-note stolen by one of the sorters out of a letter in the post-office. But a deputy-postmaster is answerable in a private suit for individual acts of misconduct or negligence, as for wrongfully detaining a letter an unreasonable time. And all subordinate officers are responsible to the postmaster-general, who may require them to make good to the sufferers any loss sustained through their neglect or breach of duty.[1]

Parliamentary notices

8. *Parliamentary notices* may be forwarded by post if posted at such offices as transact money-order business. The postage and the registration fee of 6d. on each must be prepaid either in money or stamps. The words "parliamentary notice" must appear legibly on each, and with them must be presented lists in duplicate to be examined at the post-office window.

Colonial letters.

9. For *Colonial letters*, 6d. the half-ounce. This rate now extends to every British colony or dependency. To the following places prepayment is optional:—Bermuda, Canada, Cape Coast Castle, Cape of Good Hope, Ceylon, Gold Coast, Ionian Islands (at an advanced rate), New Brunswick, Newfoundland, Nova Scotia, Prince Edward Island, Sierra Leone. To all others it is compulsory.

Foreign letters.

10. For *Foreign letters* the rates are too numerous for much detail. To France the rate is 4d. per *quarter*-ounce, if prepaid; double, if not prepaid. To Belgium, to most parts of Germany *via* Belgium, to Holland, 8d. per *half*-ounce; to Sardinia *via* France, and to Spain, 6d. per *quarter*-ounce; to the Papal States, to Greece, and to Naples, 11d. per *quarter*-ounce; to the United States, 1s. the half-ounce, and so on.

Foreign newspapers and book-packets.

11. To Belgium, France, Algeria, to Prussia *via* France, and to the French offices in Turkey, Syria, and Egypt, registered newspapers are conveyed at the rate of 1d. for 4 oz., 2d. for 8 oz., and 2d. for every additional 8 oz., or fractional part thereof. Other printed papers are 3d. for 4 oz., 6d. for 8 oz., and 6d. for every additional 8 oz., and so on. Prepayment is compulsory. To Sardinia, Spain, the Balearic and Canary Islands, the

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[1] See the cases Lane *v.* Cotton in Lord Raymond's *Reports*, i. 646; Whitfield *v.* Lord Le Despencer in Cowper's *Reports*, 754; and Browning *v.* Goodchild, in Wilson's *Reports*, iii. 443.

rates for registered newspapers are double the above. To Tuscany, Parma, Modena, and the Austrian dominions, they are quadruple, *i.e.*, 4d. for 4 oz., and 8d. for every 8 oz., or fractional part thereof. Book packets are—to Sardinia, &c.,—4d. for 4 oz., 8d. for 8 oz., and the like for every additional 8 oz. But no packet of books or newspapers can be sent to the Austrian dominions *via* Sardinia, if it weigh more than 1 lb.

12. The term "printed papers," as applied to foreign countries, includes parliamentary proceedings, books of all kinds (whether printed, engraved, or lithographed), sheets of music, prints, maps, and every thing necessary for the safe transmission of such; but must contain no writing of any sort, except in the single case of transmission to Sardinia, where writing, not of the nature of a letter, is permitted, as in the United Kingdom; and no packet must exceed 18 inches in length, width, or depth, unless it be addressed either to Sardinia, Spain, Balearic or Canary Islands, Tuscany, Parma, Modena, or the Austrian dominions, in which countries the limit is 24 inches. But *bound* books cannot be sent to Spain or the Balearic or Canary Islands; neither can prints, music, maps, nor drawings, unless they form part of a book. The United States have not yet attained a book-packet rate, except for periodicals under 16 oz. weight, at 1d. for 2 oz., 6d. for 3 oz., and 2d. for every additional ounce. Pamphlets under 8 oz. may be sent at the same rate.

Colonial book-packets.

13. *Colonial book packets* may be transmitted at the rate of 3d. for every 4 oz. Newspapers are 1d. each. Newspapers for India weighing above 4 oz., and not exceeding 8 oz., are chargeable with two single rates; above 8 oz., and not exceeding 21 oz., with three single rates. The book post to and from India and New South Wales is limited to packets not exceeding 3 lb. in weight; any packet weighing more than 3 lb. is liable to the letter rate. In all other respects the regulations were assimilated in 1857 to those of the inland book post.

Registration of colonial and foreign letters and packets.

14. By the prepayment of the ordinary postage and the British registration fee of 6d., letters, newspapers, and book packets can be registered, irrespective of weight, between this country and the British West Indies, British North America, Sierra Leone, Gold Coast, St Helena, Cape of Good Hope, Natal, Mauritius, South Australia, Western Australia, Malta, Gibraltar, and Ceylon. Letters may on the same terms be registered to Belgium, Luxemburg, Holland, and countries through Holland, Sardinia, Spain, the Balearic or Canary Islands, the United States, Alexandria, Suez, India, and Liberia. By the prepayment of a fee of 9d., in addition to the usual postage, letters, &c., irrespective of weight, may be registered to Prussia, and to countries to which correspondence is usually sent through Belgium. In like manner, for a fee of 11d., letters, &c., may be registered to Tuscany, Parma, Modena, and Venetian Lombardy; and for *double postage*, letters may be registered to France, and to countries, the correspondence of which is, as a rule, sent through France, and can be paid to destination.

Returned or "dead" letters.

15. When letters, &c., remain undelivered, owing to the residences of the persons to whom they are addressed being unknown, a list of the addresses is exhibited in the window of the post-office to which they have been sent during one week. "Refused" letters are sent as soon as possible to the "returned letter office," as are all letters intended for ships which have sailed before their arrival. When the reason is "not known," or "gone away," the letter is retained by the provincial postmaster, for a period not exceeding fourteen days, before being sent to the "returned letter office;" and when the reason is "not called for" (the letter being addressed to a post-office), the letter is retained for a month. Undelivered letters from the country to London are retained for three days in the "letter-carriers office," and then sent to the "returned letter office," whither London district letters go on the second day after the unsuccessful attempt to deliver them. All inland letters which contain the name and address of the senders are returned to them on the day of their receipt at the "returned letter office." Colonial and foreign letters are returned in periods which vary from one month to two months. Letters which contain no address of the sender are destroyed, unless they contain money or other articles of value.

[The number of letters so returned to the writers during 1857 was about 1,700,000, as against 1,581,000 in 1856. The number of newspapers which could not be delivered during 1857 was about 580,000.[1]]

Re-directed letters.

16. *Redirected letters* are usually chargeable with additional postage at the prepaid rate, unless they be re-directed by an officer or servant of the post-office, and be so re-directed to a place within the district of the same head-office. A registered letter, when redirected is subjected to the ordinary rate.

Money order business.

17. Application forms for *money-orders* may be obtained at the rate of ten for a penny. The commission is 3d. on an order not exceeding L.2; 6d. above L.2. No order is granted for more than L.5. Unless the remitter shall notify, in writing, that the order is to be paid through a bank, the person applying for it at the office must furnish the surname, and at least the initial of one Christian name, both of remitter and of payee, together with the remitter's address. Applicants for money-orders are cautioned not to transmit the information required on payment in the same letter with the order. After once paying an order, by whomsoever presented, the office is no longer liable. Presentation must be made before the end of the *second* calendar month after the month of issue. If made later, a new order and new commission are required. If not paid before the end of the *twelfth* calendar month after issue, all claim to the money will be lost.

Penalties for offences against post-office acts.

18. *Penalties* of L.5 for conveying any letter otherwise than by post, and of L.100 for every week during which the practice of such conveyance is continued, are enacted by 1 Vict., c. 36, sec. 2. The sender also incurs a penalty of L.5 for every letter, with full costs of suit. The exceptions (by 1 Vict., c. 34) are these:—(1.) Letters by a private friend; (2.) Letters by an express messenger on the personal affairs either of sender or of receiver, and proceedings of courts of law; (3.) Letters sent out of the United Kingdom by private ships; (4.) Letters of merchants and of owners of vessels or cargo, sent by such vessels without reward or profit for such conveyance; (5.) Letters expressly relating to and accompanying merchandise sent by common carriers. Provided always that no *collection* be made of any such excepted letters.

19. The following persons are expressly forbidden to carry letters, either with or without hire or reward:—(1.) Common carriers, except as above; (2.) Owners or commanders of ships, except as above; (3.) Passengers, or other persons on board ships or other vessels; (4.) Owners of, or any persons whatsoever conveyed by, any ship or boat passing on a river or navigable canal, within the United Kingdom.

III. HISTORY AND MECHANISM OF THE POST-OFFICE OF THE UNITED STATES OF AMERICA.

Benjamin Franklin was the first postmaster-general of the United States, but he very soon vacated the office on being appointed ambassador to France. From November 1776 to November 1858, the office has been held by nineteen persons.

From 1776 to 1816 the rates of postage varied from 7 to 33 cents (3½d. to 1s. 4d.) according to distance: reductions of slight extent were made in 1816, and again in 1845. In 1851 Congress established the following rates:—For "drop" or local letters, 1 cent (½d.); letters not exceeding ½ oz., for any distance not exceeding 3000 miles, 3 cents (1½d.), if prepaid; five cents (2½d.), if not prepaid; and double those rates for letters of like weight if conveyed more than 3000 miles. The existing law, enacted in 1855, and carried into full effect on the 1st of January 1856, fixed the rates at ½d. for local letters, 1½d. for single letters if under 3000 miles, 5d. if above 3000 miles; made prepayment compulsory; and directed that unpaid letters should be stopped and sent to the "Dead-Letter Office." It was further enacted, that from the date last named the prepayment should be by stamps. By another law of March 1856, prepayment was extended to printed matter. Under this compulsory system upwards of a million of unpaid letters were detained, not returned to the writers as in this country,—and sent to Washington, where they were *destroyed*. The same practice is pursued with respect to all letters refused or undelivered, from whatever cause. It leads, according to the testimony of the able historian of the American post-office, Mr Pliny Miles, to the destruction of about 4,000,000 of letters annually.

On the same authority (but in a much abridged form), the statistics of the American postal system for the last seventy years may be stated thus:—

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[1] *Fourth Report,* ut supra, 18.

Statistics of American post-office.

Post-Office of the United States.—Statistics, 1790–1856.

Year.	No. of Post-Offices.	Miles of Post Road.	No. of Letters.	Expenses of Conveyance.	Total Expenses.	Revenue.
				L.	L.	L.
1790	75	1,875	265,545	4,416	6,428	7,587
1795	453	13,207	1,124,340	15,071	23,578	32,124
1800	903	20,817	1,965,628	25,728	42,798	56,160
1805	1,558	31,076	2,949,651	47,927	75,473	84,274
1810	2,300	36,406	3,861,788	65,593	99,193	110,366
1815	3,000	48,966	7,301,455	97,555	149,624	208,613
1820	4,500	72,492	8,895,415	145,685	231,185	222,385
1825	5,677	94,052	10,016,488	157,129	241,316	250,412
1830	8,450	115,176	13,804,664	254,801	386,541	370,116
1835	10,770	112,774	26,942,013	343,801	551,470	598,711
1840	13,468	155,739	40,891,698	642,608	943,547	908,704
1845	14,183	143,940	39,958,978	579,726	864,146	887,968
1850	18,417	178,672	69,426,452	619,194	1,042,590	1,110,594
1855	24,410	227,908	126,723,425	1,215,267	1,993,668	1,577,035
1856	25,565	239,642	131,450,409	1,353,127	2,081,573	1,524,164[1]

The total number of mail routes on the 30th June 1856 was 7972, and the number of contractors 6372. The aggregate length of routes, and annual amount of transportation stood thus:—

Post-Office of the United States.—Statistics of Transit, June 1856.

Mode of Transit.	Length of Routes.	Annual Transportation.	Cost per Mile.
	Miles.		
By steamboat	14,951	4,240,170	10d.
By railway	20,323	21,809,296	5⅛d.
By coach	50,453	19,114,991	3½d.
By other methods of transit...	153,915	26,143,440	2½d.
Totals......	239,642	71,307,897	...

The income and expenditure of the post-office of the United States, during each of the years 1855 and 1856, were respectively as follows:—

Post-Office of the United States.—Income and Expenditure, 1855–56.

Headings of Expenditure.	1855.	1856.	Income.	1855.	1856.
	L.	L.		L.	L.
Salaries and wages	596,253	604,777	Gross Income	1,482,366	1,524,164
Conveyance of mails	1,215,267	1,353,128			
Miscellaneous expenses, including packet service, and balances due to foreign offices...	197,479	123,668	Deficiency to be provided for by votes of Congress..........	526,633	557,409
Total...............	2,008,999	2,081,573	Total..............	2,008,999	2,081,573

Causes of the deficiency of income to meet expenditure in United States post-office.

An annual deficiency of half a million is a result so strikingly in contrast with British postal experience, that it may well claim some elucidation. Its true causes, and the lesson they convey, have been brought saliently before the American public by the indefatigable advocate of Transatlantic post-office reform, Mr Pliny Miles. On one important point, his views and those expressed in the report of the postmaster-general (then Mr James Campbell) for the year 1856 are in harmony. Both agree in condemning the extent to which the franking privilege is carried in the United States. Both recommend its abolition. On most other points of postal affairs they are greatly at variance.

Mr Campbell's report, after referring to previous expressions of his official disapproval of the continuous increase of franking, proceeds thus:—"The experience of the last year has satisfied me more fully that this privilege should be speedily abolished. For months during this year free matter by the ton passed through the mails into every part of the United States, interfering greatly with the regular transmission of the correspondence of the country. When this free matter passes from the railroad, it is almost impracticable to forward it by the ordinary conveyances. The evil is yearly increasing, detracting largely from the revenues of the department, and impairing its efficiency." . . . "The reduced rates of postage having largely reduced the revenue, it has not been possible to confine the expenditures of the department within its income, and the postmaster-general has been compelled to apply to Congress annually to appropriate the deficiency from the general treasury. These causes have removed in effect the salutary restraints imposed by the act of 1836, and left the head of this department in a great degree uncontrolled in his expenditures. This state of things should not continue. The laws should be so framed as to produce a sufficient amount of revenue to defray all proper expenditures. If my views regarding the abolition of the franking privilege . . . be not adopted[2] [be adopted ?] by Congress, I would recommend the passage of a law enabling the department to charge the ordinary rates of postage on letters and printed matter which now pass free through the mails. If, in addition to this, the clause in the act of the 30th of August 1852, allowing a deduction of 50 per cent. on newspapers and periodicals, when paid quarterly or yearly in advance, be abolished, as recommended in my last two annual reports, and the department be relieved from the expense of ocean mail-steamships and isthmus service, it would, with a proper economy, soon sustain itself."[3]

In 1854 there was laid before the Post-Office Committee of the House of Representatives a report from the postmaster of Washington of the weight of the letters, newspapers, and official documents posted in that city, under franks, within one ordinary month,—that of January 1854. It ran thus:—

Nature of Matter transmitted.	Weight in One Month.	Amount of Postage, if charged at usual rates.		
	lb.	L.	s.	d.
Letters from members of Congress...	3,446	932	16	0
Documents from do. do.	693,508	22,192	4	0
Letters from departments of State ...	7,065	1,356	8	0
Newspapers	111,002	2,220	0	0
Total for one month.........	815,021	26,701	8	0

According to this return, the franked matter transmitted outwards, from Washington alone, would amount in a year to about 5000 tons, and its postage, at ordinary prepaid rates, to upwards of L.320,000. Taking this as a datum, the postage of the whole of the matter so transmitted throughout the Union cannot be fairly estimated at less than L.500,000 a year on the average. The amount actually appropriated by Congress to cover this expenditure has, during the last ten years over which the official reports extend, averaged but L.112,535. If to this fact it be added that the entire influence of the post-office functionaries at Washington has been exerted for seventeen years to keep up the rates of postage as much as possible, and, when concessions became inevitable, to make those concessions as small in extent and as imperfect in their practical working as they could be made, further explanation or hypothesis as to the causes of the annual deficit become quite needless.

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[1] Miles, "History of the Post-Office of America," *Bankers' Magazine*, ut supra, 363, 364.

[2] So the passage reads as printed in the official document.

[3] *Report of the Postmaster-General of the United States*, Dec. 1, 1856, printed in the documents appended to the President's Message of Dec. 2, ii. 771.

The postal statistics of the United States compared with those of Great Britain.

The extent to which the natural development of postal correspondence, amongst such a population as that of the American Union, is checked by bad methods and insufficient facilities, cannot be more strikingly displayed than by contrasting the postal statistics of Great Britain with those of the United States. Those statistics show that the ratio of letters annually passing through the post to the total population of the country is nearly five times as high in Britain as it is in America; and that the population of London alone sends by post a greater number of letters than does the whole population of the Union. The details of the ten years, 1847–56 inclusive, are as follows:—

British and American Post-Offices.—Comparative Numbers of Letters, 1847–56.

Year.	London Local Letters.	London Mail Letters.	Total of London Letters.	Total of Letters in Great Britain.	Total of Letters in U. States.
1847......	34,630,817	43,757,540	78,388,357	322,146,243	47,585,757
1848......	33,672.747	45,991,153	79,663,900	328,830,184	52,364,819
1849......	33,960,398	45,845,683	79,806,081	337,399,199	60,159,862
1850......	38,887,844	44,856,170	83,744,014	347,069,071	69,426,452
1851......	40,585,952	47,819,499	88,405,451	360,647,187	83,252,735
1852......	40,403,207	51,171,423	91,574,630	379,501,499	95,790,524
1853......	42,816,314	54,402,023	97,218,337	410,817,489	102,139,148
1854......	46,191,569	57,186,159	103,377,728	443,649,301	119,634,418
1855......	45,844,963	59,647,549	105,492,512	456,216,176	126,723,425
1856......	47,894,708	64,961,321	112,856,029	478,393,803	131,450,409
Total of 10 years	404,885,519	515,638,520	920,527,039	3,864,670,152	888,527,549

In no particular is the defective character of the American system more apparent than in its treatment of the local correspondence of towns. In none does that system contrast more unfavourably with our own. Whilst in Britain local letters yield a considerable proportion of the nett revenue of the post-office, the larger share of their transmission in the United States is left in the hands of private persons. The law which prohibits the carriage of letters by individual enterprise between New York and Philadelphia, and punishes it with heavy penalties, permits any speculator to establish a private post-office in either of these cities, provided its operations do not extend beyond the municipal limits. Mr Miles thus describes the operations of the "two that do the largest business" in New York:—"One," he says, "employs 45 letter-carriers, has over 2000 receiving-boxes where letters can be deposited in various parts of the city; and collects and delivers, *or deposits in the city post-office for the mails*, from 6000 to 15,000 letters daily. In one day . . . there passed through his hands, he tells me, in collecting and delivering, 164,000 letters. This was the largest day's work he ever did. Another tells me he employs 25 letter-carriers, lets 350 boxes in his private post-office at a rent of four dollars each, and collects and delivers an average of 10,000 letters a day. There are three or four other private post-offices . . . in the city."[1] This system is, as might be anticipated, attended by much irregularity and insecurity. Nor are its disadvantages in any material degree compensated by the extensive and provident facilities which mercantile enterprise and competition usually bring in their train. The greatest cities of the United States are still in arrear of our second-rate towns, as respects both the number and conveniency of receiving-houses and the frequency of letter deliveries.

Improvements needed in the United States post-office.

In brief, it may be said that the chief deficiencies which need to be supplied in the American postal system are these:—(1.) An equitable compensation for the service rendered to the government and nation in the transmission of official correspondence and public documents, so regulated as to admit of plain and exact account-keeping, which is wholly unattainable under the existing system of franks; (2.) Low and uniform rates of postage, graduated according to weight, and by a broad not minute or fractional scale; (3.) An ample provision of receiving-houses in the cities and great towns, more frequent and punctual deliveries, and abolition of private post-offices; (4.) A book post, at low rates and with liberal regulations; (5.) A money-order system of like character; (6.) A "returned letter office," in place of the present discreditable method of destroying all correspondence remaining undelivered, from whatever cause. These improvements once fairly established, there will be an end of the doleful complaints hitherto reiterated, year after year, by the postmaster-general, of the inadequacy of the revenue to meet the outgoings; yet rarely, if ever, suggesting the wisdom of giving extended facilities to correspondence, were it only by way of experiment.

IV. HISTORY AND MECHANISM OF THE POST-OFFICE OF FRANCE.

Origin of French postal system.

The French postal system dates from the reign of Louis XI., who, by an edict of the 19th June 1464, established posting-houses on the great roads of the kingdom, at stages of four French leagues apart, and created a postmaster-general (*conseiller grand-maître des coureurs de France*), "to be near the king's person." This edict contains minute regulations as to the passports which every courier was to be provided with, and establishes a "register of passports," as a department of the newly-created post-office.[2] In France, as elsewhere, the posts were at first intended exclusively for the royal service, but they were soon rendered available (under stringent regulations) for private correspondence. The times of departure and arrival, however, continued long to depend on the exigencies of the governmental despatches.

For a century no important change appears to have beer made in the system. But in 1565 Charles IX. gave to the postmaster-general large powers with reference to the appointment and dismissal of postmasters and their assistants; and by subsequent letters-patent precluded the jurisdiction of the law courts in relation thereto, "because the establishment of the said office of postmaster-general (*controlleur-général des postes*) is a matter which concerns our special service, and is a dependency of our household, and therefore beyond the knowledge and province of our local officers and magistrates.[1] It is obvious, from the repeated issue of similar letters-patent at subsequent periods, that there were frequent contests on this point between the postmaster-general and the Parliaments.

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[1] Miles, *Postal Reform, its Urgent Necessity and Practicability*, 19; Comp. *Banker's Magazine*, Dec. 1857, N.S., vii. 441. Both publications treat the questions connected with the American post-office system with great fulness and vigour. Whatever delays may yet be interposed, Mr Miles' labour and energy can scarcely fail of ultimate success.

[2] Le Quien de La Neufville, *Usages des Postes*, 1730, pp. 59–67.

The French post-office under Henry IV.

In 1603 Henry IV. issued letters-patent which recite the great importance and dignity of the office of *controlleur-général des postes*, "the designation of which," it is added, "we think fit to alter, seeing that the title of 'comptroller' has, since the creation of the said office, been made more common than it was at that time." For the future the official title was to be "general of the posts." At this period the office was held by De La Varanne, under whose successor (by purchase, at the price of 350,000 livres), Pierre D'Alméras, the first great improvements in postal arrangements were gradually introduced. In 1622 he laid down rules for the departure of the couriers at certain days and hours. In 1627 he established a tariff for letters. Until that date it had been the practice for the writers of letters to mark on the cover the fee which was to be paid by their correspondents on delivery, a practice which was found to involve a descending scale of payments. He also established, at the same date, a rudimentary sort of "money-order office," with the view, as it is stated in the regulation, of preventing abuses which had grown up by the frequent "enclosure of gold, silver, and precious stones in letters and packets, for the safe carriage of which the senders claimed to make the office responsible."[3] A system of registration of letters sent on the public service was also set on foot.

The farming of the post-office revenue in 1672.

It was not until the year 1672 that any settled revenue accrued to the State from the post-office. The sale of offices had brought occasional sums into the treasury from time to time, especially when the function of "general of the posts" was suppressed, in order to create three "superintendents." With a like view, decrees were repeatedly issued to restrain all persons other than the officers of the post from intermeddling with the supply of post horses in any part of the kingdom, as well as with the transport of letters. But the troubles of the Fronde had completely disorganized the service, which, as respects some parts of the country, may almost be said to have ceased to exist. In 1672 the postal revenue was let on lease to Lazare Patin, the first "farmer-general of the posts of the kingdom."[4] The farming system remained in operation until 1790. Local postmasterships continued for a long period to be hereditary. Great improvements of detail in many branches of the service were introduced by Louvois, who was "superintendent-general" from 1663 to 1691. From this period that office was usually held by one of the principal secretaries of State. In 1728 Cardinal de Fleury issued a regulation which made certain postmasters on one of the great lines of road that had become notoriously unsafe, specifically responsible for all losses or depredations occurring to the mails thereon, a principle which in subsequent years he extended to other main routes as occasion required. The rents of the farmers-general were increased from time to time, as the profits of the office augmented; but here, as in so many other departments of the State, some formidable abuses continued with little check.

Organization of the post-office under Napoleon.

The Revolution introduced a new system,—that of administration by a board. The last lease of the farmers-general was cancelled by a decree of the 12th June 1790. The constitution of the governing council, and its subordinate machinery, were modified by several successive laws; but the new plan, whatever its favourable results in other particulars, appears to have failed to secure a sufficient amount of direct and certain responsibility. Towards the close of the Consulate a postmaster-general (*directeur-général des postes*) was again appointed. He became president, *ex officio*, of the council, which continued to exist as a consultative body. In substance the organization thus established still continues. The council consists of the director and two sub-directors.

Extent of the postal monopoly.

The law of France vests in the post-office the exclusive right of conveying letters, newspapers, periodical works, packets, and papers of all kinds, not exceeding the weight of a kilogramme (two pounds), subject to the following exceptions:—1. Letters or packets sent by one private person to another, in charge of a domestic servant or express messenger; 2. Registers, maps, and plans; 3. Proceedings in law-suits; 4. Printed books, not periodical, nor bearing any writing, nor partaking of the character of a circular or advertisement; 5. Newspapers or periodical works in collective packets exceeding 2 lb. in weight; 6. Letters accompanying merchandise to which exclusively they relate, or simply authorizing the delivery of merchandise to the bearer; 7. Papers exclusively relating to the personal business of a carrier. These, and also the letters referred to under No. 6, must be open at the ends or sides. Every infraction of the privilege thus conferred is punishable by fines, which range, according to the character of the offence, from L.6 sterling up to L.120.[5]

In addition to the service of which it has a legal monopoly, the French post-office undertakes the conveyance at special rates of—(1.) Valuable articles of small dimensions (*valeurs cotées*); 2. Books, prints, and autographs; 3. Mercantile prices-current and circulars, &c.; (4.) Visiting-cards; (5.) Money subscriptions to the legal periodicals,—*Bulletin des Lois, Moniteur des Communes, Bulletin des Arrêts de la Cour de Cassation*; (6.) Money by orders as in England, at the rate of two per cent. commission."[6]

Rates of postage in France prior to 1847.

Until 1847 the general letter-rates were regulated by weight and distance, under a law of the 15th March 1827. The rates were, on the average, about two-thirds of the English rates for like distances prior to the adoption of the plan of Mr Rowland Hill. One postage was charged for any weight not exceeding 7½ grammes, or about ¼ oz. English, and an additional half-postage for every additional five grammes, or about ⅙ oz. English; so that a letter weighing an ounce was charged three postages and a half. Newspapers were charged two centimes (somewhat less than a farthing) if addressed to a place within the department in which the paper was published, and double that rate if addressed to another department. Other printed papers and pamphlets were charged at the rate of a halfpenny per sheet of 400 square inches. Under these rates, the number of chargeable letters, as nearly as could be ascertained, was in the year 1837, 83,348,008; that of newspapers and other printed publications was 50,376,029; that of franks was estimated at 8,760,000.[7] The gross receipts (exclusive of returns) amounted to L.1,615,294, the expenditure to L.882,653, the nett revenue to L.732,641.

Number of letters, amount of revenue, under the charge by weight and distance.

The details of the expenditure, which included the whole cost of providing and working the mail-coaches, were as follows:—

Salaries and wages	L.336,610
Conveyance of mails	487,142
Rent, furniture, printing, and incidental expenses	58,901
Total	L.882,653

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[1] Lettres Patentes du Roy Charles IX., printed in Le Quien de La Neufville, ut supra, 86.

[2] Le Quien de La Neufville, ut supra, 121–123.

[3] *Reglement du Sieur d'Alméras sur le port des Lettres*, &c., ibid., 147–149.

[4] Ibid. 286–291.

[5] *Annuaire des Postes*, 1858, pp. 35–37.

[6] Ibid.

[7] Hill, *Report on the French Post-Office, addressed to the Chancellor of the Exchequer* (1837), 3.

French Post-Office.

French postal reform of 1848.

In August 1848 a decree of the National Assembly altered the scale and method of charge, by enacting that all mail letters of like weight should pay a uniform rate, irrespectively of distance. Such letters, if not exceeding a quarter of an ounce weight, were to be charged twenty centimes (or twopence sterling), and greater weights in prescribed proportion. This rate was increased in 1850 to twenty-five centimes (2½d.), but reduced to the former amount in 1854, so far as respects prepaid letters; unpaid letters being charged at one rate and a half, or threepence. These differential rates continue in force. Local letters pay in Paris, for any weight not exceeding 15 grammes (about ½ oz.), ten centimes, if prepaid; fifteen, if unpaid,—ten centimes being added for every additional 30 grammes, or fraction thereof. Local letters in the provinces pay the same rate, whether prepaid or not; the single rate carrying in the towns 15 grammes, but in the rural districts only 7½ grammes.

The legislation of August 1848, whilst lowering the letter rates for certain classes of correspondence, had the effect of cancelling the special tariff for mercantile circulars, prices-current, &c., which was previously in extensive operation. Matter of this sort passed almost entirely away from the post-office in consequence; but was brought back by a new law of June 1856, which established five distinct tariffs for postal matter, not of the nature of ordinary correspondence, as follows:—(1.) Newspapers and periodical works treating of politics or social economy, which are charged, for transit within the department in which they are published, at rates varying from 2 centimes (¼d.) for any weight not exceeding 40 grammes (about 1⅓ oz.), up to a franc and a half (1s. 3d.) for weights ranging between 2 and 3 kilogrammes (4 to 6 lb.), and double those rates beyond the limits of such departments. (2.) Newspapers (not political), magazines, transactions of societies, and other periodical works, exclusively devoted to literary, scientific, artistic, or industrial subjects, and appearing at intervals not exceeding three months; these are carried at rates nearly identical in amount with the preceding, but beginning at 1 centime within the department, and 2 centimes beyond it, for weights not exceeding 20 grammes, and being more minutely graduated on the scale. (3.) Circulars, catalogues, prices-current, &c., which are charged at a uniform rate, from a centime for 5 grammes or under, up to 3 francs for packets exceeding 2 and not exceeding 3 kilogrammes. (4.) Papers of business, commerce, and law proceedings in packets; these are charged at 50 centimes for any weight not exceeding 500 grammes (or 1 lb.), with an additional centime for every additional 10 grammes. (5.) Announcements of births, marriages, and deaths; visiting-cards, circulars, and other like matter, in the form of letters unsealed, or in wrappers open at the ends or sides;—these are carried, separately, at the rate of 5 centimes for 10 grammes within the district in which the post-office receiving them is situated, and at double that rate beyond such district (*arrondissement*). Registration, whether of letters or of packets, entails an extra payment of 20 centimes (2d.); and in the event of the loss of a registered letter or book-packet, the post-office is bound to pay to the sender 50 francs, whatever may have been its contents.

No portion of the postal reform of 1848 has worked more successfully than has the introduction of postage stamps. The good precedent set by the British post-office was of course the immediate cause; but it is curious to note that the practice had been, in rudimentary form, established in Paris itself almost two centuries before the advent of Mr Rowland Hill. In 1653 a master in chancery (*maître des requêtes*), named De Velayer, established an office close to the law courts, in pursuance of a royal grant giving him an exclusive privilege so to do, at which were sold for a penny stamped slips of paper, printed with the words, "Port payé le . . . jour du mois de . . . l'an 1653." These slips were folded round the letter or note to be thrown into the letter-box, the blanks in the superscription being first filled up. The boxes were cleared and the letters delivered three times daily.[1] How long the practice subsisted does not appear to be known. The success which has attended its re-introduction in 1849 (the law of August 1848 took effect on the 1st of the following January) will be strikingly indicated by the following tables, compiled from official sources:—

Postal statistics of France from 1847 to 1857.

Post-Office of France, 1847–57.—*Number of Stamps Sold, and of Prepaid and Unpaid Letters*

Years.	No. of Stamps Sold.	Total No. of Prepaid Letters (by Stamps or otherwise).	No. of Unpaid Letters.	Total No. of Letters Prepaid and Unpaid.	Gross Revenue.	Expenditure.	Nett Revenue.
					L.	L.	L.
1847.........	......	12,648,000	113,832,000	126,480,000	2,220,653	1,478,222	742,431
1848.........	......	12,214,040	109,926,360	122,140,400	2,205,839	1,522,496	683,343
1849.........	21,232,665	23,740,200	134,527,800	158,268,000	1,751,452	1,482,921	268,531
1850.........	21,523,175	31,900,000	127,600,000	159,500,000	1,814,999	1,416,316	398,683
1851.........	25,848,113	33,000,000	132,000,000	165,000,000	1,846,143	1,443,017	403,125
1852.........	28,589,540	39,820,000	141,180,000	181,000,000	1,942,063	1,379,984	562,078
1853.........	31,254,226	40,819,240	144,722,760	185,542,000	2,057,043	1,366,768	690,274
1854.........	83,359,350	104,068,650	108,316,350	212,385,000	2,237,826	1,410,354	827,471
1855.........	148,433,000	198,489,450	35,027,550	233,517,000	2,251,698	1,501,802	749,895
1856.........	169,508,750	221,773,024	30,241,849	252,014,873	2,326,801	1,512,120	814,680
1857.........	185,947,200	227,629,710	25,292,232	252,921,942	2,334,618	1,517,502	817,115

Thus, it will be seen, the number of *prepaid* letters, relatively to the whole number of letters transmitted, was in 1847 and 1848 but ten per cent. After the adoption of uniform rates for like weights in 1849, the pre-payment increased, but only very gradually, until 1854, when the introduction of the extra charge for unpaid letters, during the last half of that year, raised the proportion of prepaid letters from 22 per cent. to 49 per cent., which was further increased in 1855 (the first whole year of the differential postage) to 85 per cent. In 1857 the proportions of paid and unpaid letters became directly the reverse of those which had obtained ten years previously, the paid being now 90 per cent. of the whole number.

The next table shows the specific items of which the gross revenue of the French post-office during the same period was composed:—

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[1] Quoted, on the authority of Pélisson, by Pierre Clément, in his *Appréciation des Consequences de la Réforme Postale*; and by the editor of the *Annuaire des Postes* (1858), p. 6.

French Post-Office.

French Post-Office.

Post-Office of France, 1847–57.—*Sources of the Income.*

Sources.	Gross Income in the several Years.										
	1847.	1848.	1849.	1850.	1851.	1852.	1853.	1854.	1855.	1856.	1857.
	L.	L.	L.	L.	L.	L.	L.	L.	L.	L.	L.
1. Letters	1,877,005	1,830,777	1,341,089	1,484,280	1,607,854	1,693,050	1,787,489	1,939,316	1,909,803	1,995,117	2,002,298
2. Newspapers and books	112,844	161,491	183,160	118,277	42,459	118,579	124,468	144.841	154,559	153,438	165,351
3. Money-orders	33,120	41,556	46,490	46,501	46,581	47,820	51,018	64,128	71,263	72,781	68,498
4. Conveyance of precious metals, &c.	17,190	17,447	21,557	19,842	17,837	...	...	...	...	...	...
5. Places in the mail-coaches	85.124	64,995	61,365	46,712	36,961	26,202	21,014	17,435	11,189	5,969	614
6. „ mail-packets	44,364	49,776	58,710	52,155	43,150	3,154	2,265	2,329	324	...	...
7. Balances from foreign offices	45,986	34,738	35,857	39,361	44,969	51,831	51,529	53.595	85,636	83,675	83,338
8. Miscellaneous receipts	5,020	4,959	3,224	7,871	6,332	1,627	19,260	16,182	18,924	15,821	14,519
Total of receipts	2,220,653	2,205,839	1,751,452	1,814,999	1,846,143	1,942,063	2,057,043	2,237,826	2,251,698	2,326,801	2,334,618

Three of the sources of income here indicated have ceased to exist—the fourth and sixth absolutely, in consequence of the transfer of the packet service to ordinary commercial enterprise (aided, however, by an annual grant or subsidy); and the fifth by the almost entire suppression of the mail-coaches. Allowance being made for these changes, and for the contingent expenditure, the nett income, as compared with the outgoings, was, according to the official reports, 61 per cent. in 1847, and 79 per cent. in 1856.[1]

The total number of branch-offices, receiving-houses, and letter-boxes in Paris is 406.—namely, branch-offices (*bureaux d'arrondissement*) 10; supplementary offices, 25; receiving-houses and boxes (*boîtes aux lettres*), 371; that of country post-offices is 2374. The total number of *despatches*, daily, throughout France, is 3363; of which number 1054 are conveyed by mail-carts or coaches, 1031 on horseback, 1162 by letter-carriers on foot, 102 by railway, and 14 by steam-packets or ships. A hundred and two travelling post-offices are attached to the various railways, and employ 786 post-office functionaries. The packet service employed in January 1858, 53 steamers, having an aggregate of 11,000 horse-power, 43 of which were on the Italian, Algerian, and Eastern lines; 7 on the Corsican and Sardinian lines; and 3 on the Calais and Dover line. Ninety-three inspectors and 30 deputy-inspectors are employed in the general superintendence of the circulation service, which is further provided for by the appointment of 30 local comptrollers, each presiding over a district. Early in 1858 an enhanced scale of remuneration was introduced into the more important offices, with the view of increasing the efficiency of the service. The entire staff attached to the French post-office numbered (at the same date) 26,071 persons, and was thus composed:—

Post-Office of France.—Staff, January 1858.

	No. of Persons.
Administration generally	315
Collection and distribution of letters in Paris	1,194
Railway service (including travelling post-offices)	1,138
Country post-offices and agencies	21,585
Agents connected with packet service	57
Postmasters, chiefly employed in the relay service on the roads	1,782
Total	26,071[2]

Franked letters.

The system of official franking on public business still prevails in France. No regular account of the number or weight of franked letters is kept, but from time to time special inquiries on the subject have been instituted by the post-office authorities. This was the case in 1841, in 1850, and in 1854, and the results were as follows:—

Post-Office of France.—Franked Letters, 1841, 1850, *and* 1854.

Year.	No. of Franked Letters.	Amount of Postage, if charged at the ordinary rates.
		L.
1841	12,263,956	2,034,084
1850	38,810,442	1,692,095
1854	30,919,704	1,654,017

Statistics of undelivered letters.

Finally, it may be stated, that the number of letters undelivered in due course (*tombées en rebut*), from various causes, and that of letters containing money, bills of exchange, or other articles of value, *claimed* of the post-office as having miscarried during transit, for the years 1847 to 1857 inclusive, are thus stated in the official reports (we repeat the total number of letters posted in each year for the sake of comparison):—

Post-Office of France.—Undelivered and Miscarried Letters.[3]

Year.	Total Number of Letters Conveyed.	Number of Letters Undelivered in due course.	Number of Undelivered Letters eventually Corrected and Re-issued.	Number of Letters Claimed as Lost in Transit.	Number of Letters so Claimed Discovered and Restored.	Number Undiscovered.	Proportion of Letters Claimed, but Undiscovered, in each 100,000 carried by Post.
1847	126,480,000	3,706,000	...	4602	2982	1620	1·29
1848	122,140,400	3,987,000	...	4483	2837	1646	1·34
1849	158,268,000	4,351,000	...	4573	2151	2422	1·53
1850	159,500,000	4,363,000	...	4627	2857	1770	1·10
1851	165,000,000	4,059,000	307,512	4747	2458	2289	1·38
1852	181,000,000	3,836,000	301,534	4659	2249	2410	1·33
1853	185,542,000	3,106,785	315,209	5049	2763	2286	1·23
1854	212,385,000	3,261,930	294,631	5531	2866	2665	1·25
1855	233,517,000	3,349,498	400,000	6188	3236	2952	1·26
1856	252,014,873	2,867,904	389,254	6767	3111	3656	1·45
1857	252,921,942	2,734,493	629,309	[5395][4]	[2498]	[2897]	[1·40]

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[1] *Annuaire des Postes*, 1858, p. 13:—"Ces déductions étant opérées, nous trouvons que le produit net versé dans les caisses du Trésor, a eté, comparativement aux dépenses; en 1847, de 61 %; en 1856, de 79 %."

[2] Ibid. 28.

[3] *Annuaire des Postes*, 1858, pp. 17, 32.

[4] The figures within brackets apply to nine months of the year only.

Comparative Statistics.

It appears from this table that the number of delayed and undelivered letters, together, has been reduced from 2·93 per cent., which was the proportion in 1847, and 2·46 per cent., which was still the proportion in 1851, to 1·8 per cent., the proportion in 1857; and, further, that whilst in 1851 only 7·57 of these were replaced in distribution, after inquiry, and ultimately delivered, 23 per cent. were so replaced and delivered in 1857. The figures, however, contrast unfavourably with those of the British post-office. There, in 1856, out of an aggregate number of postal letters amounting to 478,000,000, the total number of letters undelivered in due course was but 2,400,000, of which 1,581,000 had to be returned to the writers after failure of all the attempts which could be made to deliver them. In 1857 the number of *returned* letters was about 1,700,000, out of an aggregate of 504,000,000. The French official tables, moreover, do not discriminate between the letters returned and those destroyed. Nor do they give any statistics of undelivered newspapers (which, in Great Britain, in 1857, were about 1 in 22 of the whole number).

Equally vain would be any attempt to discover the rules, methods, or results of the inspection of "suspicious" correspondence. The historian of French police under the monarchy writes of this practice, as it then existed, with significant brevity:—"Violation of the secrecy of letters is regarded as an ordinary prerogative of government, and that pretended prerogative weighs as heavily on the princes nearest to the throne as on the most obscure subject of the realm."[1] There is good reason to believe that these words have still as much applicability and force as they ever had; but the whole matter remains one of inferential deduction. Precise evidence is at present out of reach.

Comparative Statistics.

V. COMPARATIVE STATISTICS OF THE PRINCIPAL POST-OFFICES OF THE WORLD.

One of the chief difficulties which lie at the threshold of comparative postal statistics on a comprehensive scale arises from the fact, that nearly all the continental post-offices are concerned with the transport of passengers as well as of letters. This difficulty, however, does not affect *all* the points of comparison, even as between the continental systems and those of Britain and America, nor does it in any degree diminish the value of the comparison between the working expenses and revenue of the same office at different periods. We give, therefore, the best approximation to such a synopsis which is at present attainable, taking as a foundation the results of the elaborate inquiries of Mr Pliny Miles, contributed to the New York *Bankers' Magazine* in November 1857, but with needful variations:—

Comparative Statistics of various Postal Systems.

Country.	Ordinary Amount of Postage for Single Letters.	No. of Letter Rates.	Year.	Gross Revenue.	Expenses.	Year.	Gross Revenue.	Expenses.
	Pence.			L.	L.		L.	L.
Austria	1¼ to 3¾	3	1841	702,680	417,269	1852	906,805	839,860
Baden	1¼ to 3¾	3	1841	91,714	69,314	1852	96,363	74,929
Bavaria	1¼ to 2½	2	1842	70,834	...	1853	77,648	...
Belgium	1 to 2	2	1848	138,619	60,612	1852	140,071	66,468
Brazil	1¾	1	1842	10,196	16,481	1851	22,877	30,302
Brunswick	¾ to 1½	3	1848	17,749	12,863	1852	21,192	14,940
Denmark	1	1	1841	79,556	54,204	1852	70,963	70,405
France	1 to 2	2	1847	2,220,653	1,478,222	1856	2,326,801	1,512,120
Great Britain	1	1	1840	1,359,466	858,677	1856	2,867,954	1,660,229
Hamburg	1¼ to 3¾	3	1851	7,946	3,307	1852	8,209	3,062
Hanover	1½	1	1849	35,762	12,470	1852	31,592	12,040
Holland	1 to 3	3	1849	112,547	39,927	1852	115,217	62,261
Oldenburg	1¼ to 1½	2	1851	12,526	10,910	1852	12,361	12,120
Peru	3*d.* to 2*s.*	6	...	...	...	1852	7,600(?)	7,600(?)
Portugal	1¼	1	...	...	...	1853	36,900	27,675
Prussia	1¼ to 3¾	3	1843	1,123,026	895,844	1853	1,285,596	1,133,101
Russia	4	1	1842	665,549	261,988	1852	771,080	489,978
Sardinia	2	1	1850	125,116	67,038	1852	128,506	78,787
Saxony	½ to 2¼	3	1849	117,756	79,637	1852	133,579	90,654
Spain	2½	1	1844	254,200	152,600	1852	326,370	208,250
Sweden	1 to 5	9	1839	52,000	45,300	1852	66,888	64,788
Switzerland	½ to 1½	3	1850	207,146	177,226	1852	260,585	192,484
Tuscany	1¼	1	1839	30,595	15,919	1852	45,109	28,483
United States	½ to 5	3	1840	908,704	943,647	1856	1,524,164	2,081,573
Wurtemburg	½ to 2	3	...	...	...	1850	76,972	74,287

Broadly it may be stated, that the half-ounce scale of Great Britain is now adopted in nearly the whole of Germany, in the United States, in Holland, Denmark, Spain, the Brazils, and Peru. In most other points of postal economy there are still wide diversities of practice; but the introduction of a simple scale of charge is in itself a vast improvement, and the sure pioneer of other improvements to come. How great the alteration is, in some cases, will appear by the statement, that in Spain, for example, under the old system, inland letters were charged at the rate of one real (2½d.) for *six* sixteenths of an ounce, and the fifth of a real for each eighth of an ounce additional; whilst all letters to the Spanish islands were treated as single up to *five* sixteenths of an ounce, and were charged at the rate of 1s. 5d., with an additional penny for every additional *sixteenth* of an ounce. The anomalies of the postal arrangements of many European and American countries are still numerous and complex enough. France yet retains the quarter-ounce scale, as do also Switzerland, Sardinia, and Tuscany. The unitary letter weight of Belgium, Brunswick, and Portugal is three-eighths of an ounce; that of Sweden is about five-eighths; that of Bremen, Russia, and Chili, is an ounce; and of Russia it may be noted, in passing, as a fact of some significance, that the whole number of letters posted in a year (1855),[2] throughout the empire, is considerably less than the number posted in the single town of Liverpool and its suburbs. Naples, again, adheres to the old plan of charging by the sheet, and is very chary of publishing the statistics of her post-office. And, lastly, in Iceland, letters are carried free of postage at the cost of the national treasury. The worthy Icelanders, however, have an intense love of orderly arrangements. Their mail to Denmark sails once in six weeks. In order that the way-bill of the postal letters may be carefully made out and alphabetically arranged, they find it necessary to close the boxes two days before the departure of the mail.[1]

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[1] Frégier, *Histoire de l'Administration de la Police*, ii. 363.

[2] About 16,400,000, according to an article in the *Journal de St Petersboury* of 1857.

Comparison of postal correspondence with population in certain countries.

The number of letters to each 1000 persons of the whole population, as it stood in 1853, was in Great Britain, 14,760; in Switzerland, 8239; in the United States, 4404; in Holland, 4367; in France, 4192; in Belgium, 2603; in Spain, 2209. In Great Britain, prior to the postal reform of 1840, the number of letters to each 1000 persons was but 3055, or little more than one-fifth of the ratio of 1853. In Holland the like proportion, prior to its postal reform of 1850, was about 2001 letters to each 1000 persons. There the inland letters have increased under the new tariff from 4,274,180, the number of the year 1849, to 12,729,143, that of the year 1856; and the number of foreign letters from 1,804,180 to 3,395,973.[2] In 1850, it may be added, the mails of Holland were conveyed over an aggregate distance of 6247 Dutch miles; in 1856, over an aggregate of 17,076 miles.[3]

The details of the comparison of 1853 run thus:—

Postal Correspondence, as compared with Population, in Six European States, and in the United States of America, 1853.

Country.	Population in 1853, or at nearest Census.	Number of Letters conveyed by Post in 1853.	No. of Letters to each 1000 persons in 1853.	Estimated cost of 1000 Letters.		
				L.	*s.*	*d.*
1. Great Britain...	27,833,501	410,817,489	14,760	6	4	0
2. Switzerland	2,392,740	19,773,625	8,239	4	12	0
3. United States of America	23,191,876	102,139,148	4,404	11	12	0
4. Holland	3,056,591	13,349,853	4,367	4	8	0
5. France............	35,783,170	150,000,000	4,192	12	8	0
6. Belgium	4,426,202	11,521,955	2,603	13	4	0
7. Spain.............	13,936,218	30,775,686	2,209	8	8	0[4]

VI. OCEAN MAIL SYSTEMS OF VARIOUS COUNTRIES.

The importance of an efficient system of ocean mails cannot be measured by the profit or loss which may directly attend it. With a regular and rapid packet service, the commercial prosperity and the defensive power of a country are obviously and closely connected. On this point public opinion has made great strides since 1830, when we find the Commissioners of Revenue Inquiry asserting, as a matter about which there could be no sort of doubt, that the excess of the outgoings of the packet service over its income, "amounting in the period of nine years to about L.300,000, must be considered a total loss." Almost a quarter of a century afterwards, the same subject was elaborately reviewed by a Treasury committee (appointed in 1853.) "It is unreasonable," reports this committee, "to expect that any person, or association of persons, should incur the expense and risk of building vessels, forming costly establishments, and opening a new line of communication at a heavy outlay of capital, without some security that they will be allowed to continue the service long enough to reap some benefit from their undertaking. It must be borne in mind that the expensive vessels built for the conveyance of the mails at a high rate of speed, are not in demand for the purposes of ordinary traffic, and cannot therefore be withdrawn and applied to another service at short notice. . . . . The value of the services thus rendered to the State cannot, we think, be measured by a mere reference to the amount of the postal revenue, or even by the commercial advantages accruing from it. It is undoubtedly startling at first sight to perceive that the immediate pecuniary result of the packet system is a loss to the revenue of about L.325,000 a year; but although this circumstance shows the necessity for a careful revision of the service, and though we believe that much may be done to make that service self-supporting, we do not consider that the money thus expended is to be regarded, even from a fiscal point of view, as a national loss."[5]

Introduction of steamers into the postal service of Great Britain.

The conveyance of mails in steamers was first adopted by the British post-office in 1821. The Holyhead station, for Ireland, and the Dover station, for the Continent, were selected for the first experiments. Theretofore the practice had been to engage sailing-vessels, under agreements with their owners or commanders, at fixed annual payments, for the carriage of the mails; the proceeds of passengers and freight accruing, of course, to the owners. After various fruitless negotiations with steam-packet companies, it was determined to build vessels at the cost of government. Eventually six such packets were stationed at Holyhead, and several others at Dover and elsewhere. The report of the Commissioners of Revenue Inquiry led to the gradual and advantageous introduction of commercial contracts for this service, the first of which was made by the postmaster-general in 1833 with the Mona Isle Steam Company, to run steamers twice a week between Liverpool and Douglas. This company has retained the contract during twenty-five years at the same rate. In the following year the General Steam Navigation Company contracted to carry the mails twice a week between London and Rotterdam, and London and Hamburg, for L.17,000 a year. This contract remained in force until 1853, when these mails were transferred to the Ostend route. In 1837 a contract was made with Mr Richard Bourne to convey the mail weekly from Falmouth to Vigo, Oporto, Lisbon, and Gibraltar, for L.29,600 per annum. This contract was transferred in 1843 to the Peninsular and Oriental Company, the port of Southampton was substituted for Falmouth, and the trips limited to three, monthly, the subsidy being proportionally reduced. In 1839 an epoch was marked in world-history, as well as in postal affairs, by the establishment of a fortnightly mail line between Liverpool, Halifax, and Boston, by contract between the postmaster-general and Samuel Cunard of Halifax, at L.60,000 a year. Soon the port of destination was made alternately Boston and New York; and, with this change, the contract continues in greatly increased activity, weekly trips being required instead of fortnightly, and the subsidy being raised by the renewal contract of 1850 to L.173,340 a year, with certain contingent allowances in addition. Last year (1858) the Cunard Company owned nine steamers, with an aggregate tonnage of 18,406, and an aggregate horse-power of 6418. This continues in force until 1862, with twelve months' notice of its discontinuance. In 1840 a contract was made for mail steamers to Malta, Corfu, and Alexandria, extended in 1845 to Suez, Bombay, Ceylon, Calcutta, Hong Kong, and Shanghai. This contract was renewed in 1853, and made terminable in 1862, on twelve months' notice. By its terms, the Peninsular and Oriental Company was bound

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[1] Miles, *Postal Reform* (1855), p. 89.

[2] *Staatkundig en Staathuishoudkundig Jaarboekje voor* 1857, p. 179.

[3] *Staatkundig Jaarboekje*, ut supra, 180.

[4] Miles in *Bankers' Magazine*, ut supra, 358.

[5] *Report to the Treasury on the Contract Packet Service* (Sessional Papers of 1853, No. 195).

Ocean Mail Systems.

to provide two packets for the conveyance of the Indian mails, one to steam between Southampton and Malta, and another between Marseilles and Malta; then one between Malta and Alexandria, and one between Suez and Aden; one between Aden and Bombay, and another between Aden and Calcutta. But owing to the rapid increase of Indian traffic, the company, of its own accord, doubled the service between Malta and Alexandria, and also between Suez and Aden. The terms of the contract with the post-office secured its performance for a subsidy of L.244,800 a year; but the communication having now become double during the greater part of the route, an addition to the amount was wisely made in 1857, which insured an additional packet between Marseilles and Malta, and thus made the most important mail route to India double throughout. The departure of the packets was also arranged at intervals of about a week. At this date the company had already thirty-nine vessels, with a tonnage of 48,835, and a horse-power of 12,850. In 1856 a new contract was made for a monthly service between Southampton, Marseilles, Malta, Alexandria, Suez, and Sydney, with the European and Australian Mail Steam-Packet Company, at L.185,000 a year. Under this contract the company runs 336,000 miles a year, at 11s. a mile.

Ocean Ma Systems

For the service of the West Indies, and of Central America, Mexico, and Brazil, a contract subsists with the West India Royal Mail-Packet Company, which dates from 1850, and is terminable in 1862 (on the usual notice). Under this contract the company runs steamers twice a month over 37,000 miles. Its aggregate annual mileage is 547,296, and the average pay 9s. 10d. per mile. These are the chief contracts at present in force. The entire ocean mail service stood thus in 1857:—

Ocean Mail Service of Great Britain—Close of 1857.

Routes.	Date of Service.	No. of Steamers.	Horse-Power.	Tonnage.	No. of Crews.	Voyages.	Annual Subsidies.
I. HOME ROUTES—							L.
1. Liverpool and Isle of Man	1833	4	790	2,089	91	Twice a week	850
2. Holyhead and Dublin	1850	4	1284	2,408	115	Twice daily	25,000
3. Aberdeen and Shetland	1840	2	300	850	42	Weekly	1,200
4. Southampton and Channel Islands	1848	5	797	1,852	107	Thrice a week	4,000
5. Thurso and Stromness	1856	1	60	250	16	Daily	1,300
II. COLONIAL AND FOREIGN ROUTES—							
6. Southampton, Spain, and Gibraltar	1852	4	973	2,782	200	Thrice a month	20,500
7. Southampton, Mediterranean, India, and China	1853	35	12,850	46,053	2,877	Fortnightly	224,300
8. Liverpool and Boston Liverpool and New York	1850	9	6,418	18,406	922	Weekly	173,340
9. *Colonial*—Halifax to St Thomas	1854	2	300	1,151	60	Monthly	14,700
10. Southampton, West Indies, Mexico, and South America	1851	20	9,308	29,454	1,667	Thrice a month	270,000
11. Dover and Calais Dover and Ostend	1854	6	640	1,765	96	Daily	15,500
12. *South American*—Panama and Valparaiso	1852	7	2,396	5,719	378	Fortnightly	25,000
13. Plymouth to Madeira and West Coast of Africa	1852	7	850	5,951	320	Monthly	21,250
14. Dartmouth to the Cape, Mauritius, and Calcutta[1]	1856	5	2,000	8,000	575	Monthly	41,000
15. Southampton to Marseilles, Malta, Suez, and Sydney	1857	7	3,290	13,410	671	Monthly	185,000
Add payments to minor lines	...	...	...	...	...	......	43,857
Totals	...	118	42,256	140,140	8,137	......	1,066,797

At the date of the report of the Treasury committee, already referred to (1853), the amount of these subsidies was L.822,390, and the estimated amount of postage was but L.479,600.[2] Under the increased payments of 1857, the service has been improved, and the revenue has also benefited by some of those improvements, but the actual receipts cannot be estimated at more than one-half of the outgoings. The deficit becomes a charge upon the naval estimates. The remarks of the committee on this point retain all their force:—"The objects which appear to have led to the formation of these contracts, and to the large expenditure involved, were—to afford a rapid, frequent, and punctual communication with those distant ports which feed the main arteries of British commerce, and with the most important of our foreign possessions; to foster maritime enterprise; and to encourage the production of a superior class of vessels which would promote the convenience and wealth of the country in time of peace, and assist in defending its shores against hostile aggression. These expectations have not been disappointed. The ocean has been traversed with a precision and regularity hitherto deemed impossible; commerce and civilization have been extended; the colonies have been brought more closely into connection with the home government; and steam-ships have been constructed of a size and power that, without government aid, could hardly—at least for many years—have been produced."[3]

The ocean mail service of the United States of America.

The experience of Great Britain as to the value of its costly packet service has excited energetic endeavours in the United States to arouse the government to the necessity of keener emulation. Mr Thomas Rainey, the author of an able work entitled *Ocean Steam Navigation and the Ocean Post*,[4] has endeavoured to do for this branch of the postal service of his country what Mr Pliny Miles is so zealously striving to do for its inland mails and local posts. Mr Rainey contends that, whilst steam mails upon the ocean control the commerce of the world, the United States have not established such mails commensurately with the national ability and requirements; that only very fast and powerful steamers can carry the mails with adequate speed; that such a speed is so costly that the steamers cannot live on their own receipts; that self-support is not likely to be attained by increasing the size of steamers; that the propelling power in fast steamers must occupy all, or nearly all, the available space not devoted to passengers and express freight; that American trade has greatly suffered for the want of more ocean mails, rapid and well organized; and that the only way in which the government can discharge its unquestionable duty in this respect is, by imitating British example in the payment of liberal subsidies for the conveyance of mails for a long term of years.[1]

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[1] This contract expired in 1857, and a new one was made with the Union Steam Shipping Company with improved results for the public service.

[2] *Report on Contract Packet Service* (in Sessional Papers of 1853, No. 195), p. 8.

[3] Ibid.

[4] Second edition, London, Trübner and Co., 1858.

The Havre and Bremen mail services were the first established in the United States. The former remains in the hands of the Old Havre Company, founded by the late eminent merchant, Mr Mortimer Livingston. The Bremen line passed into the hands of Mr Vanderbilt in 1857, on the termination of the contract. On both lines, for the present, the mails are carried for the gross ocean and inland postages. The Pacific Mail Steamship Company, and the Aspinwall Steamship Company, respectively, maintain the two lines which connect the Atlantic and Gulf seaboard with the American possessions in the Pacific, California, and Oregon. The Pacific Company possesses thirteen steamers, and may, it is said, boast that it "never lost a trip, a mail-bag, or a passenger, by marine disaster, during the eight or nine years they have been running in the Pacific. These steamers run the 3300 miles between Panamá and San Francisco within an average period of less than fourteen days, stoppages included, or at the rate of about 250 miles a day.[2] They carry the mail at a charge of 6s. 11d. per mile. The United States Mail Steamship Company has six steamers, with a tonnage of 8544. This company's vessels run 5200 miles twice a month, at 7s. 9d. per mile. The Collins Company had at the close of 1857 three steamers, with an aggregate of 9727 tons. At that date the American ocean mail service, in commission, stood thus:

Packet Service of the United States of America, Nov. 1857.[3]

Route.	No. of Steamers.	Tonnage.	Miles of Route.	No. of Trips	Compensation.
New York and Liverpool (*Collins Line*).	3	9,727	3100	40	L.77,000
New York and Havre...	2	4,548	3270	26	Gross amt. of postages
New York and Bremen (*Vanderbilt*)...	3	6,523	3700	26	Do.
New York, Havana, New Orleans, and Aspinwall (*U.S. Mail Company*).......... ..	6	8,544	5200	48	58,000
Astoria and Panamá (*Pacific Mail Company*)................	13	16,421	4200	48	69,650
Charleston and Havana.	1	1,115	669	48	12,000
New Orleans and Vera Cruz..........	1	1,149	900	48	5,800

French ocean mails.

Some particulars of the French packet system have been glanced at already. Here it must suffice to add that the stations (Mediterranean and Levantine), routes, and departures of the mail steamers, were as follows in 1858:[4]—

Route.	Trips.	Length of Route.
Marseilles to Malta.................	Weekly	870 miles
Marseilles to Naples.................	......	432 „
Marseilles to Alexandria..........	Fortnightly	1500 „
Alexandria to Smyrna.............	Do.	1230 „
Marseilles to Smyrna.............	Weekly	1359 „
The Piræus to Smyrna.............	Fortnightly	236 „
Smyrna to Constantinople.........	Weekly	300 „
Marseilles to Constantinople......	Do.	1441 „
The Piræus to Constantinople....	Fortnightly	667 „
Constantinople to Ibraila..........	Weekly.	404 „
Constantinople to Trebizond......	Do.	552 „

This service, together with that of part of the Algerine lines, is performed by the powerful company of the Messageries Impériales; but the official documents at present accessible do not state the terms of contract. The company possesses fifty steamers, with an aggregate power of about 12,500 horses, and an estimated tonnage of 60,000. It has recently added the line of the Brazils to its former contracts.

Here we close our protracted survey. It offers not a few topics for comment and further elucidation, which cannot, however, find present place. One reflection will probably have suggested itself to many readers during this retrospect of post-office annals: Few subjects should give more encouragement for steady perseverance to the practical reformer in the field of social science. What has been achieved, with great toil and difficulty, and after long delay, in one country, speedily works its way into other countries, and produces results of world-wide magnitude. Even when improvements are borrowed with an ostentatious avowal of jealousy at the progress they have facilitated amongst those who originated them, they cannot fail to add some strength to the ties which give to different countries an indefeasible interest in their common prosperity, whatever may be the prejudices or animosities of the passing moment. The history of postal improvements is eminently a history of international benefactions. (E. E.)

POSTULATE, in ordinary language, signifies any position assumed without proof, or one which is considered as self-evident. In *geometry* it is applied to whatever is to be assumed or taken for granted; as in Euclid's three postulates, which differ from his axioms in the manner in which they are put. The former is put forward as an assertion, the latter as a request. In *philosophy* it means any proposition of which the truth is demanded or assumed for the purposes of future reasoning.

POTASH. See CHEMISTRY.

POTATO (Nat. Ord. *Solaneæ*, see BOTANY), a valuable vegetable, said to be introduced into this country by Sir W. Raleigh about 1586. Queen Elizabeth in 1584 granted a patent "for discovering and planting new countries not possessed by Christians," when Raleigh equipped some ships and set sail for America. Thomas Herriott, who accompanied the expedition, sent home the description of a plant called *openawk* by the natives of Virginia. Gerard, in his *Herbal*, mentions that he had the plant from Virginia, that he had grown seedlings of it in 1590, and that it grew admirably in his garden. He gave it the name of *Solanum tuberosum*, afterwards adopted by Linnæus, and which it still retains. Sir Robert Southwood, president of the Royal Society, claimed the honour for his grandfather of having first cultivated this plant in Ireland, where it has so long constituted the principal food of the peasantry. Sir Robert stated that his ancestor obtained roots of the potato from Sir Walter Raleigh. The story of Sir Walter's gardener at Youghal, on going to taste the apples of the fine American fruit, being so sadly mortified at not finding them, and of his subsequent discovery of the tubers when his master desired him to throw out the weeds, is probably authentic.

The potato, it seems, had been known in Europe for some considerable time before. The name which we now apply to it seems to be taken from the Spanish or Portuguese, while they derived the epithet from the mountaineers of Quito in South America. The inhabitants of Quito called it *papas*, which the Spanish corrupted into *battata*, and the Portuguese softened into *batata;* hence the English *potato*. This plant was cultivated in Ireland long before its introduction into Lancashire, which was owing, it is said, to a shipwreck at the mouth of the Ribble. From Lancashire it soon spread, first into the gardens, and gradually into the fields of Great Britain. (For the cultivation and disease of the potato, see Agriculture.)

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[1] *Ocean Steam Navigation*, passim.

[2] Ibid. 184.

[3] *Annuaire des Postes* (1858), pp. 258, 259.

[4] Hon. H. King to T. Rainey, 12th Nov. 1857, *Ocean Steam Navigation*, 220.

POTEMKIN, Gregory Alexandrovich, a famous Russian statesman, was born of a noble though poor family at Smolensk in 1736. He was an ensign in the Horse Guards when an incident occurred which set him upon the road to eminence. Happening to be in St Petersburg on the day of the revolution of 1762, and seeing that Catherine II., as she rode through among the ranks, had no tassel upon her sword, he presented her with the missing badge from his own weapon. This act of gallantry caught the queen's attention; the manly beauty and noble bearing of the young soldier affected her susceptible heart; and the ardent manner in which he responded to her amorous advances completed the impression. In no long time he was installed as favourite, and occupied a suite of apartments in the palace. It is true that the fickle royal heart soon transferred its affections to another. But by that time his grotesque and extraordinary character had begun to command attention in the political world. Up from among his sluggishness, sensuality, extravagance, and whimsicality, there had sprung into action, as if spontaneously, a strong intellect, which easily rendered him the prince of tuft-hunters. The other votaries of civil power soon began to feel that they could not stand before him. Their hearts lay open to the gaze of his instinctive insight; their intrigues could not escape his ready observation; and their downfall was speedily effected by his dexterous policy. Ministers, generals, and favourites he raised like puppets before the public, used them for a while, and when he was tired threw them aside. Catherine herself, with all her decision and force of character, could not escape from his influence. With delicate tact he laid his hand upon the springs of her conduct, and controlled them to his own advantage. He gained her ear by flattery; he earned her gratitude by the invincible energy with which he fulfilled her behests; and he won her admiration by the striking projects which he formed for extending the bounds of the empire. His very faults were not without their effect. It was interesting to the queen to see the giant put off his intellectual armour, and lounge in undress for several successive weeks, playing at chess or cards from morning till night. Potemkin having thus attained to the virtual possession of the supreme power, began to use it with the most unbounded license. He drew upon the public treasury for money to gratify his extravagant epicurean taste. He insulted, bullied, and cuffed the nobility upon the slightest provocation. He even murmured, chafed, and resisted when his royal mistress attempted to cross his wishes. His condition, in fact, was more like the state of an Asiatic potentate than the position of a European subject. The Taurian palace, a superb edifice embodying the very highest ideas of luxury and magnificence, was erected for his residence. There he was wont to dream away his existence, surrounded by every circumstance of wealth, and pomp, and power. Diamonds were his playthings, which he threw aside as soon as he was tired. The revenues of vast estates were his pocket-money, which he recklessly squandered on the gratification of his meanest desire. Crowds of attendants stood by, ready to carry into execution his every passing whim. Aristocratic courtiers truckled before him, craving his interest for some high appointment. There was scarcely an honour in Europe which was not lavished upon him. Crowned potentates in different countries ennobled him with every kind of dignity and honour. His own sovereign often paid him a visit, adding new lustre to his gorgeous halls by the beauty and effulgence of her court. He was, in fine, the possessor of every gift that the world could bestow, when Fate, as if envious of such an unclouded prosperity, interposed to lure him on to his destruction. It was in 1787 that Prince Potemkin, bent upon achieving some military feat, and thus winning the ribbon of St George, undertook the command of an unfortunate war against the Turks. Success, it is true, attended him at first. His energy was as resistless in battle as it had been in politics; Oczakow was taken by a terrific storming in 1788; and in 1791 he returned to St Petersburg to be honoured, enriched, and fêted in a manner worthy of an emperor. But after his return to the scene of war, a deadly epidemic seized upon him at Jassy in 1792. In vain did the robust giant laugh at it, eat and drink more voraciously to show his contempt for it, and think to shake it off by setting out to Nicolaieff. The disease only fixed its fangs the deeper. On the road he became alarmingly sensible that it was mastering him. He alighted in terror, fell down upon the grass by the wayside, and immediately expired. (See *Biog. Univ.;* Tooke's *Reign of Catherine II.*, 3 vols., 1799; and *Mémoires de Catherine II., ecrits par elle-meme*, 1859.)

POTENTIAL, in grammar, an epithet applied to one of the moods of verbs. The potential is the same in form with the subjunctive, and is, according to some, implied in that mood; but others consider that it differs from the subjunctive by always implying in it either *possum*, *volo*, or *debeo*. It is also called the *permissive mood*, because it often implies a permission or concession to do a thing, and is denoted in English by the auxiliary verb *may* or *might*.

POTENZA, a fortified town of Naples, capital of the province of Basilicata, on the summit of a hill in a wild region of the Apennines, 85 miles E. by S. of Naples. It is for the most part meanly built, but contains several handsome buildings. The cathedral is a fine Doric edifice; and there are two other churches, an ecclesiastical college, and several monasteries. Potenza is the seat of the highest civil and criminal courts of the province. The ancient *Potentia* stood at a place called Murata, in the plain below the modern town. Some ruins of it have been discovered. Cloth, leather, and earthenware are manufactured in Potenza. Pop. 8900.

POTHIER, Robert Joseph, a celebrated French jurist, was born at Orleans in 1699, and received his education in his native town. At an early age he turned the whole bent of his mind towards the study of law. His ready and untiring intellect, his tenacious memory, and his upright, moral character, formed a good basis for a legal reputation. Accordingly, his *Pandectæ Justinianæ*, which began to be published in 1748, and which was afterwards finished in 3 vols. in 1752, introduced him to a distinguished career. He was appointed professor of law in the university of his native city in 1749, and became an earnest and popular teacher. Pothier died in 1772.

There also issued from his pen the following series of learned works:—*Traité des Obligations*, in 2 vols., 1761; *Traité du Contrat de Vente*, in 3 vols., 1762; *Traité du Contrat du Constitution de Rente*, 1763; *Traité du Contrat de Change et Billets de Commerce*, 1763; *Traité du Contrat de Louage*, 1764; *Traité du Contrat de Bail à rente*, 1764; *Traité des Cheptels*, 1765; *Traité des Contrats de Bienfaisance*, in 2 vols., 1766-67; *Traité des Contrats Aléatoires*, in 2 vols., 1766-67; *Traité du Contrat de Mariage*, in 2 vols., 1768; *Traité de la Communauté*, in 2 vols., 1769; *Traité du Douaire*, 1770; *Traité du Droit d'Habitation, des Donations, et du Don Mutuel*, 1771; and *Traités du Domaine de Propriété, de la Possession et de la Prescription*, in 2 vols., 1772. After his death all his publications, with the exception of the *Pandectæ Justinianæ*, were published in a collected form in 4 vols. 4to, 1781. His posthumous works had also been published in 8 vols. 12mo, Orleans, 1776–78. All his productions, with the exception of the *Pandectæ*, are included in the edition of Siffrein, 20 vols. 8vo, Paris, 1820–24. The latest edition is that of Bagnet, in 10 vols. 8vo, 1845–48.

POTOMAC, a river of the United States of North America, formed by the confluence of the north and south branches, both of which take their rise in the Alleghanies, and unite on the northern frontier of Virginia. Through the whole of its course it separates that state from Maryland and the district of Columbia, flowing E. and S.E. till it falls into Chesapeake Bay. Its length from the junction of the two branches is about 350 miles; and its breadth at its mouth 6 or 8 miles. Its largest affluent is the Shenandoah, which has a volume of water little inferior to the main river. It is navigable for ships of the line to Washington, the capital of the United States, 120 miles above its mouth; but above this its course is interrupted by numerous falls and rapids.

POTOSI, a town of Bolivia, capital of a department of the same name, stands in a bleak and barren country, on the northern slope of the Cerro de Potosi, S. Lat. 19. 36., W. Long. 65. 20. It is one of the highest inhabited places in the world, being about 13,500 feet above the sea. On account of the unevenness of the site, the town is irregularly built; the houses are substantial, but not more than one storey high in general. In the middle of the town is a large public square, with an obelisk in honour of Bolivar. Here also stand the large granite cathedral, and the long, low range of government buildings. The town has also numerous churches, a large mint, and a college. The temperature is very hot in the sunshine, but in the shade the cold is extreme. The place is, however, healthy, notwithstanding the difficulty of respiration at such an elevation. The silver mines of Potosi, for which the place is chiefly famous, are described under BOLIVIA. Those parts of the town that were inhabited by Indians are now almost all in ruins, and the population has dwindled down from 100,000, which it is said to have contained in the seventeenth century, to 15,000.

The department of Potosi, which is bounded on the N. by that of Oruro, N.E. and E. by the department of Chuquicaca and province of Tarija, S. by La Plata, and W. by the province of Cobija and by Peru, has an area of 37,227 square miles. It is a mountainous table-land, and many of the heights rise above the limits of vegetation. Its chief production is the silver obtained from the mines of Potosi. Pop. 297,000.

POTSCHINKI, a town of European Russia, in the government, and 120 miles S.S.E. of Nijni Novgorod, on the Rudnia. It has manufactures of linen, some trade in cattle, and a large stud. Pop. 5000.

POTSDAM, a town, and the second royal residence of Prussia, in the province of Brandenburg, stands on the Havel, which here forms a small lake, 17 miles S.W. of Berlin. It occupies one of the most beautiful situations in the province. The banks of the Havel are beautifully wooded, while here and there in the vicinity are seen hills covered with vines. The river is crossed by several bridges, the finest of which is that of Teltow, consisting of eight iron arches reposing on massive stone piers. Potsdam is, next to Berlin, the finest town in Prussia. It has broad, well-paved streets, handsome houses, and fine squares; but presents in general a lifeless and deserted aspect. It consists of the old and the new town,—the former on an island formed by the Havel on one side and by a canal on the other; and there are also several suburbs. The market-place, a large and handsome square, contains an obelisk adorned with busts of Frederick William, the great elector, and of the first three kings of Prussia. In the neighbourhood stands the royal palace, a fine old building begun in 1673, and completed in the reign of Frederick the Great. It contains in the interior the rooms occupied by Frederick, preserved in the same state as he left them. Here are also the apartments of Frederick William III. and of the present king. In front of the palace there are extensive pleasure gardens, containing an artificial pond, several pieces of sculpture, and statues. The church of St Nicholas is a Grecian building, containing in the interior, which is very fine, several beautiful paintings and frescoes. The council-house, built in 1754 after the model of that of Amsterdam, has a cupola surmounted by a colossal figure of Atlas bearing the globe. The garrison church, near the west end of the town, contains the tombs of Frederick William I., the founder, and of Frederick the Great. Outside of the town lies Sans Souci, the favourite residence of Frederick the Great. The grounds are laid out in a formal style, and adorned with fountains and numerous statues. On a height, ascended by six terraces, stands the palace, a long building of one storey, built by Frederick 1745–47. It is chiefly remarkable for its historical interest; the bedroom of the great king and the apartment of Voltaire are still to be seen, as well as a clock which Frederick used to wind up himself, and which stopped at the moment of his death. The new palace, which is also within the grounds of Sans Souci, was built by Frederick after the Seven Years' War, to show that his resources were not exhausted. Near these grounds is Charlottenhof, a beautiful villa in the Italian style. Another royal residence in the vicinity of Potsdam is the Marble Palace, a building at once splendid and tasteful, both in the interior and the exterior. The Peacocks Island (*Pfaueninsel*), in the Havel, is occupied by a beautiful park containing many fine large oak trees and a royal villa. The town of Potsdam has, besides the buildings already mentioned, several schools and benevolent institutions. Among the former are a gymnasium, a normal seminary, military, industrial, and other schools. Of the latter, the most important are the infirmary, the military orphan hospital, poor's-house, and an asylum for the widows of clergymen and schoolmasters of the Established Church. There are also extensive barracks, a guard-house, theatre, &c. The manufactures of Potsdam are numerous and important. The chief is that of arms, of which about 800 are produced weekly. Chocolate, sugar, silk, cotton, linen, leather, hosiery, hats, porcelain, musical instruments, and carriages are also made here. The trade is of very little importance. Potsdam stands on the railway between Berlin and Magdeburg. The celebrated Alexander von Humboldt was born here in 1767. Pop. (1849) 39,864.

POTT, PERCIVAL, one of the most eminent surgeons of his day, was born in London in 1713, and received his education at Darne in Kent. His friends wished him to enter the church; but a decided bias led him to devote himself to surgery. Apprenticed in 1729, to Mr Nourse of St Bartholomew's Hospital, he learned the first principles of his profession. Appointed in 1749 as one of the principal surgeons of the same institution, he had abundant scope for testing and correcting these principles. His knowledge became so great that, in 1756, on being laid aside from practice in consequence of a severe compound fracture of the leg, he appeared in print as a great surgical reformer. As his various works came out, they promulgated many new and valuable opinions, the results of extensive experience, unwearied zeal, and skilful observation. His *Treatise on Ruptures*, 8vo, London, 1756, soon became a standard work. His dissertation *On Injuries in the Head*, 8vo, 1760, was unrivalled for its originality and methodical perspicuity. His paper *On Amputation*, 8vo, 1778, clearly determined and specified those cases in which that method of cure was proper and necessary. In fact, he greatly simplified the art of surgery by limiting the employment of severe and extreme operations, and by trusting more to the healing virtue of nature. Before his death in 1788 he saw the old savage plan of surgical treatment discontinued, and his own new and humane method introduced. The latest edition of the works of Percival Pott is that by Sir James Earle, in 3 vols 8vo., 1808. One of Pott's pupils was the celebrated John Hunter.

POTTER, John, Archbishop of Canterbury, was the son of a linen-draper at Wakefield in Yorkshire, and was born about 1674. Having attained to great proficiency in Greek while at school, he entered University College, Oxford, at the age of fourteen. He was induced to publish, at the suggestion of the master of his college, *Variantes Lectiones et Notæ ad Plutarchi librum de Audiendis Poetis cum Interpretatione Latina Hugonis Grotii; item Variantes Lectiones et Notæ ad Basilii Magni Orationem ad Juvenes quomodo cum fructu legere possint Græcorum libros*, 1693, 8vo, when only in his nineteenth year. He shortly after became master of arts, was chosen a fellow of Lincoln College, and took orders. In 1697 he edited the *Alexandra* of Lycophron; and his *Archæologiæ Græcæ* appearing soon after, at once established his fame as a scholar. He became bachelor of divinity in July 8, 1704, and was appointed chaplain to Archbishop Tenison, when he required to exchange Oxford for Lambeth. He became doctor of divinity in 1706, and soon after was made chaplain in ordinary to her Majesty Queen Anne. He published during the following year *A Discourse of Church Government.* In 1708 he was chosen regius professor of divinity, and canon of Christ Church, Oxford; and in 1715 he was made bishop of Oxford. An edition of Clemens Alexandrinus occupied his attention during the same year; and shortly afterwards he deemed it necessary to publish against the doctrines of sincerity as advocated by Hoadly, Bishop of Bangor. In January 1736–7 he was raised to be Archbishop of Canterbury. This arduous and important office he filled during ten years with considerable reputation, until in 1747 he was cut off by a lingering disease. He was a learned and exemplary churchman, but somewhat too strongly tinctured with the pride of office. His theological works were printed at Oxford in 3 vols. 8vo, 1753.

POTTER, *Paul*, a distinguished animal-painter, was born at Enkhuysen in 1625. His father, who bore the same name, was an artist of moderate ability, and from him he received his instruction. At the age of fifteen he was considered quite a prodigy in painting; nature was his sole instructor, and her works his only models. Landscapes were the subordinate parts of his pictures; and he chose to bring into prominence those pastoral scenes where cattle could be shown browsing or ruminating. The bull and the cow, the sheep, the ass, and the goat, are rendered with surprising accuracy and skill. His colouring is clear and transparent; his execution firm, and finished without the appearance of effort. At the age of twenty he removed to the Hague, married, and remained about six years. He gained the acquaintance of Maurice, Prince of Orange, who liberally patronized him. The pressing invitation of Tulk, burgomaster at Amsterdam, induced him to remove to that city in 1652. Here he continued with the most untiring devotion to pursue, regardless of seasons, the study of those objects which came within the scope of his profession. He broke his health, and was attacked by pulmonary disease, which terminated his life in 1654, in the 29th year of his age.

POTTERY AND PORCELAIN.

The word *pottery* is said to be derived from the low Latin term *potus*, a pot, which is from the classical Latin *potus*, drink;[1] but the etymology of porcelain is more uncertain. Some writers derive it from *porcellana*, the Portuguese for a drinking-cup; others from a similar word in Italian, which is applied to a univalve shell of the genus *Cypræidæ*, or cowries, having a high arched back resembling that of a hog (*porco*, Ital.), and a white, smooth, vitreous glossiness of surface similar to that of fine porcelain. The essential ingredients of every article in pottery and porcelain are silica and alumina. The pure chemical compound, silicate of alumina, must, however, be regarded as an ideal type, unattainable even in the finest porcelain; while in the coarser varieties, and in pottery, impurities, such as iron, lime, potash, &c., give character to the resulting wares. Even if it were possible to obtain pure silica and alumina in sufficient quantities for manufacturing purposes, it would still be necessary to add certain substances to increase somewhat the fusibility of those refractory materials. Pottery is also distinguished by being opaque, while porcelain is translucent. Wares of either kind are further distinguished by the terms *soft* and *hard*, or, as the French term them, *tendre* and *dur*,—distinctions which relate as well to the composition of the ware as to the temperature at which it is made solid. Common bricks and earthenware vessels, pipkins, pans, &c., are soft; while fire-brick and crockery, such as queen's-ware, stone-ware, &c., are hard. Soft pottery, consisting of silica, alumina, and lime, admits of being scratched with a knife or file, and is usually fusible at the heat required merely for baking porcelain. Stoneware is composed of silica, alumina, and baryta, and may be regarded as a coarse kind of porcelain. Hard porcelain contains more of alumina and less of silica than the soft; it is baked at a stronger heat, and is more dense. Soft porcelain contains more silica than the hard, and is also combined with alkaline fluxes, so that its softness is manifested in being easily scratched and less able to resist a strong heat.

SECTION I.—HISTORICAL SKETCH.

Articles of fictile ware are at once the most fragile and the most enduring of human monuments. A piece of common pottery, liable to be shivered to pieces by a slight blow, is more enduring than epitaphs in brass and effigies in bronze. These yield to the varying action of the weather: stone crumbles away, ink fades, and paper decays; but the earthen vase, deposited in some quiet but forgotten receptacle, survives the changes of time, and even when broken at the moment of its discovery by the pick of the labourer, affords instruction in its fragments. In their power of traversing accumulated ages, and affording glimpses of ancient times and people, fictile articles have been compared to the fossils of animals and plants, which reveal to the educated eye the former conditions of our globe.

Clay is so generally diffused, and its plastic nature is so obvious, that the art of working it cannot be considered as above the intelligence of a savage; hence the production of articles in clay may be said to belong to every people and to all time. The first drinking-vessels would be sun-baked, and consequently very destructible; so that few articles would survive a single winter. A considerable period must have elapsed before the method of giving permanence to these articles by the action of fire was discovered; but it is chiefly to this discovery that we owe the preservation of so man ancient relics of the fictile art. The sun-dried bricks of

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[1] *Pot* is said by Tooke to be the past tense of the verb to *pit*,—*i.e.*, to excavate or sink into a hollow.

Egypt, Assyria, and Babylonia, have, however, been preserved to this day, and "not only afford testimony to the truth of Scripture by their composition of straw and clay, but also by the hieroglyphs impressed upon them, transmit the names of a series of kings, and testify the existence of edifices, all knowledge of which, except for these relics, would have utterly perished. Those of Assyria and Babylon, in addition to the same information, have, by their cuneiform inscriptions, which mention the locality of the edifices for which they were made, afforded the means of tracing the sites of ancient Mesopotamia and Assyria with an accuracy unattainable by any other means. When the brick was ornamented, as in Assyria, with glazed representations, this apparently insignificant but imperishable object has confirmed the descriptions of the walls of Babylon, which critical scepticism had denounced as fabulous. The Roman bricks have also borne their testimony to history. A large number of them present a series of the names of consuls of imperial Rome; while others show that the proud nobility of the Eternal City partly derived their revenues from the kilns of their Campanian and Sabine farms."[1]

The excellent authority just quoted refers to the next step in the progress of manufacture, namely, that of modelling in clay the forms of the physical world, the origin of the plastic art, "to which the symbolical pantheism of the old world gave an extension almost universal." When stone and metal came to be used as materials for sculpture, clay was still employed for the elaboration of the model, and also for the multiplication of copies for popular use of celebrated pieces of sculpture. The invention of the mould caused the terra cottas of antiquity to be as widely diffused as the plaster casts of modern times. Among the Assyrians and Babylonians clay was used as a material for writing on. The traveller Layard discovered in the palace of Sennacherib a whole library of clay books, consisting of histories, deeds, almanacs, spelling-books, vocabularies, inventories, horoscopes, receipts, letters, &c. About 2000 of these clay books of the Assyrians have been discovered: they are in the form of tablets, cylinders, and hexagonal prisms of terra cotta.

Before the invention of the potter's wheel, clay vessels could have had but little symmetry of shape. The necessity for some such contrivance must have been early felt, and it was probably invented by several nations. It is represented on the Egyptian sculptures; it is mentioned in Holy Scripture; and was in use at an early period in Assyria. Mr Birch states, that "the very oldest vases of Greece, some of which are supposed to have been made in the heroic ages, bear marks of having been turned upon the wheel." The art of firing the ware is also of the highest antiquity. Remains of baked earthenware are common in Egypt in the tombs of the first dynasties, and the oldest bricks and tablets of Assyria and Babylon bear evidence of having passed through the fire. The oldest remains of Hellenic pottery owe their preservation to their having been fired. As the clay by this process is rendered porous and incapable of holding liquids, the necessity for some kind of glaze must have been early felt. Opaque glasses or enamels have been found in Egypt as old as the fourth dynasty, and both the Egyptians and the Assyrians seem to have preferred an opaque enamel to a transparent glaze, somewhat after the fashion of the modern *faience*. Numerous fragments testify to the use of glazing amongst the ancient Greeks and Romans. With respect to form, the Greek vases, by their beauty and simplicity, have become models for various kinds of earthenware; while the application of painting to vases has transmitted to us much information respecting the mythology, manners, customs, and literature of ancient Greece. Even the Roman lamps and red ware illustrate in their ornaments many customs, manners, and historical events.

As the pottery of different modern nations has its characteristic features, so the ancient pottery has its distinctions of time and place. It is impossible not to distinguish between the rude and simple urns fashioned by the early inhabitants of Great Britain and the more carefully finished specimens of the Roman conquerors of these islands. Then, again, the simple unglazed earthenware of Greece contrasts with the more elaborate Etruscan forms, the finest of which, however, are probably by Greek artists. Then, again, the red and black potteries of India contrast with the black and white potteries of North America, the latter being interspersed with fragments of bivalve shells. On the discovery of the extraordinary ruins in Central America, specimens of pottery were found which showed considerable advance in the art compared with the date assigned to these ruins, namely, 1000 B.C. The specimens had been formed without the assistance of the potter's wheel; but they are well baked, the ornaments are in different colours, and they are coated with a fine vitreous glaze, such as was unknown in Europe until within about ten centuries. The religious employment of earthen vessels in early times, and the custom of placing them in tombs as receptacles for medals, trophies, insignia, money, charms, rings, and votive offerings, has greatly assisted the studies of archæologists in modern times, and we can do no more in this brief sketch than refer to their useful labours.

Porcelain is of modern introduction into Europe, but it was known in China more than a century before the Christian era. The Chinese appear to have improved their art during four or five centuries, and then, supposing themselves to have attained perfection, they allowed the art to remain stationary. So completely was the manufacture identified with that nation, that on the introduction of porcelain into Europe by the Portuguese in 1518, it received the name of *china*, which it still partially retains. The Chinese continued to supply us with porcelain during many years. It was supposed that the fine clay or *kaolin* used in its production was peculiar to China, and that it was consequently hopeless to attempt to manufacture porcelain in Europe. The porcelain of Japan is only a variety of the Chinese.

While the Chinese were improving their manufacture, the art of making decorative pottery became lost in Europe amid the darkness which followed the overthrow of the Western Empire. The first symptoms of revival were due to the Mohammedan invaders of Spain, whose tiles of enamelled earthenware are to be seen in the Moorish buildings of Seville, Toledo, Granada, and the Alhambra. They are of a pale clay, "the surface of which is coated over with a white opaque enamel, upon which the elaborate designs are executed in colours."[2] The Spaniards acquired from the Moors the art of manufacturing enamelled tiles, or *azulegos* as they are called, and they still continue to be made in Valencia. The Moors also adorned their pottery with Arabic inscriptions, and with arabesque patterns resembling a lace veil in richness. The vase known as that of the Alhambra is of earthenware; the ground is white, the ornaments are either blue of two shades, or of gold or copper lustre.[3] The Moors continued to manufacture ornamental pottery until the time of their final expulsion from Spain at the beginning of the seventeenth century. This Hispano-Arabic pottery, as it is called, is the prototype of the Italian majolica, and was long confounded with it. Specimens of it are to be seen in several celebrated collections. The majolica, or enamelled ware of Italy, probably dates from the twelfth century. It is related that a pirate king of Majorca, about the year 1115, was besieged in his stronghold by an armament from Pisa, and being vanquished, the expedition returned to Italy laden with spoil, among which, it is supposed, were a number of plates of painted Moorish pottery, such specimens being found encrusted in the walls of the most ancient churches of Pisa. They appear to have been regarded as religious trophies. No attempt, however, was made to imitate them until the fourteenth century, when specimens of majolica, so called from the island of Majorca, were produced; they resemble the Moorish examples in having arabesque patterns in yellow and green, upon a blue ground. About the year 1451 the manufacture had become celebrated at Pesaro, the birthplace of Luca della Robbia, who is regarded by persons who set aside the foregoing origin of majolica as the inventor of this ware. He appears to have earned distinction as a sculptor when he took to working in terra cotta, and gave permanence to his productions by the invention of a white enamel. His Madonnas, Scripture subjects, figures, and architectural pieces are still prized by collectors. Mr Marryat refers to them as "by far the finest works of art ever executed in pottery." He is also "the founder of a school which produced works not much inferior to his own." Existing specimens are of a dazzling whiteness, and the glaze, after so great a lapse of time, continues to be quite perfect. The manufacture of majolica flourished during two centuries under the patronage of the House of Urbino. The first duke, Frederick of Montefeltro (1444) took a lively interest in the manufacture; his son established a manufacture at Pesaro, and the most eminent artists were employed in furnishing designs, a system of patronage which was maintained by succeeding dukes. There is a tradition that Raffaelle was employed in furnishing designs; whence majolica sometimes passes by the name of *Raffaelle ware.* But as the finest specimens do not date earlier than 1540, or twenty years after the death of that great artist, he was probably not directly concerned in the manufacture. But it is admitted that his scholars used his drawings in composing designs for the finest specimens. In the middle of the fifteenth and during part of the sixteenth century, many towns of Italy had become renowned for their majolica ware, of which the coarser specimens were named *mezza-majolica*, and the finer, however inappropriately, *porcelana.* The manufacture had attained its greatest celebrity between 1540 and 1560. After the last-named date the art began to decline, and the introduction of porcelain, properly so called, helped to complete its downfall. The caprices of fashion cannot be alone charged with the destruction of this beautiful art, since, so far as utility is concerned, a hard paste covered with a vitreous glaze, as in porcelain, must be very superior to a soft paste coated with a metallic glaze, as in the case of majolica. The best examples of mezza-majolica are distinguished by the beauty of their colour, and the perfection of their enamel glaze; the latter imparting to the yellow and white tints the metallic lustre of gold and silver. There is also a remarkable mother-of-pearl lustre, together with an iridescent ruby, peculiar to Pesaro and Gubbio. The most general colours used in the painting were blue and yellow, with their mixtures. The drawing is not so good as the colouring, until the so-called porcelana raised the art to its zenith. After the year 1560 the designs became more fanciful and grotesque, and the colours inferior. It must not, however, be supposed that the articles manufactured were ornamental only. During the whole reign of majolica ware, all kinds of common articles were produced, such as pilgrim's bottles, with holes in the bottom rim for the strap or cord by which the vessel was carried; various forms of vases, adorned with paintings, with handles in the form of serpents, and rims surmounted by grotesque figures of animals and fishes; fruit dishes, with embossed patterns in high relief; small plates for ices and sweetmeats; vases, for holding different kinds of wine, which could be poured out from one spout; small flasks, in the shape of lemons and apples; cups covered with tendrils or quaint devices; small figures of saints; jocose figures; birds, coloured after nature; painted tiles for walls and floors, &c. Some of the most interesting specimens of majolica are known as *amatorii*, and consist of vessels, plates, or deep saucers, containing the portrait and name of a lady; these were filled with fruits or sweetmeats, and presented as pledges of affection. The portraits not only perpetuate the female beauty of a former age, but also the costume by which it was sought to make that beauty more attractive. Some of the amatorii represent hands united, hearts a-flame, or pierced with darts, after the fashion of the modern Valentine. The painters who executed the designs were usually copyists, the design itself being furnished by an eminent artist. In some cases, however, the painters themselves were the artists, and are known by certain monograms and marks. Occasionally the painters bought the pieces ready prepared for painting, executed them at home, and took them to the kiln to be fired. In such cases, the piece is often marked with the name of the potter, as well as that of the artist. The custom of attaching signatures to the pieces is peculiar to some manufactories; those with names and monograms for the most part belong to Gubbio and Albino. Different towns had their distinguishing marks, and it was common to mark in blue characters on the back of the dish the subject of the design; but when a complete service was painted, only the principal piece was marked: it was also customary to introduce the arms of the family for whom the service was prepared.

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[1] *History of Ancient Pottery*, by Samuel Birch, F.S.A., London, 1858.

[2] *A History of Pottery and Porcelain, mediæval and modern*, by Joseph Marryat, 2d edition, London, 1857.

[3] This vase is figured in Owen Jones' work on the Alhambra.

Majolica was introduced into Germany in 1507 by Hirschvögel of Nuremberg, but the manufacture does not appear to have survived him. It prospered better in France, where, under the name of *faience*,[1] it flourished under the patronage of Catherine de' Medici and her kinsman Louis Gonzaga. The latter established Italian artists in his dukedom of Nevers, and they were successful in producing enamelled pottery from native materials. Gradually as native artists succeeded the Italian ones, the classical designs of the latter were degraded, and the enamelled ware of Italy was represented only by the common faience of France. In the eighteenth century Nevers recovered her reputation, and became celebrated for the brilliancy of a dark blue enamel with white patterns upon common ware. A variety of enamelled pottery was also produced at Rouen: this attracted some notice; but the kind of ware which may be said to be peculiar to France is that known as Palissy ware. There is a good deal of romance mixed up with the life of the inventor of this ware. Bernard Palissy and his adventures, real or imaginary, have assisted in multiplying the number of those dangerous books which ascribe imaginary events to real characters. Palissy was born at the commencement of the sixteenth century, of poor parents; but nature had implanted within him a love of the beautiful, which became his teacher. He managed to acquire a knowledge of reading, writing, and land-surveying, by which last-named art he earned his livelihood. In the intervals of employment he was much given to the study of the Italian masters, and he was delighted to obtain work in painting images and designs on glass. This enabled him to gratify his taste for travel, and for studying natural objects. He became master of the chemistry and mineralogy of his day, such as it was. In 1539 he settled at Saintes as an artist, where he married. His attention was first directed to pottery by being shown a beautiful enamelled cup, and on proceeding to inquire into its mode of manufacture, he found that there were secrets connected with it, and especially with the composition of the enamel. He at once undertook a course of experiments on the subject, but without success. The desire to master the subject had, however, taken such possession of him, that during several years he devoted nearly all his time and means to this pursuit, in spite of the claims of his wife and family and the remonstrances of his friends. He borrowed money to enable him to construct a new furnace; and when too poor to buy fuel, he used his furniture instead. When unable to pay his assistant's wages, he gave him the coat from off his back. Thus, becoming every year more wretched than the preceding, the folly of sixteen years (as it would have been called had he failed) ended in a triumph. His *figulines* or rustic pottery became the fashion of the day, and his beautiful patterns were everywhere admired. The general style of his ware is marked by quaintness and singularity; his figures are usually chaste in form: the ornaments and subjects of a historical, mythological, and allegorical character are in relief, and coloured. His natural objects, with the exception of certain leaves, were all moulded from nature. His shells are those of the tertiary formation of the Paris basin; his fish are those of the Seine; the reptiles and plants are from the neighbourhood of Paris; and he made use of no foreign natural production. The colours are usually bright, and mostly confined to yellows, blues, and grays; sometimes extending to green, violet, and brown. Mr Marryat says that Palissy "never succeeded in attaining the purity of the white enamel of Luca della Robbia, or even that of the faience of Nevers." The *pieces rustiques* of this artist, intended to adorn the large sideboards of the dining-rooms of the period, are loaded with objects in relief. A favourite subject with him was a flat kind of basin or dish, representing the bottom of the sea, covered with fishes, shells, sea-weeds, pebbles, snakes, &c. We have also from the hand of this artist, ewers and vases with grotesque ornaments, boars' heads, curiously-formed salt-cellars, figures of saints, wall and floor tiles, &c. Mr Baring Wall speaks of Palissy as "a great master of the power and effect of neutral tints."[1]

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[1] This term is supposed to be derived from the small town, now a village, of Faience, in the department of Var, which, as early as the sixth century, appears to have been celebrated for glazed pottery.

France is also celebrated for a fine ware known as *faience fine* and *grès cérame*. Some of the earliest specimens are known under the name of *renaissance*, or fine faience of Henri II. There are only thirty-seven pieces of this manufacture extant; and as twenty-seven of them have been traced to Touraine and La Vendée, it has been conjectured that the manufactory was at Thouars in Touraine. The material is a fine white pipe-clay, the texture of which is seen through the thin transparent yellow varnish. The patterns are engraved on the paste, and the hollows filled up with coloured pastes, so as to resemble fine inlaying, or chiselled silver works in *niello;* whence this ware has also been termed *faience à niello*. There are also beautifully-modelled raised ornaments: the articles are for the most part small and light, consisting of cups, ewers, and a vase with a spout for pouring, called a *biberon*. A single candlestick of this ware was sold a few years ago for L.220.

Germany had its enamelled wares as early as the thirteenth century, the secret of success being of course the discovery of a fine glaze. Ratisbon, Landschut, and Nuremberg thus became formidable rivals of the Arabs and the Italians. The distinctive characters of this ware are the fine green glaze, the complex form, the number and variety of ornaments, lightness, and good workmanship. Nuremberg also became famous for its large enamelled tiles used for covering stoves.

Holland, from its exclusive trade with Japan, was induced to imitate the Japanese porcelain. The chief seat of the manufacture was Delft; and the ware was known and esteemed in the sixteenth century by its fantastic design, good colour, and beautiful enamel—the latter being smooth and even, and slightly tinged with blue. The Japanese origin was seen in the monstrous animals of the *chimera* class, the three-ringed bottle, the tall shapeless beaker, and the large circular dish, which were long regarded in Europe as favourite ornaments; while the common articles were so generally distributed as to obtain for Delft the title of the "parent of pottery." The fine English wares introduced by Wedgwood and others were the means of injuring the trade of Delft.

In England, the first manufactory of fine earthenware is said to have been erected in the reign of Elizabeth at Stratford-le-Bow. The well-known Shakspeare jug is cited as a good specimen of Elizabethan pottery. It is of cream-coloured earthenware, about 9 inches in height and 16 in circumference in the largest part. Its shape resembles that of a modern coffee-pot. It is divided lengthwise into eight compartments, each containing a mythological subject in high relief and of considerable merit. The silver top is a modern addition. The Elizabethan pottery nearly approaches in hardness that of fine stoneware; it is of a dingy white, and its ornaments in relief consist mostly of quaint figures and foliage. In the reign of Elizabeth the Staffordshire potteries came into notice, of which some of the earliest specimens consist of butter-pots of native brick earth, glazed with powdered lead-ore, which was dusted on while the ware was in a green state; the *tig*, or drinking-cup, with three handles; and the parting-cup, with two handles. In 1684 a manufactory of earthenware was established at Fulham, some of the products of which, under the name of *Fulham-ware*, are still valued by collectors. They consist of white *gorges* or pitchers, marbled porcelain vessels, statues, and figures. The proprietor, Mr John Dwight, attempted to produce the transparent porcelain of China, but his success was not such as to turn him from the more profitable manufacture of earthenware. About the time of the Revolution, ale-jugs of native marl, ornamented with figures in white pipe-clay, were introduced. During the reigns of Anne and George I. an improved ware was made of sand and pipe-clay coloured with oxide of copper and manganese, forming the well-known *agate-ware* and *tortoiseshell-ware*, conferring on the pottery the character of a hard paste, which was subsequently so much improved by Wedgwood, and introduced under the name of *Queen's ware*.

The proceedings of Wedgwood form an epoch in the history of the art. Josiah Wedgwood was the son of a potter at Burslem in Staffordshire. He was born about the year 1730, and can scarcely be said to have received any formal education. At the age of eleven he entered his brother's pottery as a thrower; but he had not been long so engaged before he was attacked by small-pox, which left him with a lame leg, and rendered amputation necessary. His first attempts to settle in life were not fortunate; he became partner for a short time in 1752 with a man named Harrison, at Stoke, where he is said to have first felt a strong desire to manufacture ornamental pottery. His next partner was named Wheildon, and his employment consisted in manufacturing knife-handles in imitation of agate and tortoiseshell, melon table-plates, green pickle-leaves, &c.; but he could not induce his partner to embark largely in the production of ornamental wares, nor was there much encouragement to do so. The upper classes of Great

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[1] *Lecture delivered before the Literary and Scientific Society of Salisbury*, January 1853. Printed for private circulation.

Britain obtained their porcelain from China; the great bulk of the earthenware in domestic use was supplied by France, Germany, and Holland; and even the trade in tobacco-pipes, in which this country had attained some success, was becoming monopolized by the Dutch. To compete with these formidable rivals required the courage and persistence of genius; and Wedgwood was not slow in bringing them to bear upon the native materials which surrounded him. Accordingly, in 1759 he established a small factory on his own account at Burslem. Here he must have been successful, for he soon undertook a second manufactory, where he produced a white stone-ware, and afterwards a third, where he manufactured his celebrated *cream-coloured ware*. Some specimens of the latter having been shown to Queen Charlotte, her Majesty was so pleased with them that she appointed Wedgwood the royal potter, and gave permission for calling the ware "Queen's ware." Wedgwood had now no longer reason to complain of want of taste or of patronage on the part of the public, and nobly did he use his best exertions to encourage the one and respond worthily to the other. He studied the chemistry of his day, and courted the society of scientific men, with a view to improve the composition, glaze, and colour of his wares. He invited good artists to furnish him with designs, among whom was the celebrated Flaxman. Among Wedgwood's inventions may be mentioned a *terra cotta*, resembling porphyry; *basalts*, or black ware, which would strike sparks like a flint; *white porcelain biscuit*, with properties similar to basalt; *bamboo* or *cane-coloured biscuit; jasper*, a white biscuit, of exquisite delicacy and beauty, well adapted for cameos, portraits, &c.; also *blue jasper* and *green jasper*, and a *porcelain biscuit* little inferior to agate in hardness, and used for pestles and mortars in the laboratories of chemists. He also succeeded in imparting to hard pottery the vivid colours and brilliant glaze of porcelain. About the year 1762 Wedgwood opened a warehouse in London, and entrusted it to the care of Mr Bentley, a gentleman of recognised taste, who succeeded in attracting attention to the rising Staffordshire works, and also in obtaining the loan of vases, cameos, oriental porcelain, &c., which at that time were difficult to procure, especially for the purposes of the manufacturer; but such was the sympathy of persons of taste with Wedgwood's pursuits, that they freely lent their fictile treasures either to be copied or to suggest new designs. Even the Barbarini vase, which was purchased by the Duchess of Portland for 1800 guineas, was lent to Wedgwood, who, after executing fifty copies, destroyed the mould. Wedgwood's wares now became so deservedly popular that the extension of his works in Staffordshire led to the formation of a new village near Newcastle-under-Lyne, which was named "Etruria," from the resemblance which the clay dug there had to the ancient Etrurian earth, and also probably to mark the success with which Wedgwood had imitated the ancient Etruscan ware. This village long continued to be a centre of attraction for travellers from all parts of Europe, and we may still trace that celebrity in many noted collections of the ceramic art, Wedgwood's finest productions taking rank with the choicest specimens of Dresden and Sèvres. Wedgwood died at his mansion in Etruria in 1795.

The stone-ware which Wedgwood so greatly improved had long existed under various forms in different potteries of the world. In some cases it was common, and in others fine—the difference consisting in the composition of the paste. The Chinese were acquainted with this ware, and were accustomed to use it as the basis for a surface of porcelain paste. The stone pottery of the Rhine of the sixteenth century is esteemed by collectors for its quaintness of form, richness of ornament, and the colour of its enamel. *Grès Flamand*, or Flemish stone-ware, of the period between 1540 and 1620 is remarkable for its beautiful blue colour, quaint forms, and rich ornaments. France also appears to have manufactured stone-ware before the sixteenth century. In England, Dutch and German workmen were engaged in the manufacture at an early period. In 1690 the mode of glazing by means of common salt enabled the stone-ware manufacturers to compete successfully with delft and soft paste fabrics. Towards the end of the seventeenth century a very fine unglazed stone-ware, with raised ornaments, known as red Japan ware, was made in England, after the failure of many previous attempts. It appears that two brothers named Elers, from Nuremberg, discovered at Bradwell, about 2 miles from Burslem, a bed of fine red clay, which they worked at a small factory erected on the bed itself. They endeavoured to conceal their discovery, as well as their mode of working, for which purpose they employed the most ignorant assistants that they could meet with; but no sooner did their ware attract attention than a potter named Astbury, feigning to be an idiot, entered the service of the two brothers, and, having learnt all their secrets, established a factory for himself: the processes soon became known, and others followed the example. In 1720 the two brothers closed their establishment, and entered the porcelain manufactory at Chelsea. Mr Marryat characterizes their ware as being fine in material and sharp in execution, the ornaments being formed in copper moulds.

Regarding stone-ware as a connecting-link between earthen-ware and porcelain, we come now to the history of the latter article. China, Japan, and Persia are the earliest nations which produced this beautiful material. Bottles of Chinese manufacture have been found in the tombs of Thebes; and from an inscription on one of them, the date of the manufacture would appear to be between 1575 B.C. and 1289 B.C. The workmanship, however, is inferior. Porcelain seems to have been common in the Chinese empire in the year 163 B.C., and to have attained its greatest perfection in the year 1000 A.D. The porcelain tower near Nankin was erected in 1277. Marco Polo describes the manufacture in China during the thirteenth century. Specimens of the ware had gradually found their way to Europe, but were not generally known until the Cape of Good Hope had been doubled by the Portuguese. The latter were so struck with the resemblance between the texture of this fine ware and that of cowrie-shells or "porcellana," as they were called, that they imagined that the ware might be made of such shells, or of a composition resembling them, and named it accordingly. They imported numerous and splendid collections of the ware into Europe, where it was also named from the country which produced it; and, from its ringing sound, "China metal." It was also called "China earth." On the expulsion of the Portuguese, the Dutch succeeded in establishing a traffic with India and Japan; and Europe was for a long time supplied with porcelain through Holland. The English shared in the trade somewhat later, through the medium of the East India Company; but the taste for collecting china had become very general, and about the middle of the seven teenth century had amounted to a passion. The writers of the day frequently refer to it, especially in Queen Anne's reign. The French, who had established missions in China, succeeded in obtaining, from time to time, information respecting the manufacture. Fokien was represented as the seat of manufacture of the pure white porcelain of China, some of which consists of small cups and similar articles, with inscriptions, devices, &c., under the glaze, so that they can only be seen by holding the article up to the light. Nankin produced the blue and white porcelain, as also the pale buff on the necks of bottles and backs of plates. King-te-tching was named as the origin of the old sea-green and crackle porcelain. To the former the term *céladon* has been applied; but the French extend the term to porcelain of any tint in which the colours are mixed with the glaze, and burnt in at the first firing. In some cases two or more colours are blended so as to give the appearance of shot-silk; a variety, known as *marbled*, belongs to this class, and resembles marble in its colouring and veining. Crackle china, in which an immense number of cracks occur on the surface in small regular figures, is due to the unequal expansion of the glaze on the paste. The crackled "tsouï-khi" are produced by combining steatite with the glaze; and this when fired, splits into a net-work over the surface. A similar effect can be produced by plunging the heated porcelain into cold water; the cracks are then filled in with a thick ink or red-ochre. The ancient crackle is so much esteemed in Japan that as much as L.300 has been paid for a single specimen. The Chinese call this ware *snake-porcelain;* and the French apply to it the term *porcelaine truitée*. But the perfection of the ceramic art among the Chinese is exhibited in their egg-shell porcelain, which is thin and transparent, and resembles an egg-shell in appearance. This ware is coloured citron-yellow for the exclusive use of the emperor, and ruby for the use of the imperial family. The porcelain in common use in China is brown, the inside being white, and white medallions outside. There is also an inferior and more modern porcelain, manufactured at Canton, and known as Indian china. But in all the specimens of Chinese porcelain, however beautiful may be the material and delicate the texture, however brilliant the colour and pure the glaze, the form and the design are hideous. It has been remarked that the vase of the humblest Greek potter of the best period has an æsthetic value far surpassing the most costly productions of the Celestial Empire. The porcelain of Japan is in better taste than that of China, the dragons being less monstrous and the flowers more natural.

After the introduction of Chinese porcelain into Europe, many attempts were made during two centuries to imitate it. The first successful experiment was the result of one of those accidents which are doubtless of frequent occurrence, although the quality of mind required to take advantage of them is rare. John Frederick Böttcher was an apothecary's assistant at Berlin: he was fond of chemistry, and conducted his experiments with so much ardour that the authorities could not resist the conclusion that he was practising the black art. He found it convenient to make his escape from Berlin and to visit Dresden, where the Elector of Saxony, Augustus II., patronized chemistry, not from the love of science, but from that of gold. Böttcher claimed the protection of the elector, who eagerly inquired of him respecting the transmutation of the baser metals. With the natural frankness of his character, Böttcher confessed his ignorance, but was disbelieved. Why should a man study chemistry except to enrich himself? it was argued; and as the elector was already patronizing the alchemist Tschirnhaus in his endeavours to discover the art of transmuting old age into youth, by means of the *elixir vitæ*, he associated Böttcher with him, with strict orders not to let him out of his sight. Böttcher was employed to seek after the philosopher's stone; and in the course of his experiments he made some crucibles, which, on being fired, possessed many of the characters of oriental porcelain. The vessels were made from a brown clay found near Meissen, and they were of a reddish tint. When the result was brought before the elector he appreciated its importance; and in order that Böttcher might pursue the inquiry in secret, he sent him to the castle of Albrechtsburg, near Meissen, where he was magnificently entertained, but restrained in his personal liberty. So much importance was attached to the secret, that during the troubles consequent on the invasion of Saxony by Charles XII. of Sweden, Böttcher, Tschirnhaus, and three workmen, were sent to the fortress of Königstein on the Elbe, where a laboratory was prepared for them. Böttcher's fellow-prisoners formed a plan of escape, which he communicated to the commandant, whereby he gained favour and a little more personal liberty. In 1707 he returned to Meissen, where he continued to prosecute his experiments, delighting every one around him with his active cheerfulness, and keeping up the spirits of the workmen during the furnace operations, which sometimes lasted sixty hours consecutively. Tschirnhaus died in the following year, and Böttcher enlarged the scale of his operations; he caused a new furnace to be erected, and extended the time of firing to five days and five nights. The elector was present at the opening of the furnace, and expressed his satisfaction at the progress which was being made. Up to this time, however, the only result was a kind of red and white stone-ware; and when, in 1709, Böttcher succeeded in producing a white porcelain, it became bent, and cracked in the fire. The progress, however, was deemed to be sufficient to determine Augustine to establish a manufactory at Meissen, and to appoint Böttcher the director. In 1715 the new factory produced a beautiful description of porcelain by means of the kaolin of Aue in the Erzgebirge, the discovery of which was made by an ironmaster of the district named Schnorr. This man had observed, while riding near the place, that his horse's feet stuck in a soft white tenacious earth, and it occurred to him that if this earth were dried and reduced to powder, it would make a good substitute for hair-powder, which the fashion of the day required, all except the poor, to use. Accordingly he manufactured the powder in large quantities, and found a ready sale for it in Dresden and elsewhere. Böttcher's valet used it, and so increased the weight of his master's wig as to lead to inquiry; and finding that the new hair-powder was of mineral origin, the idea flashed across his mind that this white powder might be useful in his experiments. He made the attempt, and was delighted to find that he had at length discovered the long wished-for material for making white porcelain. The secret so curiously obtained was for a long time as carefully guarded. The powder was made to retain its commercial name of "Schnorr's white earth" (*Snorrische weisse Erde*), its export was forbidden, and it was introduced into the factory in sealed barrels by persons sworn to secresy. All persons connected with the factory were obliged to take a similar oath: no visitor was admitted; and the factory was regulated after the manner of a fortress. The motto in large letters, "Be secret unto death" (*Geheim bis ins Grab*), was set up in each room; the oath to the workmen was renewed every month; and when the king or any distinguished visitor was allowed to enter the factory, a similar obligation was imposed on him.

But all this parade of secresy would make it clear to the most ill-informed workmen that the secret had a high marketable value, and we cannot wonder that it should have been sold to one or other of the monarchs of Europe, most of whom were ambitious to manufacture oriental porcelain. Böttcher died in 1719, at the age of thirty-seven, but before his premature death, a foreman had escaped from the factory, and proceeding to Vienna, submitted to be bribed, and it was not long before rival factories sprang up in different parts of Germany. A few years ago the writer visited the Meissen factory, which is pleasantly situated on the banks of the Elbe: it still retains something of its fortress character, although the workshops are light and cheerful. The principal room is adorned with the bust of Böttcher. The factory, however, has lost its former vigour: an air of lassitude seems to pervade the place, and neither here nor at Sèvres are we impressed with the idea that the work is being done in earnest, as it is at such an establishment as Minton's at Stoke-upon-Trent. There can be no doubt that private enterprise, unshackled by state restrictions, is the only healthy condition of the useful arts. A royal factory, which can neither become bankrupt nor meet with the wholesome stimulus of competition, is not likely to be worked at a profit, nor to inspire activity in its attendants.

The temporary success of the Meissen factory depended on the singularity of its position. There was a great demand in Europe for fine porcelain, and Meissen was in a condition to supply it. The first productions of the factory were mostly imitations of oriental patterns, but they were deficient in grace and lightness. There was a marked improvement when Kändler, a professional sculptor, was appointed in 1731 to superintend the modelling. He introduced wreaths and bouquets, animals and groups of figures, with the feeling of an artist. The works were arrested by the Seven Years' War; but after this calamity Meissen became celebrated for its exquisite miniature copies of the best works of the Flemish school, together with birds and insects, painted by Lindenir, and flowers and animals by the best artists. In 1745, when Frederick of Prussia took possession of Dresden, he obtained among the spoils of war enormous quantities of porcelain. He also removed to Berlin some of the workmen, together with the models and moulds of the finest pieces. Again, in 1759, the factory was plundered and its archives destroyed: it revived somewhat under Dietrich the painter, Lüch the modeller, Breicheisen, and the sculptor François Acier. Gradually, however, the factory ceased to be profitable, and was for many years maintained at a loss; when some years ago the king gave it up to the finance department of the state. The finest works of art are no longer produced; and it is also stated that the beds of fine clay in the neighbourhood are nearly exhausted, and that an inferior material from Zittau is used instead.[1] Various marks were placed on the wares at different periods: the first mark consisted of the letters A. R. (Augustus Rex), and was placed on all pieces not intended for sale. The well-known mark of the electoral swords, crossed, also distinguishes Dresden china. Fac-similes of these marks, and of the marks and monograms of other celebrated European potteries, are given in Mr Marryat's work.

Among the best of the Dresden works are groups from antique models; lace figures, so called from the fineness of the lace-work in the dress; flowers, evidently studied from nature; and vases richly adorned and encrusted, forming what is called *honey-comb* china. But even during the palmy time of this manufacture, namely, from 1731 to 1756, the productions were sometimes disfigured by the highly artificial taste of the age. Thus, in the Ceramic Court of the Crystal Palace, we have lately examined some curious specimens of *basket-ware*, resembling large wicker baskets, with numerous handles and small wicker doors opening at the side and moving on hinges. We may perhaps be allowed to repeat in this place some observations which we have made on one of these productions elsewhere:—"A certain ideal finish is given to the work by resting it, as it were, upon a bed of flags, whose lanceolated foliage rises up gracefully, and constitutes indeed the only pleasing part of the production, affording as it does a refreshing glimpse of nature amidst the embarrassments of art. Those only who are acquainted with the practical details of this manufacture can be at all aware of the enormous difficulties of forming one of these baskets, and passing it successfully through the furnace; and when the results have been successful, as in the cases before us, we have an infringement of one of the soundest canons of art,—namely, not to imitate an inferior material in a superior."

The first rival of Meissen was the porcelain factory of Vienna, which originated in 1720, in consequence of the perjury of a Meissen workman, as already noticed. The factory does not, however, appear to have flourished until warmed into life by the patronizing smiles of Maria Theresa in 1744, and of the Emperor Joseph. The porcelain of Vienna holds a lower rank than that of Dresden or of Berlin. It is not so light as that of Dresden, and the glazing has a grayish tint. Its chief feature is its raised and gilded work, which are in good taste, and of late years the application in relief of solid platinum and gold. The works are now in private hands, and the chief markets for the sale of the ware are in Turkey, Russia, and Italy.

As the Vienna works were based on treachery, so was the next important establishment based on the defection of a Viennese workman. A celebrated pottery was already in existence at the village of Höchst on the Nidda, when in 1740 a man named Ringler undertook to superintend the manufacture of porcelain if the proprietors would introduce it. This man appears to have been simply a knave without skill or invention: he had committed to writing the various processes of the Vienna establishment, and concealing his manuscript about his person, consulted it every time he had to give out materials to the workmen. As knavery propagates itself, the workmen, taking advantage of Ringler's fondness for wine, invited him to a feast, where they made him helplessly drunk,—when they robbed him of his papers, carefully copied his recipes, and then decamped to other parts of Germany, where they sold the secrets to those who were anxious for their possession. Hence originated from one source the porcelain factories of Switzerland, of the Lower Rhine, of Cassel, and even of Berlin. The Fürstenburg works, in the duchy of Brunswick, originated in a bribe offered by one of the dukes to a Höchst workman. The works at Frankenthal in Bavaria originated in a pottery which was visited by Ringler after he had been plundered of his papers. The factory of Nymphenburg in Bavaria had a similar origin. The porcelain of this factory is much esteemed, many of the designs having been furnished by the celebrated picture gallery of Munich. A factory at Baden was conducted by some of the Höchst workmen until 1778. The factory of Ludwigsburg, begun in 1758 under the patronage of the Duke of Wirtemberg, has executed some beautiful works, which are known as *Cronenburg* porcelain, from the town of that name, and the mark CC on its wares. The distance from which the clay and the fuel had to be procured prevented the success of this establishment. The porcelain factory of Berlin was first undertaken in consequence of the information supplied by the men who robbed Ringler; but it was not very successful until a more magnificent fraud had been perpetrated, namely, the transference of the best of the work-people, and the material of the Meissen factory, as already referred to. The Berlin porcelain was, of course, only an imitation of the Dresden, but the factory was carried on with such vigour as to yield to the king an annual revenue of 200,000 crowns. In 1790 a second royal porcelain factory was established about 2 miles from Berlin. To one of Ringler's fraudulent comrades is also due the factory established at Fulda, about 1763. The prince-bishop of Fulda established another factory in a house adjoining the episcopal palace; but it is said to have failed in consequence of the taste for porcelain extending to the dignitaries of the church, who claimed the privilege of carrying off specimens without paying for them. The porcelain factories of Thuringia originated about 1758, when an old woman having sold some sand at the house of the chemist Macheleid, his son, struck by its appearance, experimented on it, and obtained by its means a porcelain-looking substance, whereupon the Prince of Schwartzburg sanctioned the erection of a factory at Sitzerode, which was afterwards removed to Volkstadt. The abundance of fuel supplied by the Thuringian forest led to the erection of other factories, such as that of Wallendorf in Saxe-Coburg, Limbach in Saxe-Meinengen, the director of which succeeded so well as to be able to purchase the factory at Grosbreitenbach in Rudelstadt, and also that of Kloster Veilsdorf. Factories were also founded at Gotha in 1780, at Hildburghaus, at Anspach, at Ilmenau, at Breitenbach, and at Gera. All these factories had their periods of prosperity, and produced porcelain which is still esteemed by collectors. Some of them have degenerated into potteries, and some produce pipe-bowls as their only article in porcelain. Nor will our list approach completeness without mentioning a factory established by the Empress Elizabeth in 1756, near St Petersburg, which still continues to produce good porcelain from native materials. Denmark has a factory at Copenhagen; it is supported by the government, but is said to be, commercially, a failure. The factory at Zurich in Switzerland was established on the information supplied by one of Ringler's workmen. A factory at Nyons, in the Canton de Vaud, has also produced some good porcelain.

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[1] This statement is made on the authority of Mr Marryat; but at the time we are writing an account is given in the German papers of an order from Paris having been executed at Meissen, consisting of portraits of the Emperor and Empress of the French, of a medallion shape, and inclosed in a rich porcelain frame. According to the German critics, "these are the finest works of art which porcelain painting has yet produced." If this criticism be true, or even partially true, the Meissen works must have experienced an extraordinary revival.

During all this active rivalry on the Continent it will not be supposed that England had escaped the porcelain-making mania. Bow and Chelsea produced the first porcelain works. They made a soft ware from a mixture of white clay, white sand from Alum Bay, and pounded glass. The Chelsea works do not appear to have been in a very flourishing condition until George II. imported workmen, models, and materials from Brunswick and Saxony. Chelsea porcelain then became the rage, and such was the eagerness to obtain it, that it was sold by auction to the highest bidders, the dealers rushing in crowds to compete for it. Some of the best works were produced between 1750 and 1755: they are in the style of the best German; the colours are fine and vivid, and the claret colour is peculiar. Bow china, made at Stratford-le-Bow, has some resemblance to that of Chelsea, but the material is not so good. Its principal productions were tea-services and dessert-sets. In 1750 was established the factory at Derby, which became important in consequence of the introduction of the Chelsea artists, workmen, and models, the junction of the two factories being notified by the anchor and the letter D, the monograms of each manufacture. Flaxman furnished designs for the establishment; but the union did not continue long; the partners quarrelled, and one of them destroyed the models. Mr Marryat describes the Derby procelain as being very transparent, of fine quality, and distinguished by a beautiful bright blue, often introduced on the border or edge of the tea-services, the ground being generally plain; the white-biscuit figures are said to equal those of Sèvres. The Worcester works were established in 1751 by Dr Wall and some others, under the name of the Worcester Porcelain Company. The company first imitated the blue and white Nankin china; they afterwards adopted the Sèvres style, with the Dresden method of painting. These works are remarkable as being the first to make use of the Cornish stone or kaolin, discovered by Cookworthy in 1768. They are still carried on with distinguished success by Messrs Kerr and Binns. In 1772 a factory was established at Caughley, near Broseley, Colebrook Dale, the productions of which are known as *Salopian ware.* Early in the present century some good porcelain was made at Nantgarrow and Swansea; it is also stated that the Bristol china, a white ware formerly common in the west of England, was made in Wales, and sold in Bristol. We cannot conclude this bare mention of English porcelain without naming such firms as Minton & Co., Copeland & Co., at Stoke-upon-Trent. We have referred elsewhere to their works (in reviewing the collections in the Ceramic Court of the Crystal Palace), in the following terms:—"The tea-services of Messrs Minton are beautiful and delicate in form, exquisite in device, and rich in colour, and contrasting with their porcelain vases, flower vases, and enormous majolica vases, would seem to illustrate the beautiful and the sublime in the fictile art. We have also some exquisite busts manufactered by Copeland from porcelain earth, such as the bust of Clytie, reduced from the original in the British Museum, a form of art which cannot be too highly commended, since there is nothing more touching to the thoughtful mind than to be brought face to face with the worthies and celebrities of the past."

France regarded with impatience during sixty years the progress of porcelain in Europe, and although eminently qualified in point of taste, skill, and science to contribute to the ceramic treasures of the world, she was unable to compete with other nations for want of a suitable raw material. It is true that as early as 1695 a soft porcelain had been manufactured at St Cloud, and that some of the scientific men of France had endeavoured, under royal patronage, to discover the secrets of the art, but no great success was attained. The company had been established at Vincennes, but in 1756 they removed to a large building which they had erected at Sèvres. In 1760 Louis XV. bought up the establishment, probably at the instigation of Madame de Pompadour, who seems to have shared with her sex the passion for china. The factory became celebrated for its soft porcelain or *pâte tendre*, but the great point aimed at was to produce the hard porcelain which had rendered Saxony the envy of Europe. But kaolin was not known in France, nor was its presence even suspected, until about 1768, when the wife of a surgeon named Darnet of St Yrieix, near Limoges, having noticed in a ravine near the town a white unctuous earth, thought that she might relieve her husband's poverty somewhat by using it in her house instead of soap. The surgeon showed a portion of the substance to an apothecary of Bordeaux, who being aware of the search that was being made for porcelain earth, forwarded a specimen to the chemist Macquer, who recognised it as the much-desired kaolin. Assuring himself that an abundant supply could be had, he established the manufacture of hard porcelain at Sèvres in 1769. At first some difficulty was experienced in managing the colours upon the more compact and less absorbent material, so that the soft porcelain continued to be made until the year 1804.

Such, in few words, is the origin of the hard porcelain of Sèvres. The *pâte tendre* was not considered as real porcelain, but the taste and skill of the French are remarkable in carrying it to the highest pitch of perfection under many difficulties, arising from its complicated and expensive composition, and from its liability to collapse during the firing. Mr Marryat speaks of it as being "remarkable for its creamy and pearly softness of colour, the beauty of its painting, and its depth of glaze." The ware for common or domestic use had generally a plain ground, painted with flowers in patterns or medallions; articles *de luxe*, and pieces intended for royal use, had commonly grounds of various colours, such as *bleu de roi*, *bleu turquoise*, *jonquille*, or yellow, *vert-prés*, or green, and a lively pink or rose colour, named after Madame Dubarry. Skilful artists were employed upon the finest porcelain, which is adorned with landscapes, flowers, birds, boys, and Cupids gracefully arranged in medallions. Some of the specimens are painted with subjects after Watteau, and other known masters. The jewelled cups, with the *bleu de roi* ground are celebrated. The best period of the soft porcelain was from 1740 to 1769, and the tests which Mr Marryat gives to distinguish it form its highest praise, namely, "the beauty of the painting, the richness of the gilding, and the depth of colour." In point of form the Sèvres china is not equal to that of Dresden. A law was passed in 1766, and renewed in 1784, limiting the use of gold in the decoration of porcelain to the royal manufactory of Sèvres, which accounts for the rarity of old French gilded porcelain.

At the time of the Revolution many fine specimens of Sèvres porcelain in the royal palaces and mansions of the nobility were destroyed. The establishment of Sèvres, however, was supported by the revolutionary government, who appointed three commissioners to manage it. In the year 1800 the first consul appointed M. Brongniart as director. He held the appointment during forty-seven years, and originated the celebrated *Musée Céramique*, consisting of a historical series of specimens illustrative of the ceramic art in all times and among all people, together with a collection of raw materials, tools, implements, trial-pieces, models of furnaces, &c. On our visit to this museum, we were particularly struck with a collection of *failures*, or specimens showing what had been done to overcome faulty results, and what it was hopeless to attempt. M. Brongniart is also the author of a classical work on the art to which he devoted his life with such distinguished success.[1] M. Ebelman succeeded Brongniart as director, and held the appointment for a year or two. The present director, M. Regnault, was appointed by the Emperor Napoleon III.

The following is a list of the more celebrated porcelain manufactures of France :—Chantilly, which owed its origin in 1735 to a workman from St Cloud; Menecy, founded in 1735 under the patronage of the Duc de Villeroi; Sceaux-penthièvre, established in 1751; Clignancourt, 1750, under the patronage of the Duke of Orleans; Etiolles, near Corbeil, 1766; Bourg la Reine, Paris, 1733. Lille, established, it is supposed, in 1708, when the Dutch were masters of the town; Arras, 1782; Tournay, 1750. At St Amand les Eaux, near Valenciennes, and at Tournay in Belgium, are two factories, the only two in Europe where the old *pâte tendre* of Sèvres is still produced.

As respects Italy, a factory was established at Doccia, near Florence, at the beginning of the eighteenth century. Venice also manufactured porcelain until 1812. There was also a factory at Vineuf, near Turin; but the most famous factory in Italy is the Capo di Monti at Naples, founded by Charles III. in 1736. This sovereign appears to have excelled the other royal amateurs of Europe in the ardour with which he cultivated the ceramic art, and he even surpassed Augustus III., who was nicknamed by Frederick of Prussia "the Porcelain King," and who exchanged a whole regiment of dragoons for some huge useless china vases. Charles III. even worked in the factory with his own hands, and held an annual fair in front of the royal palace at Naples, where there was a shop for the sale of the royal productions; and there was no more certain road to the king's favour than to become a purchaser. When Charles became king of Spain he founded a factory at Madrid, and that at Naples declined. His successor Ferdinand sanctioned the erection of other porcelain works, and allowed the royal workmen to assist in their formation; and they appear not only to have assisted but to have robbed the parent factory of its gold and silver models and other valuables. The royal factory was closed in 1821. The porcelain of Capo di Monti is not, as is commonly the case, an imitation of that of some rival factory. Its beauty and excellence are due to the design from shells, corals, embossed figures, &c., artistically moulded in high relief. Mr Marryat regards the tea and coffee services of this ware as perhaps the most beautiful porcelain articles ever produced in Europe, for transparency, thinness of the paste, elegance of form, and gracefully-twisted serpent handles, as also for the delicate modelling of the ornamental groups in high relief, painted and gilt, contrasting well with the plain ground. The factory at Madrid was conducted with the utmost secresy during several reigns, but was destroyed by the French in 1812. Portugal has a factory of hard porcelain near Oporto.

The prices paid for porcelain are high. As much as L.150 has been paid for a single specimen of majolica; while a service of Chelsea ware has cost L.1200. One of Sèvres, of a good period, 30,000 livres; while the Dresden ware was equally costly. Although our modern manufacturers have produced porcelain rivalling that of the best periods of celebrated works, the price still continues to be necessarily high, where the materials require to be treated with the precision of a chemical process, and the design and ornamentation require high artistic skill. Mr Minton received L.1000 for his service of turquoise and Parian; Lord Hertford gave L.1000 for two vases; Mr Mills the same; one of the Queen's vases has been valued at L.1000, and Lord Ward gave L.1500 for a dessert service of Sèvres. Such works as these, however, belong rather to the fine arts than the useful arts, to be preserved in cabinets and museums. Formerly it was customary on great occasions to serve the guests on porcelain, which gave to wealth a real distinction. In those days the transition from porcelain to earthenware was abrupt; but through the exertions of Wedgwood and others, porcelain now descends through numerous varieties of material, style, taste, and decoration; so that every class of consumer may suit his own taste and means. Our trade in earthenware has of late years gone on increasing. In the year 1835 the declared value of earthenware exported from the United Kingdom was L.540,421; in the year 1857 it amounted to L.1,488,668. Our exports extend to most parts of the world, including Russia, Austria, Turkey, and even France. The United States of America take nearly the half of our exports in earthenware, so little has the potter's art been encouraged in the New World. Our exports to foreign countries would doubtless be larger if the restrictions were fewer and less clumsy. In Germany and Italy the duty is levied on the weight; so that Wedgwood, on account of the lightness of his ware, was long able to command the market in those states. In France the duty on common English china of one colour, without gilding or ornament, is 164 francs per 1000 kilogrammes (200 lb.); for fine china, 327 francs for the same quantity. The most whimsical of all tariffs is that of Portugal, where the charge is according to the number of colours; so that, as Mr Wall remarks, "no man's pocket could stand the choice of a rainbow pattern."

SECT. II.—THE MATERIALS.

Clay, which forms the basis of pottery and earthenware, is not only abundant and widely diffused, but presents so many varieties that much experience and judgment are required in adapting the kind of clay to the article to be manufactured. Brongniart enumerates 167 varieties of clay, and states their physical and chemical characters, composition, locality, and application.[2] Some of the commonest varieties of clay consist of—1. *Pipe-clay.* It has a grayish-white colour, a smooth greasy feel, an earthy fracture; it adheres to the tongue, and is plastic, tenacious, and infusible. It becomes of a cream colour when fired; and is used for tobacco-pipes and white pottery. It is found near Poole in Dorsetshire.—2. *Potter's-clay.* This is of various colours; those used in the Staffordshire potteries are the *brown* and *blue* clays from Dorsetshire,[1] and black and cracking clays from Devonshire. The colour of the black clay is due to bitumen or coaly matter, which disappears in passing through the kiln; so that the wares formed of it are almost white. Cracking clay is esteemed on account of its whiteness, but as it is liable to crack during the firing, it must be mixed with other clays which are free from this defect. Brown clay when passed through the gloss oven sometimes causes the glaze to crack, or *craze*, as it is called. For ordinary purposes blue clay is preferred; it can be mixed with a larger proportion of flint than the other varieties, and thus produces a white ware. Potter's clay, mixed with sand, is formed into bricks and tiles.—3. *Stourbridge clay.* This is of a dark colour, from the presence of carbonaceous matter, and from its being more refractory than potter's clay, it is largely employed for glass pots, crucibles, &c.—4. *Brick clay* or *loam* is abundantly met with on the London clay, and is often found on an interposed bed of sand. Its appearance, texture, and composition vary greatly; and the colour depends on the proportion of oxide of iron contained in it.—5. *London clay.* This is an extensive deposit of bluish clay: although near the surface, it frequently has the usual clay colour. It extends over the greater part of Middlesex, a portion of Norfolk, and the whole of Essex and Suffolk. It is often found near the surface; but the lower beds are sometimes yellowish, white, or variegated. Organic remains are found in it.—6. *Plastic clay.* This skirts the London clay within the London chalk basin, and is also found in the Isle of Wight. This formation comprises a number of sand, clay, and pebble beds, alternating irregularly, and lying immediately on the chalk.

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[1] *Traité des Arts Céramiques ou des Poteries considerées dans leur histoire, leur pratique, et leur theorie,* par Alexandre Brongniart, &c., &c., 2 vols. 8vo, with an Atlas of plates, Paris, 1844.

[2] Under the article BRICK will be found a notice of the various coarse clays employed.

The above varieties of clay are mixed with such substances as carbonate of lime, magnesia, protoxide of iron, manganese, finely-divided quartz, felspar, mica, organic matter, &c., which greatly modify its properties and applications. Pure clay is soft, more or less unctuous to the touch, white and opaque, and has a characteristic odour when breathed upon. It is a compound, or perhaps only a mixture, of the two earths, alumina and silica, with water. Silicate of alumina enters largely into the composition of many crystallized minerals, among which is felspar, so abundant an ingredient in granite, porphyry, and other ancient unstratified rocks. Under certain circumstances the felspar undergoes decomposition, and is converted into a soft friable mass. In certain districts of Devonshire and Cornwall the felspar of the white granite is often disintegrated to a great depth, and the rock becomes converted into a substance resembling soft mortar. This being collected, is thrown into a stream of running water, which washes off the argillaceous portions, and holds them suspended while the heavier quartz and mica subside. At the extremity of these streams the water is dammed up, forming *catch-pools*, where the pure clay sinks and forms a solid mass, which, when the water has been drawn off, is dug out in blocks, and placed on shelves called *linnees* to dry. It is next stove-dried, crushed, packed in casks, and sent to the potteries, under the name of *china clay*, or *kaolin.* It consists of 80 parts alumina and 20 silica; a proportion of undecomposed felspar, under the name of *china-stone*, is sometimes added to the ingredients for porcelain. In the year 1855 as much as 60,188 tons of china clay was shipped from Cornwall, and 19,961 of china-stone; while Devonshire shipped 20,000 tons of pipe-clay, and 1100 of china-clay. Of late years improved methods have been adopted for getting out the china clay in Cornwall. At the Lee Moor clay-works, for example, Mr Phillips, the managing director, has introduced the following arrangements:—The decomposed felspar is transferred directly from the quarry to the works, where it is thrown into hoppers, and passes into a trough under the action of a full stream of water, encountering on its way a series of knives and iron arms furnished with teeth, which thoroughly beat up the clay in its passage along the trough. Pure spring water is used in the operation, and great care is taken to exclude the surface drainage from the peat soil of Dartmoor. As the water leaves the trough it flows through sieves, which separate the coarser fragments of quartz, and the fluid, charged with clay and mica, passes on; the mica breaking up into thin scales, has a tendency to float, but being heavier than the suspended alumina, it gradually subsides under the regulation of the current, which is now not sufficiently rapid to carry on the mica, nor sufficiently sluggish to allow of the deposition of the clay. When at length the stream holds nothing but pure clay, it is allowed to flow into deep V-shaped channels, which terminate in large covered reservoirs, in which the clay is deposited. Warm-air pipes circulate beneath the reservoirs, so as to produce a temperature of about 90°. The fine clay soon subsides, so as to allow of the clear water above it being drawn off. The mineral *pegmatite* is also valuable, as containing all the ingredients for hard porcelain. It consists of felspar, kaolin, and a small proportion of prismatic quartz. The mineral must, however, be in the state of decomposition already referred to. The quartz gives whiteness and transparency to hard ware; but for soft porcelain bones are substituted. These melt into a kind of semi-transparent enamel, which imparts transparency to the ware. *Steatite*, or *soap-stone*, is also an ingredient in porcelain. The *statuary* porcelain known as *Parian* or *Carrara*, from its similarity to those beautiful marbles, owes its effect chiefly to the use of a soft felspar instead of Cornish stone; while its agreeable yellowish-white tint is due to the presence of a small portion of oxide of iron contained in the clays and the felspar.

The property possessed by clay of forming a perfectly plastic mass with water, and of being permanently fixed by heat, has led to its employment in the manufacture of bricks and vessels of various kinds, but it undergoes a large amount of contraction in drying and burning, to diminish which the clay is usually mixed with a considerable proportion of quartz-sand, or with the powder of previously-burnt clay. The quartz in pottery ware is in the form of flints; these are obtained from the chalk districts of Gravesend and Newhaven; they are white outside, but dark and clear within. Such flints should be selected the fracture of which is free from yellow or iron stains.

The preparation of the clay for such coarse articles as tiles consists first in *weathering*, or spreading it out to the action of the air, so that by absorbing water the particles may separate, and the clay work freely. It should be exposed to at least one night's frost, or to one day's sun, before a second layer is added to the first. The weather-clay is cast into pits, and left for some time covered with water to *mellow* or *ripen.* Before being used it is tempered by grinding in a pug-mill. This differs somewhat from that described under BRICK, it being tapered at both ends, and the hole is at the bottom instead of in front. If the clay be *foul*, or contain many stones, it is *slung*, or cut into lengths of about 2 feet with a *sling* or wire-knife, and then further divided into slices of three-quarters of an inch in thickness, during which operation the stones fall out, or are picked out. The clay goes once more through the pug-mill, and is then ready for the moulder. For chimney-pots and such articles the clay is slung once or twice, and pugged or ground two or three times.

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[1] In the year 1855 there were exported from Poole in Dorsetshire 53,702 tons of Poole clay, and 582 tons were sent to London by railway.

Materials.

The clay for fine pottery undergoes a number of preparatory processes. Two or more kinds of clay being put together in proportions according to the judgment of the manufacturer, they are thrown into a trough with water and left for some hours. They are then well worked with a long blade of ash furnished with a cross-handle, named a *blunger*, until a smooth pulp is formed, a pint of which weighs 24 ounces, or, in the case of china clay, 26 ounces. The operation of *blunging*, as it is called, may be assisted by pugging the clay in an iron cylinder furnished with knives on the inside, and a moving vertical axis also containing knives, which by their joint action divide the clay, and by their position force it downwards, and out through an opening at the bottom. It is then removed to a vat, mixed with water, and blunged by means of cross-arms attached to a perpendicular shaft. In this operation stony particles sink to the bottom.

The flints having been heated in a kiln, and plunged in cold water to increase their brittleness, are crushed into fragments by means of stampers, and are next reduced to powder in a *flint-pan*. This is a circular vat 10 or 12 feet in diameter, the bottom of which consists of masonry of quartz or felspar. In the centre is a vertical axis, from which radiate four arms for moving the *runners:* these are masses of *chert*, a hard siliceous stone found near Bakewell in Derbyshire. The broken flints are thus ground with water, and in the course of some hours are reduced to powder, which forms with the water a creamy mixture. Felspar, broken porcelain, &c., is sometimes ground up in the same manner in smaller vats. The creamy mixture is transferred to another vat furnished with a vertical shaft and arms, and being diluted with water, the arms are set rotating, the effect of which is to keep the finer siliceous particles suspended, while the coarser ones sink to the bottom. The former are drawn off with the water, and the latter are sent back to the flint-pan. The water thus drawn off is received into a reservoir, in which the finer particles subside. The creamy mixture of flint and water is fit to mix with the clay when a wine pint of it weighs 32 ounces. The proportions, however, in which the clay and the flint are mingled vary greatly with the kind of ware intended to be made, and the experience of the manufacturer.

These proportions being determined, the ingredients are first mingled by being agitated together, after which the mixture is passed through sieves of fine hard-spun silk, arranged on different levels, so as to run through comparatively coarse into finer sieves, and produce a smooth, uniform mixture of *slip*, as it is called. To assist the easy passage of the mixture a jigging motion is given to the sieves. The water which has thus far served as a vehicle for the ingredients, is next got rid of by evaporation in the *slip-kiln*. This is a long brick trough, heated by flues underneath, and capable of raising the water to the boiling point. During the heating the slip is diligently stirred to prevent the heavier flint from subsiding, and also to prevent the flint and clay from forming a kind of mortar with the water. When bubbles of steam cease to form, the operation is at an end. In countries where fuel is not so abundant as in England, the water is got rid of by filtration, assisted by mechanical pressure, or by rarefying the air beneath the filter by atmospheric pressure.

When the stuff is of uniform texture and sufficiently hard, it is cut up into wedges which are dashed down upon each other, in order to get rid of vesicles and air-bubbles, which might afterwards form blisters in the ware. To obtain a fine grain the clay should be *wedged* at intervals during several months. It is stated that in China the stuff is prepared many years in advance. The French missionaries were informed that it was customary to prepare the stuff for a hundred years (*pour cent années*), whence arose a fanciful derivation of the word porcelain. However this may be, there is no doubt that newly-made stuff produces bad ware, and that *ageing* greatly improves it. During the last-named process a kind of fermentation sets in, carbonic acid and sulphide of hydrogen are liberated, and the mass improves in texture and colour. These gases are doubtless formed at the expense of the carbonaceous and organic impurities of the clay or of the water, whence the improvement in colour; while the disengagement of the gas accounts for the improvement in texture. The next process is *slapping*, in which the workman takes up a mass of the paste and dashes it down with violence, then dividing the mass with a wire, he dashes the top portion on the lower; this is done many times, care being taken to preserve the *grain*,—that is, to slap the layers parallel to each other, and not obliquely, otherwise the paste would be liable to fall apart during the firing.

Manufacture.

SECT. III.—THE MANUFACTURE.

There are three processes by which fictile articles are shaped,—namely, *throwing*, *pressing*, and *casting*. Of these, throwing is the most common, and by far the most ancient. It is performed by means of the potter's wheel or lathe, which is a disc of wood fastened to the top of a vertical spindle, and made to rotate by being connected by means of a strap with a multiplying wheel driven by an attendant. The paste, as it is received from the slapper, is of the consistence of dough. The thrower's attendant cuts it up into portions, weighs each, according to the quantity required for the intended article, and rolls each portion up into a ball. The thrower, seated before his lathe, dashes one of the balls down upon the rotating board, and with the fingers, which are frequently dipped in water, raises the lump into a conical form, presses down the mass to get rid of air-bubbles, and with one hand, or finger and thumb, in the mass, gives shape to the intended article; he is also furnished with a piece of horn or porcelain called a *rib*, the edge of which accurately represents the curve of the vessel. With this he smooths the inner surface, and gives it shape. During this operation the assistant turns the wheel with varying rates of speed, so that the centrifugal force may act differently in different conditions of the growing vessel. The thrower is furnished with a rude kind of fixed gauge, consisting of an upright stick, from which projects a horizontal rod at such a height above the whirling table as to enable the thrower to make all the articles of one kind very nearly of the same size. When one article is finished, it is removed by passing a wire beneath it, and is set aside in an airy or a warm room until sufficiently consolidated for the next operation, which is *turning*. As it would not be possible for the thrower to produce articles sufficiently thin, they are reduced in size by being put on the chuck of a lathe, and turned to shape by means of cutting tools, the material flying off in long, broad shavings just as if it were wood. When it has thus been properly thinned and brought to shape, the vessel is smoothed and solidified by the pressure of a broad tool upon its surface. Handles, spouts, &c., are formed separately, and are attached to the articles by means of slips. Flowers, leaves, &c., are formed partly in moulds and partly by hand, and are stuck on separately. The article is lastly trimmed with a knife, and cleaned with a damp sponge, and is ready for the kiln.

By the process of pressing, such articles as plates, dishes, saucers, &c., are formed. The exact pattern, say of a plate, having been determined by means of a model, a number of plaster casts are taken, one of which the plate-maker places on a whirling table, bats out a sufficient quantity of paste by means of a plaster mallet, and when sufficiently extended, places it on the mould, much in the same way as a housewife would cover a pie with paste. The table is then set whirling, and a profile or shape in earthenware being brought down upon the paste, gives the required form to the bottom of the intended plate. When the plate-maker is satisfied with his work, the mould, with the plate in its *green* state, as it is called, upon it, is conveyed by a boy to a warm room, and he brings back an empty mould, which has been drying, for another plate. In about two hours the plate is sufficiently dry to be removed from the mould, but the mould itself is left to dry before it is used again. One man and two boys can produce from sixty to seventy dozen of common plates in a day of ten hours, the same mould being used some five or six times during the day.

The above operation is called *flat-ware pressing.* Deep vessels are formed by what is called *hollow-ware pressing* or *squeezing*, for which purpose the mould consists of several parts, which fit accurately together by means of projecting pins and cavities. The clay having been batted out, the several parts of the mould carefully lined with it, and the points of junction well worked and wetted with slip, are brought together and secured by a cord, when the joints are further well worked and pressed, thin rolls of clay being sometimes inserted, and the whole worked and smoothed with moist leather and a cow's lip. The interior is then washed with a sponge, set aside for a time, and, when somewhat solidified, is worked or polished with a flexible plate of horn; it is next put into a warm room, and when the plaster has absorbed sufficient moisture, the article is removed from the mould and *fettled* or trimmed with proper tools to get rid of seam marks. The outside is also cleaned with a moist sponge, and the handles, &c., having been added, and the horn again used, it is set aside for baking. For elaborate works, models are first formed by experienced artists in clay, and the moulds for the separate parts may be numerous. Works of a comparatively simple character are formed by the united agency of throwing and moulding.

By the third process, called *casting*, such delicate articles as egg-shell china are formed. The paste having been reduced to a creamy state, is poured into a plaster-mould, which, absorbing water from that portion of the paste which comes in contact with it, fixes it, so as to allow the remaining fluid portion to be poured off. A very thin coating of paste is thus left attached to the mould; when this is sufficiently dry, the mould is again filled for a short time with the creamy mixture, when a second thin deposit is formed upon the first. The mould having been dried in a warm room, the cast is taken out, examined, and touched upon by the modeller. Busts and statuettes are also formed in this way; but as they shrink as much as one-fourth during the firing, considerable dexterity is required to preserve their shape. The lace which is sometimes seen on these figures is real lace, dipped into slip, when the heat of the kiln destroys the thread, and solidifies the paste, which takes its place.

Encaustic tiles are made by what may be called a fourth process, namely, *veneering.* They consist, as we saw them made at the works of Mr Minton (to whom this branch, as well as other branches of the ceramic art is so deeply indebted), of a body of red clay, faced with a finer clay for the pattern, and strengthened at the bottom with another clay, the junction of these layers apparently preventing warping. After the usual preparatory processes, the red clay is slapped into the form of a quadrangular block, from which the tile-maker cuts off a slab with a wire, and upon this the facing of finer clay, coloured to the required tint, is batted out and slapped down. The bottom facing is added in a similar manner. The tile is then put into a box-press, when a plaster of Paris slab, with the pattern in relief, is brought down on the face of the tile, and impresses in the soft tinted clay the design, the hollow being afterwards filled up with clay of another colour. At the same time, the maker's name is stamped at the back, together with a few holes to make the mortar adhere. The coloured clay, in a creamy state, is next poured over the face of the tile, so as completely to conceal it, and when, in the course of twenty-four hours, this coloured slip has become hard, the superfluous clay is scraped away, the coloured clay being left only in the hollows formed by the pattern-mould. The tile having been finished off with a knife, and defects corrected, is kept during a week in a warm room, called the *green-house*, and the drying is finished in a warmer room, called the *hot-house*, preparatory to firing.

The various articles of pottery, stone-ware, or porcelain having, by one or other of the processes named, been perfected as to form, and handles and other appendages, and solid ornaments added, are now in what is called the *green* state. The next process is to fix them, and deprive them of their plastic nature by the action of heat. The *potter's kiln* consists of a massive domed cylinder of brick-work, bound with iron, and protected from the weather by an outer conical hood or casing. The dome contains openings for the exit of the smoke, which escapes into the air through a chimney in the hood. Heat is supplied by means of six or eight fire-places fixed round the cylinder, with proper circulating flues and dampers for regulating the draught. During the firing, the ware (unless of the commonest kind) is not exposed to the direct action of the fire, but is carefully packed in strong vessels, shaped very much like band-boxes; they are made of Staffordshire marl, and are called *seggars.* The pieces must be packed in the seggars in such a way as to economize space, and yet give them the full benefit of the heat; at the same time, they must be arranged according to their size and solidity, so that small and delicate articles may not vitrify under too strong a heat, and large ones have heat enough. Some articles admit of being placed in contact, so as to support each other and prevent distortion. When the pieces are large or complicated in shape, they may require special supports to prevent warping; these supports are of fire-clay, and nicely fit the parts supported. Articles in porcelain are sometimes separated during the firing by means of sand or powdered flint; but the contrivances of this kind are numerous. When the seggars are filled, they are conveyed to the furnace, and piled up so that the flat bottom of one seggar may form a cover to the open mouth of the seggar immediately beneath it, the surfaces being separated by a ring of soft clay, which forms a tight joint. As many as 30,000 pieces of ware may be included in one baking. When the seggars are properly arranged in piles, or *bungs*, as they are called, and steadied by means of short struts, the door of the kiln is closed with brick-work, the fires are lighted, usually in the evening, and are urged during the whole of the night, so that flame may be seen issuing from the chimney. Early in the morning the man draws his first *watch.* Watches or trial-pieces are small rings of fire-clay, which vary in colour with the temperature; a number of these are placed within the kiln in such positions that the man can withdraw them at pleasure by inserting a long iron rod through holes in the side of the kiln. The heat is regulated according to the aspect of these watches, and when, after thirty or forty hours, the firing appears to have been satisfactory, no more fuel is added, the fires are left to go out, and the kiln gradually cools during the next twenty or thirty hours. As much as fourteen tons of coal may be consumed in one firing. There can be no doubt that a very large proportion of this fuel is wastefully expended: our present abundant native store of coal leads to much extravagance in our various factories; and it has been suggested by M. Arnaux, a competent authority, to fire the ware by means of gas, which, he thinks, can be done with an ease and precision unattainable by the present system.

When the ware is removed from the kiln, its characters are found to have undergone a remarkable change. Instead of a soft, dull, friable or plastic material, we have a hard, brittle, resonant, light-coloured, porous body. In this

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state it is called *biscuit*, from its resemblance to well-baked ship bread. Wine-coolers and similar porous articles, when brought to this state, are finished; but most articles, especially of earthenware, must be covered with some kind of vitreous glaze, to remove their porosity and liability to tarnish, and to render them fit for use. If coloured ornaments have to be added, these are first put upon the biscuit, and the glaze, in the form of a white powder, is then made to cover the whole article, which, being passed a second time through the fire, the powder melts into a glass, which forms the ordinary surface of common wares. The firing is a costly process, from the great expenditure of time and fuel, and this second firing still further increases the cost of the ware. It thus became a great improvement when Wedgwood was able so to compound the ingredients of his ware that partial vitrification took place at the first firing, thereby depriving the ware of its porous character, and rendering a second firing unnecessary. So also, in the commonest kind of stone-ware, such as is made at the Lambeth potteries, the glazing is, by an ingenious device, effected simultaneously with the baking. When the ware has attained a very high temperature in the kiln, a quantity of moist salt (chloride of sodium) is thrown in; the salt is volatilized and decomposed in the presence of moisture, and by contact with the heated surfaces of the clay, hydrochloric acid is disengaged, and the ware becomes covered with silicate of soda, which, combining with the silicate of alumina of the ware, forms a fusible double alkaline silicate or glaze on the surface.

The object of the glaze being to render the article impermeable by water, attempts have been made to accomplish that end in various ways. Certain rude nations render their wares impermeable by rubbing them while hot with tallow, which, becoming partially decomposed, fills up the pores, and imparts a black colour. Even the vases of the artistic Etruscans and Greeks have not a vitreous but a carbonaceous glaze, which wears off in the handling. The wine and oil jars of Spain and Italy are made watertight by the ancient method of rubbing them over with wax. The most common description of glaze is, as its name *glaze* or *glass* implies, vitreous. It is of two kinds, *transparent* and *opaque*. When the ware is of good colour, and the ornaments are impressed upon it, the glaze may be transparent; but where the clay, otherwise good in quality, is bad in colour, an opaque glaze, or *enamel*, as it is then called, is used. In some cases, articles made of a good clay, of a bad colour, may, before firing, be dipped into a slip of white clay, and being thus veneered, admit of taking a transparent glaze. Glazes coloured by means of a metallic oxide are also sometimes used. The glaze should not have too strong an affinity for the paste, or during the second firing it may be absorbed into the ware instead of remaining at the surface, to which it should adhere firmly, and expand and contract equally with the ware, so as not to be liable to craze or crack. Numerous substances are employed in the composition of glaze. For very hard ware, in which the point of fusion is high, the felspars and certain volcanic scoriæ are used; in other cases, common salt, potash, boracic acid, phosphate of lime, and sulphate of baryta, are the ingredients. Another class of glazes contains earthy and metallic substances, mixed or fritted into a glass; such are silica and lead, or enamels of silica, tin, and lead. Some glazes contain metallic oxides, such as those of manganese, lead, and copper. Metallic and earthy substances, if not previously fritted, form a glaze with the silica of the paste in the gloss oven. Such glazes, however, are commonly soft, and liable to be acted on by acid and fatty substances; so that lead glazes should be avoided for articles intended to receive food. In such cases, borax may be advantageously substituted for lead. A pure white paste is improved by a transparent glaze, but if of bad colour, it may be dipped into opaque glazes even before the first firing. Glazes are made opaque by means of oxide of tin; colour is given by the oxides of manganese, copper, and iron; while, by introducing these, together with the oxides of cobalt and of chromium, into opaque and transparent glazes, an agreeable variety is produced. Pegmatite forms a good glaze for hard porcelain; but for soft porcelain a glass is fritted and mixed with oxide of lead, or with earthy substances.

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In applying the glaze to the biscuit, it is reduced to a fine powder, and mixed with water. When the biscuit is plunged into this mixture, the porous material immediately absorbs a quantity of the water, and leaves the powder equally distributed over its surface. When articles are glazed and fired at one operation, the ware in its green state is not absorbent, so that the glazing has to be put on with a brush. For articles which are glazed on the inside only, such as pipkins, the glaze is made creamy with water, and poured into the vessel and then out again, a sufficient quantity adhering to the surface by this means. Custom requires that jars shall have a portion of their surface of a deeper brown than the natural colour of the material; they are therefore dipped to a certain height in a mixture of red ochre and clay slip. The glazing is completed during the firing by means of common salt, as already noticed.

The pieces having been covered with white powder, are arranged in seggars to protect them from the direct action of the fire in the gloss oven. They are separated from each other by means of supports, which present the smallest possible surface of contact. These supports, known as *cockspurs, triangles, stilts*, &c., have points projecting from them above and below, which serve to separate, while they support, the articles as they are piled up in the seggars. The seggars are piled up in the glaze-kiln in the same manner as in the biscuit-kiln, and the temperature is raised to a point sufficient to fuse the glaze into a transparent glass, and to unite it perfectly with the surfaces of the ware. To enable the workmen to determine when the proper temperature has been reached, watches, or rings of clay, covered with glaze, are placed in the oven, and drawn out from time to time.

SECTION IV.—THE ORNAMENTATION.

The love of ornament, which forms part of that higher sense of beauty common to our nature, requires the addition of some kind of adornment to articles in common use. The rude pottery of savage nations is relieved in this way, and often with considerable taste. It may admit of question whether our own taste is equally correct in the elaborate decorations which we bestow upon articles intended for everyday use. Plates of Sèvres porcelain, richly decorated with landscapes, or portraits of distinguished individuals, may have a high artistic value, but are certainly not adapted to be placed before the company at a dinner table. A dessert or dinner plate is not in itself remarkable for beauty of form; but its effect is absolutely hideous when it is made to take a prominent part in decoration. In the palace at Fontainebleau we were introduced to a room, the walls of which were decorated with plates of Sèvres china, arranged in horizontal lines. In such an example, the costliness of the material and the skill of the artists were rendered simply ridiculous. So also the rich blue and gold of a tea-service have too heavy an effect, when the feeling of grace and lightness ought to be inspired. The leading idea in ceramic ware should be that of purity. The white colour would sufficiently suggest this if it were not concealed by ornament, just as that pure material glass, when not spoilt by the glass-cutter, reveals the unsullied transparency of the water or of the wine contained in it. The artist may exercise his taste in producing beauty of form, but the ornamentation of that form should be of the simplest character, only just calculated to relieve the beauty of the material. Our limited space will not allow us to enlarge on this subject, so that we at once proceed to a brief notice of the mechanical and chemical means by which ornaments are applied to pottery and porcelain.

When common ware is to be ornamented with a pattern, it is put on before the glazing. The blue pattern of an ordinary plate is printed on the biscuit with an ink composed of boiled linseed oil, resin, tar, and oil of amber, coloured by means of a mixture of oxide of cobalt, ground flint, and sulphate of baryta (fritted and ground), and blended with a flux of ground flint and thick glass powder, which serves to fix the colour. The ink is made fluid by spreading it on a hot iron plate. It is taken up by means of a leathern dubber, and transferred to engraved copper-plates, also heated, and the superfluous colour is scraped off with a palette-knife, and the surface of the plate is cleaned with a dossil. A sheet of yellow unsized paper is next dipped into soapy water, and placed on the copper-plate, which is thus passed through a cylinder press. The pattern is thus transferred to the paper, which is taken by a girl called the *cutter*, who cuts away the unprinted portions, and leaves the pattern in separate parts. These are taken by a woman called the *transferrer*, who places each portion with its printed side next the biscuit, and rubs it with a flannel rubber, until the ink is properly absorbed. The pattern-papers are subsequently removed by placing the biscuit in water, and gently washing it with a brush. The biscuit is next dried in an oven, and is then ready for glazing; the heat of the gloss oven vitrifies the glaze, and allows the pattern to be seen through it. Instead of paper, a flexible sheet of glue, called a *paper* or *bat*, is in some cases used for transferring the design. The impression is taken in oil from the engraved plate, and after it has been transferred to the biscuit, the required colour is dusted over it in a dry state. The sheet of glue can be cleaned with a sponge, and can be used over and over again.

When the pattern is required to produce high artistic effects of form and colour, the work is performed by hand with a camel-hair pencil. The colours consist of metallic oxides ground up with such vitrifiable substances as glass, nitre, and borax, oil of turpentine or of lavender being the usual vehicle. The greatest difficulty which the artist has to contend with arises from the fact, that the colours are for the most part dingy and unpleasing, and give no idea to an inexperienced eye of the intended effect.[1] It is not until the heat of the furnace has driven off the oil, and chemically combined the ingredients of the colours, that the effect can be judged of. The artist has thus to work, as it were, in the dark: he is not cheered with the idea of progress, as in ordinary oil-painting, where the work seems to grow into life, and to develop new details of beauty at every touch. Even after the first firing, it by no means follows that success has been attained. The work may have to be re-touched, and again passed through the fire, or it may be injured by one or other of the numerous accidents to which a work is liable which has to pass through the fire.

The colours used are formed by the combination of certain metallic oxides and salts with certain fluxes, by means of heat, which enables them to fuse into coloured glasses. The oxides are usually those of chromium, of iron, of uranium, of manganese, of zinc, of cobalt, of antimony, of copper, of tin, and of iridium. The salts and other bodies used for imparting colour are the chromates of iron, of baryta, and of lead, the chloride of silver, the purple precipitate of cassius, burnt umber and burnt sienna, red and yellow ochres, &c. Some of these develop their colours under the influence of the highest temperature of the porcelain furnace, and are hence called by the French chemists *couleurs de grand feu*; others, and by far the larger number, are termed *muffle-colours*, inasmuch as they become developed under the more moderate heat of the muffle, which is a kind of seggar, in which the painted ware is inclosed, to protect it from the fuel. The first class of colours is limited to the blue produced by oxide of cobalt, the green of oxide of chromium, the brown produced by iron, manganese, and chromate of iron, the yellows from oxide of titanium, and the uranium blacks. Those colours form the grounds of hard porcelain, and as the heat employed in firing it is capable of fusing felspar, that substance is used as the flux. For an indigo blue, four parts oxide of cobalt and seven parts felspar, or for a pale blue, one part oxide of cobalt and thirty parts felspar, are well pounded, mixed by repeated siftings, and vitrified in a crucible in the porcelain furnace. The resulting glass is reduced to powder, ground up with a volatile oil, and applied to the surface of the biscuit, which, being again raised to the high temperature of the porcelain furnace, the colour fuses, and becomes incorporated with the substance of the ware. The high temperature required for cobalt has, however, this inconvenience, that a portion of it becomes volatile, so as to affect objects placed near it. In this way a white vase in the same furnace may derive a blue tint from the vapour of the cobalt. This colour is also uncertain in its results: it sometimes leaves white uncoloured patches, or forms a dull granular surface. Oxide of chromium may be employed without a flux to give a green colour to hard porcelain; but as it does not, under such circumstances, penetrate the ware, it is liable to scale off. A bluish-green is produced from three parts oxide of cobalt, one part oxide of chromium, and one-tenth of felspar, without fritting. Mixtures of the oxides of iron, manganese, and cobalt, produce a fine black, and by omitting the cobalt, various shades of brown.

The muffle colours are too numerous to be stated here; they are fired at a temperature equal to about the fusing point of silver. Many of them would become more brilliant and solid under a greater heat, but this would be injurious to those colours which are obtained from the purple precipitate of cassius,[2] on which the artist relies for some of his finest effects, such as fine purple, violet, and carmine tints.

In preparing metallic oxides and their fluxes sound chemical knowledge is required, otherwise the results cannot be depended on. The chemist relies on the stability of nature, as revealed to him by his science; he reduces his materials to a state of chemical purity, and compounds them according to the law of definite proportions. In order, for example, that the yellow colour imparted by chromate of lead shall be identical at all times, the compound must obviously consist of nothing but equal equivalents of oxide of lead and chromic acid. In such case, if the pigment be applied at different times under the same circumstances, it will produce precisely similar results; but if either of the proximate elements of the salt be impure, no reliance can be placed on the compound. Different specimens will produce different results, although the same mode of applying them be always observed. In some cases, however, not even the chemical purity of the ingredients will insure harmonious results. The physical condition of one of the ingredients may be of importance, as in the case of oxide of zinc, an ingredient in some of the enamel greens, yellows, yellow-browns, and blues. If the oxide be lumpy, granular, dense, and friable, it will produce a dull pigment, although chemically pure, while a light flocculent impalpable oxide, chemically identical with the former, will give satisfactory results. It is further necessary that solutions of a metal be made at the same temperature, that the acids which dissolve it be of the same strength, that the precipitate be neither more nor less rapid on one occasion than on another. Such conditions as these require to be carefully studied and noted, as, indeed, has been done in the laboratory at Sèvres, where minute records are kept of the processes required for compounding the colours.

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[1] Attempts have been made to construct a palette of enamel colours which do not change colour in the firing, but only change from a dullness to a creaminess of texture. A case of this kind is mentioned by Brongniart, but the success attained by the inventor, M. Dihl, was only partial; since the rose tints, purple, and violet, produced by the precipitate of cassius, which cannot be prevented from changing under the action of heat, were omitted. Besides this, the action of the surface, and the different kind of glaze upon the colours were not taken into account.

[2] This pigment is formed by adding a solution of gold in *aqua regia* to one of chloride of tin.

But even when such conditions as the above are known and observed, there are others so slight as scarcely to be appreciable, but which, nevertheless, have an influence on the colour. With certain delicate pigments, the porphyrization or grinding with water or oil a little more or less, the difference of touch of different artists in laying on the same pigment, will produce differences in tone, although all the other conditions be strictly observed.

Dumas defines the process of painting on hard porcelain to be the art of soldering by heat to a layer of the glaze a layer of fusible colour, the dilatation of which shall be the same as that of the glaze and the body of the ware. The function of the flux is to envelop the colour and attach it to the glaze. In most cases it has no action on the colour, but is simply mechanically mixed with it: the flux, however, must mix with the glaze. That muffle colours do not penetrate the porcelain, may be proved by boiling in nitric acid a piece of painted ware after it has been fired, when the colours will disappear. As the flux is only a mechanical vehicle for the colour, it must vary with the colour; but the necessity for mixing or blending colours greatly limits the range of fluxes. A common flux is the silicate of lead, or a mixture of this with borax. Now the borax cannot be replaced by the fixed alkalies, on account of the readiness with which soda or potash becomes displaced in order to form other compounds. They have also a tendency to make the colours scale off. The mode of using the fluxes varies with the colour: in some cases it may be ground up in proper proportions with the colour; in others it must be previously fritted with the colour. The first mode is adopted when the colouring oxide is readily altered by heat; but when the oxide requires a high temperature to bring out its characteristic colour, the second method is adopted.

Not the least among the difficulties of enamel-painting is the high temperature required for the vitrification of the colours. The lowest heat of the muffle is about 1100° Fahrenheit; while some oxides do not develop their colour below 1850°. In the regulation of the furnace, the most successful method is to begin with a low heat, and urge it rapidly up to its maximum, and as rapidly to lower the heat. A moderate heat, long continued, may produce devitrification,—that is, the elements of the flux may separate, and combine again in a different manner, so as to produce an opaque substance known as *Réaumur's porcelain*. There is danger in the opposite extreme; for if the temperature be carried too high, some of the more delicate tints, such as the roses and the grays, become faint or vanish altogether, while the hardier greens, blues, and blacks remain. On the other hand, if the maximum temperature be not quite reached, the colours do not present that peculiar creaminess and glossiness which is characteristic of the art. The temperature is regulated by means of watches, consisting of small slabs of porcelain smeared with some trial colour, usually the carmine produced by the purple precipitate of cassius. This forms a useful exponent of all the other pigments: it varies greatly in tint according to the temperature; so that, by arranging a scale of temperatures corresponding with a scale of tints, a tolerably accurate thermoscope may be formed. Brongniart invented a pyrometer for estimating the temperature of the interior of the muffle; its action depends on the expansion of a bar of fine silver, nearly eight inches long, introduced into the muffle, and connected with a graduated scale on the outside.

The kind of fuel used for heating the muffle has an influence on the colours; for although the muffle may consist of an iron box heated only on the outside, it is almost impossible to prevent some of the products of combustion from entering it. The smoke of ordinary coal is especially injurious to the colours, from the presence of sulphurous acid, which is also given off from coke. Wood has its pyroligneous acids, and even charcoal gives off carbonic acid. The presence of an acid is so injurious in the muffle, that the reds produced from green vitriol, before being used, must be thoroughly washed, to get rid of the last traces of acid. It is also stated that a muffle in which cuperose has been calcined, cannot be used for the firing of colours.

There is also a difficulty connected with the use of oxide of lead, which is required in the preparation of certain colours, but is injurious to the development of some others. Again, the fixed alkalies used in the composition of the glaze may re-act on the colouring oxides, especially at the maximum temperature. In this way, the oxide of chrome will produce yellow instead of green. The oxide of lead, the potash, and the soda, may not only act injuriously by contact, but, by becoming volatilized, they may injure every colour in the muffle. Moreover, the oxide of tin, used in certain glazes, may impart its own opacity to the colours. It is also a curious fact, that different kinds of kaolin are not all equally favourable to the development of the colours put upon the ware; and we are informed that the kaolin of Ebreuil will not allow of the development of any colour derived from gold.

In close relationship with painting on porcelain stand the sister arts of enamel-painting[1] and painting on glass. It does not belong to our subject to enter into any details respecting them, but we must notice one or two more processes connected with the ornamentation of porcelain.

The metals used for imparting colour, hitherto referred to, have been in the form of oxides, &c., and used with a flux. The gold used in gilding porcelain is first dissolved in *aqua regia;* the acid is driven off by heat, when the gold remains in a state of minute division. It may also be precipitated by means of sulphate of iron. In this minutely-divided state it is mixed with one-twelfth of its weight of oxide of bismuth, together with a small quantity of borax and gum-water, and applied to the ware by means of a hair pencil. If the article is to have only a circular line of gold, it is placed upon a small table or whirler, and the artist, steadying his hand on a rest, applies the pencil to the article, while with the other hand he causes the table slowly to revolve. The gold ornaments come out of the fire with a wretched dingy hue; but the lustre of the gold is brought out by burnishing with agate and blood-stone, and the gilding is cleaned with vinegar or white lead.

Other metals which, like gold, do not become readily oxidized, are applied to stone-ware, and form what are called *metallic lustres.* The silver-white hue known as *silver-lustre* is obtained from platinum by dissolving the metal in *aqua regia*, and pouring the saturated solution into boiling water. This is poured into a warm solution of sal ammoniac, when the metal forms a yellow precipitate, which, after having been washed and dried, is applied to the ware by means of a flat brush, and the article is then passed through the muffle-kiln. A sufficient body of lustre may be obtained by repeating the operation; and should the articles come out of the muffle black, friction with cotton will give the required lustre. A platinum lustre resembling that of polished steel is obtained by dropping a solution of equal parts of tar and sulphur in hot linseed oil, known as *spirit of tar*, into the acid solution of platinum. The mixture is spread over the ware, and passed through the muffle as before. *Gold lustre* is obtained by precipitating a solution of gold in *aqua regia* by means of ammonia: it has fulminating properties, and must therefore be mixed with the essential oil of turpentine while moist, and in this state applied to the ware. After the firing, the lustre will be brought out by friction with linen. The *lustre cantharide* of the French, which is remarkable for its iridescence, is obtained from chloride of silver, partly decomposed by means of combustible vapours. For this purpose a mixture of a lead glass, oxide of bismuth, and chloride of silver, is applied to the ware. This is then raised to a red heat in the muffle, when a fuliginous smoke is introduced, which effects the partial decomposition required. An *iron lustre* is obtained by mixing a solution of iron or steel in hydrochloric acid with spirit of tar, and applying it to the ware. Silver and platinum lustres are usually laid upon a white ground; gold and copper lustres have the best effect on coloured grounds. The paste body for lustrous ware is usually made for the purpose, of four parts clay, four of flint, four of kaolin, and six of felspar. Its colour is brown, but it is coated with a lead glaze composed of sixty parts litharge, thirty-six of felspar, and fifteen of flint.

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[1] The writer has some observations on vitrifiable colours in three articles entitled "On Enamel-Painting," contained in the *Art-Journal* for 1857.

In the Great Exhibition of 1851, some cheap articles, producing a novel and agreeable effect, were shown in the French department. They consisted of what is called *émail ombrant*, and the process of their manufacture is to stamp the designs in the body of the ware, and to flood them with coloured transparent glazes. In this way a plane surface is produced, in which the hollows of the stamped design appear as shadows of various depths, while the parts in highest relief, coming nearest the surface of the glaze, have the effect of lights in the picture.

In the volume containing the *Jury Reports* of the Great Exhibition is a "Supplementary Report on Design," by Mr Redgrave, in which, among a number of judicious remarks on the ornamentation of ceramic wares, he gives his opinion as to the present artistic position of the factories of Europe. He places Sèvres at the head of the list, and refers to the wares exhibited as illustrating the wisdom of a judicious application of the *best* art to manufactures. "Here we find the taste of the first artists, assisted by the science of able chemists, and under a judicious direction, united to the most skilful workmanship and manufacture; and the result is, that the fabrication of porcelain is carried to the highest state of excellence." Most of the works exhibited must be classed as *ornaments*, such as vases, tazzas, &c. The forms were pure, and rarely interfered with by reliefs. The modelling and the painting were of rare excellence, and it was deemed to be scarcely possible to produce such works without exercising an important influence on the other manufactures of the country, and a general cultivation of the public taste. The exhibition of Dresden ware was not remarkable for purity of form or appropriateness of decoration. "The surface is often covered with purely imitative flowers in high relief, glowing and brilliant as the tints of nature, yet looking gaudy as ornament, and, from their filmy projections, liable to injury with every touch. . . . . Even the May-flower pattern, a production of great beauty, on the principle of a diaper of form and colour, from its minute hollows, is quite incapable of being cleansed; and from the thickness which it adds to the form, contradicts the true effect of porcelain, which should unite lightness with capacity." Where these works were not purely imitative, they partook of the extravagant prettiness of style of Louis Quinze, when the Dresden manufacture was enjoying its most prosperous days.

The works both of Sèvres and Meissen have had considerable effect on the progress of our own manufactures; but while on the Continent decoration has been, for more than a century, cultivated as a branch of the fine arts, our painters on china have been mere copyists, who, until the establishment of schools of design, had no opportunity of obtaining artistic education. Our modellers have hitherto been deficient in knowledge of the human figure, but an improvement in both respects has for some time set in, and will doubtless be fostered by the many facilities of the day.

The royal manufactories of Berlin and Bavaria, in their specimens forwarded to the Great Exhibition, seem to have followed classic models, and although free from some of the faults of Dresden, they committed the great fault of overloading ornament. (C. T.)

POTTINGER, Sir Henry, was descended from an English family which had been long settled in Ireland, and was born at Mount Pottinger, in the county of Down, in 1789. His rise in life was slow but steady. Having gone out to India in 1804 as a cadet in the Bombay service, he recommended himself for promotion by his energy and sagacity in practical affairs. He was employed for more than seven years as judge and collector at Ahmednugger in the Deccan. The following fifteen years were passed in the post of political resident at Cutch and Scinde. At length in 1840 he returned to England, dignified with a baronetage, and possessing a high reputation. Sir Henry Pottinger soon proved himself worthy of the high consideration in which he was held. Despatched to China in 1841 as ambassador extraordinary and minister plenipotentiary to adjust the differences relating to the opium trade, he set himself to this arduous task with vigour and address. On his arrival at the scene of war, he took the most decisive measures to drive the Chinese to an honourable and lasting peace. Nor after he had succeeded in 1842 in bringing the enemy to terms, did he lay down his commission until he had taken strong precautions to prevent future abuses. The eminent services of Sir Henry Pottinger were rewarded with a series of honours and appointments, which continued over the rest of his life. In 1843 he was promoted to the office of governor and commander-in-chief of the island of Hong Kong. On his return to England in the following year the office of a privy councillor and a pension of L.1500 were conferred upon him. He then held the governorship of the Cape of Good Hope from 1846 to 1847. His last appointment was that of governor and commander-in-chief of Madras, an office which he held till 1854. The death of Pottinger took place at Malta in March 1856.

POTTSVILLE, a town of the United States of North America, Pennsylvania, occupies a picturesque situation on the Schuylkill, 93 miles N.W. of Philadelphia. It stands on uneven ground in a very narrow valley, and is in general well built, chiefly of brick. The chief public edifices are the court-house, town-hall, jail, and numerous churches. There are also an academy, several other schools, and five or six newspaper offices. Among the manufactories of the place are iron-works, machine-shops, woollen and carpet factories, tanneries, and breweries. The surrounding country, though barren and rugged, is very rich in minerals, especially in coal; and is densely inhabited, containing numerous towns and villages. The coal trade in Pottsville is extensive, and rapidly increasing. The coal is brought here from the various mines in the vicinity, and conveyed by railway or river to Philadelphia and other places. The town has entirely risen up since 1825. Pop. (1850) 7515; (1853) about 10,000.

POUGHKEEPSIE, a town of the United States of North America, in the state of New York, on a plain on the left bank of the Hudson, 75 miles N. of New York, and 70 S. of Albany. It is regularly built, and contains numerous churches belonging to Presbyterians, Episcopalians, Methodists, Baptists, Roman Catholics, and other denominations; a collegiate school, occupying a large and handsome building, on an eminence; an academy; several girls' schools; and three or four newspaper offices. The principal manufactures of the town are machinery, farm implements, guns, ironware, leather, carpets, cotton goods, flour, and beer. Here is the largest brewery in the United States, producing annually 36,000 barrels of ale; and many of the other establishments are among the most extensive in the country. Many steamers and sailing-vessels are owned at Poughkeepsie. Pop. (1850) 13,944.

POULTRY. See AGRICULTURE.

POUND, applied to a measure of weight, of which the *pound avoirdupois*, weighing 7000 grains troy, and the *pound* troy, weighing 5760 grains, are used in England. The former is divided into 16 ounces and the latter into 12 ounces. (See WEIGHTS AND MEASURES.)

POUND is also a denomination of money, being equal in value to 20 shillings or 240 pence. Anciently 240 pence were equivalent to a *pound weight* of silver. Hence the origin of the term.

POUNDAGE, a subsidy of twelve pence in the pound, granted to the crown on all goods and merchandises exported or imported; and if by aliens, one penny more.

POURCAIN, ST, a town of France, in the department of Allier, in a beautiful valley at the confluence of the Limon and Sioule, 18 miles S. of Moulins. There are here a parish church of the tenth century, an hospital, a theatre, and several flour-mills. Some trade is carried on in the excellent wines raised in the vicinity, as well as in cattle, poultry, and fish. Pop. 4636.

POUSSIN, GASPAR, whose real name was *Dughet*, was born at Rome in 1613. His father, who was French, had settled in Rome sometime before his birth, and Nicolas Poussin having married his sister, he acquired the appellation by which he is ordinarily known. He studied under his brother-in-law, by whose advice he adopted landscape-painting, in which he attained to a great celebrity. His passion for grace and beauty was extreme: he selected in all his pieces the most enchanting views of nature, and "in the opinion of many," says Lanzi, "there is not a greater name among landscape-painters." He is said to have acquired singular facility; and, like Rosa, could finish a landscape and decorate it with figures in a day. He painted all sorts of landscapes, and in everything he did, he displays elegance and erudition. Nicholas Poussin occasionally embellished Gaspar's pictures with figures representative of some portion of history or of fable. Gaspar has left behind him a few masterly etchings, consisting of four circular landscapes and a set of four landscapes lengthways. He died at Rome in 1675. A considerable number of pieces from this excellent artist's pencil are to be seen in the National Gallery, London.

POUSSIN, *Nicolas*, a celebrated painter, called the "Raphael of France," was born at Andely in Normandy, on July 19, 1594. He was sprung from a noble but very poor family, who had been much reduced by the part they had taken in the civil wars. Having obtained his father's consent to become a painter, and having made a beginning in his native village, he, at the age of eighteen, visited Paris, where he placed himself under the instruction of Ferdinand Elle, a Flemish portrait-painter. He did not remain long with Elle, but applied himself to composition from casts and prints after Raffaëlle and Giulio Romano. Some of his earliest attempts were the paintings in the church of the Capuchins at Blois, and some Bacchanalian pieces for the Chateau of Chiverny. He was now invited to Rome by Marino, the Italian poet, whom he met at Paris; but the "Death of the Virgin," a painting on which he was then engaged, compelled him to decline. He was enabled, however, to undertake the journey in 1624, when his friend received him with great kindness. Marino soon after died, and Poussin was for some time reduced to paint for almost nothing. He lodged with the eminent sculptor, Francis du Quesnoy, called "Il Fiamingo," and studied the works of Raffaelle with untiring devotion. Cardinal Barberini returning to Rome, to whom he had been introduced by Marino, liberally patronized him. He painted for him his celebrated pictures of the "Death of Germanicus," and the "Taking of Jerusalem by the Emperor Titus;" and he procured for him a commission to paint the "Martyrdom of St Erasmus" for St Peter's. The first series of his "Seven Sacraments of the Church of Rome," were painted for the Cavaliere del Pozzo, and are now in the collection of the Duke of Rutland. He subsequently painted another set of "Sacraments," which were purchased by the Duke of Bridgewater for 4000 guineas, and now occupy a place in the gallery of the Earl of Ellesmere. On his return to France in 1639, at the request of Louis XIII., he was made painter to the king, with apartments in the Tuileries. Here he produced his admirable work of the "Last Supper," and was engaged to decorate the gallery of the Louvre, when the criticisms of his brother artists determined him to return to Rome. He quitted France for ever in 1642, and after many years spent in the diligent practice of his art, he died on November 19, 1665.

Eight of his pictures are in the National Gallery:—"The Nursing of Bacchus;" "A Bacchanalian Festival;" "A Bacchanalian Dance;" "Phineas and his followers turned into stone at the sight of the Gorgon's head;" "Cephalus and Aurora;" "Venus Sleeping surprised by Satyrs;" "Phocion: a Landscape with Figures;" "The Plague among the Philistines at Ashdod." (*Memoirs of Nicolas Poussin*, by Maria Graham, 8vo, London, 1820.)

POWNALL, THOMAS, an able politician and antiquary, was born at Lincoln in 1722. The first part of his career was occupied with civil duties. Having repaired to America in 1753, he was appointed in succession governor of the colonies of Massachusetts, New Jersey, and South Carolina. After his return to England in 1761 he obtained a seat in Parliament, and wrote several pamphlets on the topics of the day. The latter part of Pownall's life, however, was more particularly engrossed with antiquarian studies. He contributed many papers on the antiquities of Great Britain and Ireland to the *Archæologia*. He also published *Notices and Descriptions of the Antiquities of Provincia Romana of Gaul*, 4to, London, 1788. The death of Governor Pownall took place at Bath in 1805. For a complete list of his works, see Watt's *Bibliotheca Britannica*.

POZO-BLANCO, a town of Spain, Andalusia, in the province, and 32 miles N.E. of Cordova. It stands among the hills of the Sierra Morena, and is regularly built, containing a church, two hospitals, a town-hall, several schools and hermitages. The chief manufactures are dyeing and the weaving of woollen fabrics. Pop. 6748.

POZZO DI BORGO, CARLO ANDREA, a celebrated diplomatist, was descended from an illustrious Corsican family, and was born in 1764 at Ajaccio, the town which four years afterwards became the birth-place of Napoleon Bonaparte. His first appearance before the public was in the character of the right hand man of the great Paoli. That patriotic chief sent him in 1791 to thank the constituent assembly of Paris for having recognised the island to be an integral part of the French dominions. After his return in the following year he employed his aid in the attempt to liberate the country from the jurisdiction of France, and to place it under the protection of Great Britain. When that effort was eventually successful in 1794, he recommended him to the presidentship of the newly-instituted council of state under the English viceroy. But it was not until Pozzo had been expelled from Corsica along with the British in 1797, and after being a sojourner in London and Vienna, had entered into the diplomatic service of Russia in 1803, that his real ability began to appear. An inveterate enmity which he was then cherishing against his former friend and fellow-townsman Napoleon, roused all his faculties into activity. Wherever any plan was in the act of being concerted or executed for the purpose of checking the French potentate, there was he, eloquent in council, far-sighted in policy, and unwearied in action. The year 1804 saw him in the character of Russian commissioner, with the allied forces in the north of Italy. In 1806 he was ready, as a colonel in the suite of the emperor, to march against the French, when the intelligence of the battle of Jena checked the enterprise. He then repaired to Vienna to try to rekindle the spirit of resistance in Austria. It is true that all these efforts proved unsuccessful; that his master was forced to agree to an armistice with Napoleon in 1807; and that he himself was obliged to be absent for some time from Russia. Yet the spirit of opposition within him did not bate one jot of its intensity. The interval of absence was spent in rearranging his plans, in concerting fresh measures along with the English government, and in mustering all his strength for another onset. Accordingly, no sooner had he been recalled by the Russian emperor in 1812, than he commenced a series of diplomatic strokes which effectually aided in overthrowing the power of Napoleon. It was he who prevailed upon the Swedish crown prince, Bernadotte, to join the confederacy against the French—he who counselled the allies to bring the contest to a crisis by marching upon Paris—he who warned the congress of Vienna of the possibility of Bonaparte returning from Elba. Nor when his diplomacy had done everything that it could, did his master passion become less active. He shed his blood at Waterloo to foil the last struggle of his great countryman; and when he heard that his vanquished adversary had died in St Helena, he exclaimed, with vindictive exultation, "I have not killed Napoleon, but I have thrown the last shovelful of earth upon him." After this great struggle, the remainder of Pozzo's life was chiefly occupied with the duties of Russian ambassador at the French court; and he died at Paris in February 1842. (See *Biographie Universelle*, and Gregorovius' *Wanderings in Corsica*, translated into English by Alexander Muir, Edinburgh 1855.)

PRADO, a town of Portugal, in the province of Minho, on the Cavado, 3 miles N.W. of Braga. The situation is unhealthy though beautiful; and the chief manufacture of the town is that of earthenware. There is salmon and trout fishing in the river. Pop. 6500.

PRAED, Winthrop Mackworth, a talented writer and politician, was the son of Mr Serjeant Praed, and was born in 1802. His educational career from the very first was full of the richest promise. At Eton he wrote precocious essays in a magazine called *The Etonian.* At Trinity College, Cambridge, his genius continued to develop itself, and there was scarcely a learned accomplishment in which he did not outstrip his rivals. He carried off four prizes for classical odes and epigrams, and three prizes for English poetry; he contested the leadership of the Union Debating Club with Thomas Babington Macaulay (now Lord Macaulay); and before he left the university he had produced poems in Knight's *Quarterly Magazine* which placed him among the very first of the rising literary men of that age. After practising for a short time at the bar, Praed began his parliamentary career by taking his seat in 1830 for St Germans. It is true that he failed to secure his return in 1832. But he entered Parliament again in 1835 as member for Great Yarmouth, and proved himself a great acquisition to the Tory party. Industrious in collecting his own arguments, wonderfully rapid in demolishing those of his opponents, and fervidly eloquent in enforcing his views, he became a very effective debater. A standing of great reputation and influence was already within his reach, when consumption cut him off in 1839.

PRÆFECT (*Præfectus urbi*) was originally warden of the city of Rome, and received the name of *Custos Urbis.* The title of præfect does not seem to have been used till after the time of the Decemvirs. On the absence of the king from Rome, the *custos urbis* acted as his representative; and exercised all the powers of the consuls if they were absent. Persons of consular rank were alone eligible for this office; and, down to the time of the Decemvirate every præfect had previously been consul.

On the institution of the office of *prætor urbanus*, the wardenship of the city became a mere name. In the reign of Augustus, at the suggestion of Mæcenas, an office bearing this designation was instituted, but widely different from the original. This new *præfectus urbi* was a permanent magistrate, with the superintendence of butchers, bankers, theatres, &c.; and to enable him the better to exercise his authority, he had distributed throughout the city a number of *milites stationarii*, a sort of modern police. Gradually his office extended, until he in turn swallowed up the office of *prætor urbanus.* On Constantinople becoming the second capital of the empire, it had its *præfectus urbi*; who were the direct representatives of the emperor. All the officers of the administration of the city—all corporations and public institutions were under their supervision. They received the petitions of the people addressed to the emperor; and when the capital deigned to present the emperor with an expression of their loyalty, it was through the præfect they had to approach him. (Smith's *Dictionary of Greek and Roman Antiquities.*)

PRÆMUNIRE (used for *præmonere*, to forewarn), is the first word of an ancient writ, whereby a party was summoned before the crown to answer a charge of contempt of the sovereign. The writ commenced—"Præmunire facias A. B., quod sit coram nobis," &c. The contempt consisted in the doing of some act derogatory of the allegiance due to the sovereign. The term has now the two meanings of the writ itself, and the offence to which the writ is applied.

PRÆNESTE (the modern *Palestrina*), one of the most important cities of ancient Latium, was situated about 2400 feet above the level of the sea, on the south-western side of a bastion-like projection of the Apennines. This favourable position rendered it a place of great strength and power from the earliest times. Accordingly we find the Prænestines offering a formidable opposition to the might of the Romans. In 380 B.C., taking advantage of the civil dissensions among their enemies, they marched up to the very gates of Rome. A severe defeat which Cincinnatus gave them immediately afterwards on the banks of the Allia, did not break their power. In the very next year they were again in the field, summoning the rest of the states of Latium to come to their aid against the common aggressors on the banks of the Tiber. It is true that in the great Latin war which began in 340 B.C., they were forced to submit, and become allies of the Romans. Yet, in 82 B.C., the city is found in greater strength than ever, sustaining a close blockade from the forces of Sylla. It was not until that general, after receiving its surrender, had razed its fortifications, and butchered all its inhabitants, that the power of the town received its death-blow. After this period Præneste was famous as a place of resort. People repaired from all parts of Italy, and even from foreign countries, to consult at the shrine of Fortune which overlooked the city. The wealthy and the noble came from Rome to pass the hot summer months on the breezy terraces which rose upon the hill-side. There, too, amid the roses for which the town was celebrated, might be seen such a poet as Horace, sitting over the famous nuts and wine which were grown in the neighbourhood, luxuriating in the cool zephyr which blew from the Tyrrhene sea, and looking down upon the plain which swept away, in wooded undulations, to the foot of the Alban hills.

The modern Palestrina is chiefly known on account of the remains of the ancient Præneste, which still exist. Many of the large irregular blocks of limestone which formed the wall of the citadel are to be seen at the present day. An exquisite piece of mosaic, which was dug up from among the ruins of the temple of Fortune in the seventeenth century, and which has been considered the finest specimen of its kind, is still preserved in the family of Barberini.

PRÆTOR *(for præitor* from *præire)*, a title of office among the Romans. The consuls were called prætors, as leaders of the armies of the state; but the term was especially appropriated to the *prætor urbanus*, first appointed in the year B.C. 366. He was at first chosen from the Patricians, who created this office as a sort of indemnification for being compelled to share the consulship with the plebeians. (Liv. vi. 42; vii. 1.) The plebeians, however, soon had a hand in the office; and in B.C. 337 the patricians were left to mourn the appointment of a plebeian prætor. The prætors were called colleagues to the consuls, and were created with the same auspices.

The prætorship was originally a sort of third consulship. The prætor occasionally commanded the armies of the state, instead of the consul; and when the consul was absent with the army he exercised his function within the city. The prætor was one of the *magistratus majores;* he went attended by six lictors (latterly by two), and owed respect and obedience to the consuls. A second prætor was appointed B.C. 246, to administer justice between the peregrini, or the peregrini and the citizens; and hence he received the name of *prætor peregrinus.* It was determined by lot what functions these prætors should fulfil; and when the one was at the head of the army, the other performed the duties of both within the city. On the extension of the state beyond the bounds of Italy, new prætors were chosen. Sulla increased their number to eight; Julius Cæsar raised them successively to ten, twelve, fourteen, and sixteen; and Pomponius says of his own time, "eighteen prætors administer justice in the state."

The prætor urbanus seems to have held the first rank; and as his name implied, his duties confined him to Rome. He was the chief magistrate for the administration of justice, and to him Roman law owes much of its development and improvement. The chief judicial function of the prætor consisted in giving *a judex;* and cases before the prætor were said to be *in jure.* They presided at criminal trials (*quæstiones perpetuæ*); and a body of *judices* determined by a majority of votes the condemnation or the acquittal of the party accused.

The prætors existed till a late period in the Roman empire, and seem to have held still their original right of jurisdiction. Prætors were usually appointed governors of provinces on the expiration of their official year, with the title of *proprætor.* (See *Die Prätorishen Edicte der Römer*, &c., von D. Ed. Schrader, Weimar, 1815.)

PRÆTORIANS was, during the Roman republic, a select cohort that attended the prætor or commander of an army. They frequently decided the fate of battles. After the overthrow of the republic, Augustus formed them into nine cohorts, and fixed their station in the capital as body-guards. They became, in short, under the emperors, what "the guards" are to the monarchies of Europe. They, in addition to their military duties, frequently had the charge of state prisoners, and often acted the part of executioners. They were all picked men, chosen for the most part from Italy. Their power increased greatly under the empire until they frequently determined the fate of an emperor. Diocletian reduced their number, and Constantine disbanded them.

PRAGA, a town of Poland, in the government of Warsaw, forming a suburb of the capital, on the opposite or right bank of the Vistula. It was at one time strongly fortified; but having been stormed by the Russians in 1794, it was reduced to ruins. Since that time it has been rebuilt, and it now contains many good streets and squares. Pop. 7500.

PRAGMATIC SANCTION is a solemn ordinance or decree of the head of a legislature on some matter of importance. The term is of Byzantine origin, and was used early in the French monarchy. Perhaps the most celebrated pragmatic sanction is that of Charles VII. of France in 1438, caused by the schism in the church between the Council of Basle and Pope Eugenius IV. One of the decisions of the king was the supremacy of the general council over the Pope. Twenty-three articles were signed by the king for the regulation of the Gallican Church, constituting the pragmatic sanction of Charles VII. Some twenty years afterwards, Louis XI., anxious to please Pope Pius II., gave up this pragmatic sanction of Charles VII., and it was ignominiously dragged through the streets of Rome. Some years afterwards Louis quarrelled with the Pope, and the pragmatic sanction again became law. The last pragmatic sanction which has attained historical celebrity is that of Charles VI., Emperor of Germany, who, in the year 1722, failing male issue, settled his dominions on his daughter, the Archduchess Maria Theresa, which was confirmed by the diet of the empire, and guaranteed by Great Britain, France, the States-General, and most of the European powers.

PRAGUE (Bohem. *Praha,* Germ. *Prag*), a fortified town of the Austrian empire, capital of the kingdom of Bohemia, stands on both sides of the Moldau, 160 miles N.N.W. of Vienna, and 75 S.S.E. of Dresden. No town of Germany has a greater charm for the spectator than that which Prague derives, not less from the beauty of its situation than from the many historical associations with which it is connected. In a valley surrounded on all sides by hills, and divided into two parts by the Moldau, the city rises from the river's edge, tier above tier, palace above palace, spire above spire, to the encircling heights, which are crowned by fortifications 12 miles in circumference. It consists of five portions,—The *Hradschin,* on the hill called the Schlossberg, to the left of the river; the *Kleinseite,* to the south of the former, in a semicircular valley between it and the hill called *Laurenzberg;* and on the right bank of the river the *Judenstadt,* or Jews' Town, which is inclosed by the *Altstadt,* or Old Town, and that again by the *Neustadt,* or New Town. To the extreme south of the New Town stands the citadel of Wysschrad, on black cliffs overhanging the Moldau, and connected with the fortifications which inclose the whole of the five quarters. Communication is kept up between the opposite sides of the river by two bridges; the older of these, called the Carlsbrücke, is 1850 feet long, and rests on 16 arches. It was begun in 1358, and finished in 1507. At each end stands a tower for the purpose of defence; and along the bridge there are on either side statues of saints, among which is that of St John Nepomuk, who is said to have been drowned from this very bridge. Farther up the river is an iron suspension-bridge resting on a small island in the centre. This bridge was completed in 1841. Each portion of Prague has its own distinct character. The Hradschin is remarkable for its numerous splendid edifices, many of them possessing great historical interest; the Kleinseite is the residence of the aristocracy of Bohemia, and contains many palatial mansions, with gardens stretching up to the heights above; the Jewish quarter, or as it has been called since 1850, Josephstadt, is densely peopled, and contains low, mean dwellings, and narrow, crooked, dirty streets. The Old Town is occupied by lofty old-fashioned houses, and it is here that most of the business is carried on; while the New Town, once separated from the former by a ditch that is now filled up, has many handsome convents, hospitals, &c., though the houses are generally low and small, inhabited chiefly by artisans. The Hradschiner Platz, the chief public square in that part of the city, is of an oblong shape, having on its north side the archiepiscopal palace and the residences of the prebendaries of the cathedral; on the west an imperial, on the south the Schwarzenberg palace; while on the east it is separated by a railing from the court of the castle, which includes within its limits the cathedral and buildings connected with it. The castle is an immense pile of buildings, containing, it is said, 440 apartments, but not in any way remarkable for architecture. It was from the diet chamber in this building that the nobles and deputies of Bohemia threw out of the window the imperial commissioners, Martinitz and Slavata, 23d May 1618, and thus gave rise to the Thirty Years' War. Two stone pillars mark the place where they fell, on a dunghill that saved their lives. The cathedral of St Vitus, begun in 1343 by Matthias of Arras, and carried on by Peter Arler till 1385, bears a considerable resemblance to that of Cologne. It is unfinished: the tower, originally 506 feet high, was reduced to its present height of 314 feet by a great fire in 1541; and the whole building and many of its monuments suffered severely from the artillery of the Prussians in 1757. In the interior stands a splendid mausoleum over the vault of the Bohemian kings. It is of marble and alabaster, and has many effigies and sculptures. The shrine of St John Nepomuk in this church is remarkable for the immense amount of silver with which it is decorated. The large and splendid palace of Count Czernin is now used for barracks. Opposite to it stands the Loretto chapel, an exact copy of the famous Santa Casa in Italy. Of the numerous palaces in the Kleinseite, the most remarkable is that of Wallenstein, or, as he is called here, Waldstein, where that general resided in almost regal magnificence. It still belongs to the family, and remains almost unaltered, containing a portrait of the great duke, and the horse stuffed on which he rode at the battle of Lützen. On the highest point of the Laurenzberg, and of the whole of Prague, stands the Strahow monastery, containing a library of 50,000 volumes in a splendid hall, a portrait of Ziska the blind Hussite leader, and an autograph of Tycho Brahe. A magnificent view is obtained from the height of the city of Prague and the whole country eastwards, as far as the Riesengebirge. The churches in this quarter of the town are not very remarkable, the chief being that of St Nicholas, which is rich in marble and gilding. In the Jewish town of Prague the most remarkable building is the old synagogue, a small and gloomy edifice, said to have been built by the earliest fugitives from the fall of Jerusalem. The old Jewish burial-place is a remarkable inclosure in the centre of the Judenstadt, crowded with thousands of gravestones carved with Hebrew characters, and covered with dark gray moss; it has not been used for about a century. The principal square in the Altstadt is called the Grosse Ring, which has on one side the town-hall, in the Gothic style, partially re-built in 1840, though the tower and some portions of the ancient edifice still remains. Opposite to this building stands the Teynkirche, a Gothic edifice with two tapering towers. It was at one time the church of the Hussites, and the service is still performed here in the Bohemian tongue. In this church is the grave of Tycho Brahe. The university of Prague is the oldest in Germany, having been founded in 1348 by Charles IV., after the model of that of Paris. The fame of the university, and the privileges accorded to its members, attracted students from all parts of Germany; so that in 1409 there are said to have been 40,000 students here. In that year John Huss, who was afterwards made rector, proposed measures for abridging the privileges of the foreign students, which caused the secession of a very large number. These, scattering themselves throughout Germany, founded the universities of Leipsic, Cracow, &c. That of Prague then became the centre of the Reformed doctrines taught by Huss and his school, but it never again rose to its former celebrity. It has 44 professors, and was attended in 1851 by 1390 students. In the university building, or *Carolinum*, only the law and some of the medical classes are held; the philosophical and theological faculties occupying the *Clementinum*, an immense range of buildings, originally a Jesuits' college. Here also are the library (containing nearly 130,000 volumes and numerous MSS.), the museum of natural history, the observatory, several churches and chapels, a gymnasium, and an episcopal seminary. In connection with the university there is also a large and valuable botanic garden in one of the suburbs. Among the other buildings in this part of the town is a large theatre. Here also is a monument to Francis I. of Austria, on the quay between the two bridges, somewhat resembling that of Sir Walter Scott in Edinburgh. In the Neustadt, one of the finest streets is the Ross Markt, or horse-market, nearly half a mile in length, and in breadth 150 feet at the foot and 192 at the head. At the foot is a statue of St Wenceslaus, and at the head one of St Nepomuk. At one corner of the large square, called the Vieh Markt (cattle-market), stands the town-hall, almost entirely re-built in 1806. In the same square stands the large and splendid building (originally a Jesuits' college), now used as a military hospital. The Neustadt contains also a general hospital, a public garden, and the Bohemian museum, which includes a library, collections of antiquities and of natural history. Prague contains in all 50 Roman Catholic and 2 Protestant churches, 9 synagogues, 11 monasteries, 4 nunneries, and many schools and academies, among which are 1 Protestant and 1 Jewish school. Besides the hospitals already mentioned, there are many admirably-managed benevolent institutions, including asylums for lunatics, the blind, and the deaf-and-dumb. The manufactures of the town are numerous and varied, comprising cotton, linen, silk and woollen fabrics; hosiery, hats, leather, paper, jewellery, musical and mathematical instruments, earthenware, sugar, beer, vinegar, &c. It is the centre of the whole trade of Bohemia, and derives great advantages in this respect from the means of communication afforded by the Moldau, and by the railways which connect it with Dresden on the one hand, and with Olmütz and Vienna on the other. Although the precise date of its origin is not known, there is no doubt that Prague is one of the most ancient cities of Bohemia. The Kleinseite is said to have been founded early in the eighth century, and the Altstadt, the next to it in antiquity, towards its close. From the earliest period Prague suffered very much from the ravages of war; but its greatest calamities were connected with the religious contests of the Hussite period. In the reign of Charles IV. the city had risen to such a degree of prosperity that it was not only the most populous in Germany, but a principal seat of the arts and sciences. The first rising of the Hussites took place under Zisca in 1419; it was caused by the martyrdom of John Huss and Jerome of Prague at Constance, and by the treacherous conduct of the Emperor Sigismund on that occasion. Zisca and his followers entrenched themselves on a hill which still bears his name, about half a mile E. of the walls of the city, and there they not only resisted the attacks of the emperor with 150,000 men, but totally defeated him. The Hussites, who obtained completely the upper hand in Bohemia, and made hostile inroads into the neighbouring countries, would not acknowledge Sigismund as king of Bohemia until a diet, held at Prague in 1435, when they obtained from the Roman Catholic Church the freedom to teach publicly their doctrines, and the use of the sacramental cup for the laity. During the disturbances that preceded this settlement most of the churches and convents in Prague had been dismantled or destroyed. The religious privileges thus obtained by the Bohemians remained undisturbed until the beginning of the seventeenth century, when the attempts of the emperors to invade them caused the outbreak at Prague which began the Thirty Years' War in 1618. Refusing to acknowledge Ferdinand II., they elected Frederick of the palatinate to the crown; but he was totally defeated in 1620, at the Weissenberg, near Prague. By this battle, and the persecutions which followed it, the Protestantism of Bohemia was entirely subverted. In 1631 the city was taken by the Elector of Saxony, but re-taken the next year by the imperialists under Wallenstein. In 1648 the Swedes gained possession of the Kleinseite, which they evacuated on the peace of Westphalia in the same year. At the beginning of the war of the succession in 1741, Prague was taken by the French and Bavarians; and in the following year it was blockaded by the Austrians under Charles of Lorraine. In 1744 it was taken by Frederick the Great, but restored by the peace of Dresden in the following year. In 1757 Frederick defeated the Austrians in the battle of Prague, and besieged the city, but was compelled to raise the siege by his defeat at Kollin. Since that period Prague has once again suffered from the devastations of war. In 1848 the Czechs, or Bohemian party, rose against the Austrians, and a desperate contest ensued between them. The military, under Prince Windischgrätz, having gained possession of the Hradschin, bombarded from thence the rest of the city on the 17th of June, and on the 19th the insurrection was entirely put down. Pop. (1851), exclusive of military, 118,405.

PRAM, Christian Henriksen, an eminent Danish poet, was born in 1756, and was educated at the university of Copenhagen. A comfortable situation which he obtained in the Chamber of Commerce enabled him to devote a considerable portion of his time and energy to literature. His *Stoerkodder*, a narrative poem in fifteen cantos, founded on some of the old Scandinavian legends, introduced him to the notice of the public. He then commenced a periodical called the *Minerva*, and contributed to its pages many pieces both in prose and verse. He also wrote two tragedies, entitled *Damon and Pythias*, and *Frode and Fingal*, several comedies, and some smaller plays. In spite of the success of all these productions, the close of Pram's life was rather melancholy. He was deprived of his post in the Chamber of Commerce in 1816; his wife died in 1819; and in 1820 he emigrated to the island of St Thomas, only to expire there in the following year. A collection of Pram's works was published by his friend Rahbek, in 4 vols., 1824–26.

PRATO, a town of the grand duchy of Tuscany, in a fertile plain near the foot of the Apennines, 11 miles N.W. of Florence. Containing well-built houses and regular streets, and surrounded by old walls and ditches, the appearance of the town is cheerful and pleasant. In the principal square stands the cathedral, with its campanile or bell-tower; and several other buildings. The most striking feature of the cathedral is the alternate stripes of black and green serpentine with which the grey limestone of this fine edifice is inlaid, both outside and inside. It contains a beautiful painted window, and some of the best pictures of Filippo Lippi. Among the other buildings of Prato are the church of La Madonna delle Carceri, with a beautiful cupola; the Palazzo Pretorio, now used as a prison; and a college that once belonged to the Jesuits. There are also a theatre, public library, and several hospitals. Coarse woollen cloth is made here in large quantities; also red Turkish caps, ropes, paper, glass, hardware, &c. From Prato London derives supplies of straw plait, which is made by the peasantry in the adjacent country. Pop. 12,000.

PRATT, Charles, Viscount Bayham and Earl Camden, was the third son of Sir John Pratt, chief-justice of the King's Bench under George I., by his second wife Elizabeth, daughter of the Rev. Hugh Wilson, canon of Bangor, and was born in 1713, the last year of the reign of Queen Anne. He had the misfortune to lose his father when only ten years old; and from the reduced circumstances of his family, he was placed upon the foundation at Eton. Here he had the good fortune to form a lasting friendship with William Pitt, afterwards the "Great Commoner," one of the noblest spirits of the place. He went to Cambridge in October 1731, where he began that course of juridical and constitutional study which afterwards rendered his name so illustrious. In 1735 he took B.A., and was called to the bar in Trinity term 1738. He rode the Western Circuit for the following eight or nine years without receiving fees sufficient to pay the tolls. Disgusted with this sort of life, he resolved to enter the church, when Henley, afterwards Lord Northington, ridiculed the idea with his accustomed raillery, and from that day Pratt's progress was determined. At the next assize town, "it so happened" that Pratt was called to fill the leader's place, when he made a most animated and eloquent reply, obtained the verdict, was complimented by the judge, and received several retainers before he left the hall. He was made a king's counsel in 1755; and in 1757 he was appointed attorney-general by his old friend Pitt, who was at the head of affairs. He received the honour of knighthood shortly afterwards, and was returned to Parliament for the close borough of Downton. He subsequently married Elizabeth, daughter and co-heir of Nicolas Jefferys, Esq. of Brecknock Place. While attorney-general he had ample opportunity of acting upon those great principles of justice for which he had contended so long. When John Wilkes was seized and committed to the Tower on a charge of publishing, in the *North Briton*, No. xlv., a paper calculated to inflame the minds of the populace against the government, his lordship granted him a *habeas corpus;* and on being brought before the Court of Common Pleas, discharged him from his confinement, amid the shouts of the people, which were heard with dismay at St James's. After the liberation of Wilkes, he condemned successively "general warrants" and "search warrants for papers," which rendered him the idol of the nation. Busts and prints of him were hawked through remote villages; a Reynolds portrait of him was hung up in Guildhall; he had the freedom of London presented to him in a gold box; he grimly laid down the law from sign-posts; and English journals and travellers carried his fame over Europe. A peerage was inevitable; and a peerage came.

He was styled "Baron Camden, of Camden Place, in the county of Kent," on the 16th July 1765; and next year, by the resignation of Lord Northington, he was made lord high chancellor of Great Britain. His attitude of opposition to the American taxation cost him his office in 1770. On the fall of Lord North he was again taken into the administration; and on the 27th of March 1782 appointed president of the Council, and so important were the lord president's services esteemed, that he was raised in the peerage by being created "Viscount Bayham, of Bayham Abbey, in the county of Kent, and Earl Camden," on the 13th May 1786. The last occasion upon which he took part in the debates was upon the discussion of Mr Fox's celebrated Libel Act in 1792. He died in April 13, 1794, in his eightieth year. (See Lord Campbell's *Lives of the Lord Chancellors*, vol. v.)

PRAXITELES, a very distinguished artist of ancient Greece, who wrought both in bronze and marble. Hardly anything is known of his personal history. Pliny alludes to him (*Hist. Nat.*, xxxiv. 8, § 19) as contemporary with Euphranor, B.C. 364, a date which probably determines the beginning of his artistic career. Judging from an inscription still extant, in which Praxiteles is called an Athenian, he must either have been a native, or at least a citizen of Athens. His position as an artist can be ascertained with more definiteness. He stands with Scopas at the head of the later Attic school, so called in contradistinction to the earlier Attic school of Phidias. If Phidias exceeded all men in his idealization of divine majesty and sublimity, Praxiteles was unsurpassed in his exhibition of the softer beauties of the human form, and especially of female grace. He is reported by Pliny to have made two statues of the goddess Aphrodite, the one draped and the other not. The inhabitants of Cos, of severe virtue, bought the draped statue; while the inhabitants of Cnidus, of less rigid tastes, chose the naked figure. The choice of the Cnidians entirely eclipsed its rival. According to Pliny, it surpassed all other works, not only of Praxiteles, but in the whole world; and all who had leisure voyaged to Cnidus expressly to behold it. King Nicomedes offered to pay off the whole of the heavy public debt of the Cnidians if they would let him have it, but to no purpose. It was afterwards borne to Constantinople, where it was destroyed by fire. Of the numerous descriptions of this masterpiece, the most satisfactory is that of Lucian. The material was Parian marble of the most brilliant character; the form was in all respects perfect; the right hand held some drapery, which fell over a vase standing by the goddess; and her face wore a gentle smile. This was the first instance in which any artist had ventured to represent this divinity entirely divested of drapery. The artist modelled it after a favourite courtezan named Phryne, who became possessed of his statue of Eros in the following manner:—Praxiteles, in his fondness for the courtezan, had promised to give her whichever of his works she might choose. She was anxious to learn which of them, in his own opinion, was the best; but this was precisely what the artist was unwilling to disclose. Not to be baffled, Phryne sent a slave to inform Praxiteles that a fire had broken out in his house, and that nearly all his works had perished. On hearing this, the artist rushed out, exclaiming frantically that all his toil was lost if the fire had reached his Satyr or his Eros. Phryne lost no time in confessing the stratagem, and claimed the Eros, which Praxiteles, however unwillingly, allowed her to carry off.

Of his statuary in bronze, the most noted was the Dionysus which stood at Elis. It represented the god, clad in ivy, girt with a faun's skin, bearing the lyre and the thyrsus. Of his subjects from the mythology of Apollo, the most celebrated statue was the bronze figure of Apollo the lizard-slayer. A full enumeration of the works of Praxiteles are to be found in Sillig (*Cat. Artif.*)

PREBEND, the maintenance a prebendary receives out of the estate of a cathedral or collegiate church. Prebends are distinguished into simple and dignitary. A simple prebend has no more than the revenue for its support; but a prebend with dignity has always a jurisdiction annexed to it.

PRECEDENCE, a place of honour to which a person is entitled either by courtesy or by right. The former is that which is due to age, estate, or the like, and is regulated by custom and civility; the latter is settled by authority, and when broken in upon, gives an action at law.

In Great Britain, the order of precedency is as follows:—(1) The sovereign, (2) the queen's consort, (3) the princes of the blood, (4) the archbishop of Canterbury, (5) the lord high chancellor, (6) the archbishop of York, (7) the archbishop of Armagh, (8) the archbishop of Dublin, (9) the lord treasurer of England, (10) the lord president of the council, (11) the lord privy seal, (12) dukes, (13) the eldest sons of dukes of the blood royal, (14) marquises, (15) dukes' eldest sons, (16) earls, (17) marquises' eldest sons, (18) dukes' younger sons, (19) viscounts, (20) earls' eldest sons, (21) marquises' younger sons, (22) bishops, (23) barons, (24) speaker of the House of Commons, (25) lord commissioner of the great seal, (26) viscounts' eldest sons, (27) earls' younger sons, (28) barons' eldest sons, (29) knights of the Garter, (30) privy councillors, (31) chancellor of the exchequer, (32) chancellor of the duchy, (33) lord chief justice of the Queen's Bench, (34) master of the Rolls, (35) lord chief justice of the Common Pleas, (36) lord chief baron of the Exchequer, (37) puisne judges and barons, (38) knights banneret if made in the field, (39) masters in Chancery, (40) viscounts' younger sons, (41) barons' younger sons, (42) baronets, (43) knight banneret, (44) knights of the Bath, (45) knights bachelors, (46) baronets' eldest sons, (47) knights' eldest sons, (48) baronets' younger sons, (49) field and flag officers, (50) serjeants at law, (51) doctors graduate, (52) esquires, (53) knights' younger sons, (54) clergymen, (55) gentlemen bearing coat armour, (56) citizens and burgesses of towns corporate, (57) yeomen, (58) tradesmen, (59) artificers, (60) labourers. It is to be observed, that ladies, except those of archbishops, bishops, and judges, take place according to the degree of quality of their husbands; and unmarried ladies take place according to that of their fathers.

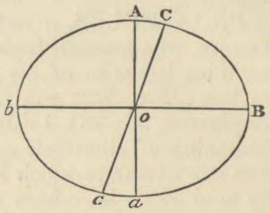
PRECESSION OF THE EQUINOXES.

In the article Astronomy (vol iv. 14), the phenomenon of the annual precession of the equinoxes has been described, and its physical cause stated to be the attraction of the sun and moon upon the protuberant mass of matter accumulated about the earth's equator, combined with the diurnal rotation. We shall here discuss the subject more particularly, and shew in what manner the different forces which tend to displace the plane of the earth's equator give rise to the phenomenon in question, and how their effects are computed from the fundamental principles of dynamics. The general problem, which is that of determining the perturbations of the earth's axis of rotation, embraces the *Nutation* of the axis, as well as the precessional motion of the equinoctial points, and is one of the most important and interesting in physical astronomy.

If the earth were a perfect sphere, the attraction of the sun or moon would have no tendency to communicate to it any motion about its centre of gravity. In this case, all the particles being symmetrically disposed with reference to every plane passing through its centre, the forces acting on opposite sides of any plane passing through its centre and the centre of the attracting body, would exactly balance each other, and consequently would have no tendency to produce a rotatory motion. But by reason of the spheroidal form of the earth, and the intensity of the force of attraction varying with the distance, the action of a distant body which is not situated either in the plane of the equator, or in the prolongation of the axis of rotation, produces an unequal effect on the opposite sides of every plane passing through the earth's centre (excepting the meridian in which the body is situated), and tends to generate a rotatory motion about that diameter of the equator which is perpendicular to the line which joins the centre of the earth with the centre of the attracting body. Hence the sun exerts a force, which at every instant has a tendency to bring the plane of the earth's equator towards the plane of the ecliptic; and if the earth had no motion of rotation about its axis, the two planes would at length be brought to coincide. In consequence, however, of the rotatory motion, the inclination of the two planes, as we shall shew, undergoes no permanent alteration; but a motion is given to the earth's axis, such that the pole of the equator constantly revolves about the pole of the ecliptic in the direction opposite to that of the diurnal rotation, and the intersection of the equator and ecliptic, following the motion of the pole, is carried backwards along the ecliptic. The moon produces a similar effect in reference to the plane of the lunar orbit; and the motion produced by the combined action of the sun and moon, which is the phenomenon observed, is the *luni-solar* precession of the equinoxes.

As the efficacy of the disturbing force to turn the earth about an axis varies with the distance of the attracting body from the plane of the equator, the precessional motion of the equinoxes is not uniform. The efficacy of the sun's force continues to increase, whilst the sun passes from either equinox to the solstice, and to diminish while it passes from the solstice to the equinox. The period of the inequality is consequently half a-year. The period in which the action of the moon passes through all its degrees of intensity is about nine years, being that in which the nodes of the lunar orbit accomplish half a revolution on the ecliptic. The apparent effect of this irregular action, is an alternate increase and diminution of the declinations of the fixed stars, most sensible for those nearest the pole, which is characteristically called the ***nutation*** of the earth's axis. The solar nutation, however, is so small as to be insensible to observation; the lunar nutation is sufficiently sensible, amounting to about 18″ between the extreme positions of the pole.

Before proceeding with the investigation of the problem, it will be convenient to premise the two following elementary theorems respecting the composition of rotatory motion, referring the reader for their demonstration to the article Rotation.



Theorem 1. If a rigid body revolving about an axis Aa, which passes through its centre of gravity O, with an angular velocity $=v$, receive an impulse which alone would cause it to revolve about an axis Bb, also passing through its centre of gravity, with a velocity $=\phi$, the body will now revolve about a third axis Cc, passing through its centre of gravity, and lying in the plane of the two axes Aa and Bb, and so situated that the sine of its inclination to the axis Aa will be to the sine of its inclination to the axis Bb, as the velocity about Bb to the velocity about Aa; that is, the new axis will divide the angle AOB, so that $\sin \text{AOC} : \sin \text{BOC} :: \varphi : v$.

In order to determine whether the pole C of the new axis lies between A and B, or between A and b, it is only necessary to consider that the new axis must evidently be that line in the body in which every point is at rest in respect of both motions. If, therefore, we suppose the original motion about Aa, to be in the direction which would raise the point B above the plane of the paper, and to depress b below it, and the new impulse to be given in the direction which would depress the point A below the plane of the paper, and raise a above it, then C will lie between A and B; but if the new impulse tends to raise A above the plane of the paper, then C will lie between A and b.

Corollary 1. If the two axes Aa and Bb are at right angles, then $\sin \text{BOC} = \cos \text{AOC}$, and we have $\dfrac{\sin \text{AOC}}{\cos \text{AOC}} = \dfrac{\varphi}{v}$, that is, $\tan \text{AOC} = \dfrac{\varphi}{v}$.

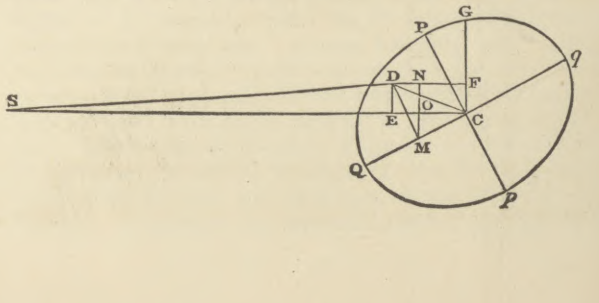
Cor. 2. If the impulse is renewed at every instant of time, the axis about which the body actually revolves must have a uniform motion in space from OA towards OB.

Theorem 2. If the force which tends to give the body a motion of rotation about an axis which is always perpendicular to the axis about which it is already revolving, and situated in the plane AOB, be uniform, the angular velocity of rotation remains unaltered, or v is a constant quantity.

These theorems, which are true of bodies in general, whatever be their figure, were first demonstrated by Frisi.

Proposition 1. To determine the efficacy of the sun's attraction to turn the spheroid about its centre, the earth being supposed homogeneous.

Let Pp be the axis of rotation, Qq the projection of the equator, S the sun, C the centre of the spheroid, and D



the projection of a point in the interior of the spheroid on the plane PQpq. Join SC, SD, DC; and draw CG perpendicular to SC, and DE, DF respectively perpendicular to SC, CG.

Let f represent the force of the sun's attraction on a particle at the centre C, and f' the force of its attraction on a particle at D, then the attraction being inversely as the square of the distance, we have $f'=f.\frac{\mathrm{SC}^2}{\mathrm{SD}^2}$. Now the force f', which acts on D in the direction SD, may be resolved into two; one in the direction CD, which has no tendency to turn the spheroid about its centre, and the other in the direction FD parallel to SC, which tends to turn the spheroid in the direction PQ about an axis passing through C, and perpendicular to the plane PQpq. The resolved part of the force f', in the direction FD is $f\cdot\frac{\mathrm{SC}^2}{\mathrm{SD}^2}\cdot\frac{\mathrm{SC}}{\mathrm{SD}}$, since SD is the diagonal of a parallelogram of which SC and CD are the sides. Now, if the resolved force in the direction FD parallel to SC were the same on every particle, and equal to f, it would have no tendency to produce rotation in the spheroid; we may therefore conceive the force on any particle which tends to produce rotation to be the difference between the part of the force acting on that particle in the direction parallel to SC, and the force f acting on the particle at C. Hence the force on D tending to impress a rotatory motion on the spheroid is $f\cdot\left(\frac{\mathrm{SC}^2}{\mathrm{SD}^2}\cdot\frac{\mathrm{SC}}{\mathrm{SD}}-1\right)=f\cdot\frac{\mathrm{SC}^3-\mathrm{SD}^3}{\mathrm{SD}^3}=f\cdot\frac{(\mathrm{SC}-\mathrm{SD})\,(\mathrm{SC}^2+\mathrm{SC}\cdot\mathrm{SD}+\mathrm{SD}^2)}{\mathrm{SD}^3}$. Now, by reason of the great distance of the sun in comparison of the radius of the earth, SD is very nearly parallel to SC, and equal to SC—CE. Substituting therefore SC—CE for SD, and neglecting terms divided by SC^2 which are so small as to be altogether insensible, the factor $\frac{\mathrm{SC}^2+\mathrm{SC}\cdot\mathrm{SD}+\mathrm{SD}^2}{\mathrm{SD}^3}$ becomes $\frac{3}{\mathrm{SD}}$, and consequently the above expression is reduced to $3f.\frac{\mathrm{CE}}{\mathrm{SD}}$, or to $3f.\frac{\mathrm{CE}}{\mathrm{SC}}$, since the difference between $1\div\mathrm{SD}$ and $1\div\mathrm{SC}$ is a quantity divided by SC^2, and therefore insensible. This is the part of the force on D which tends to turn the spheroid about the diameter of the equator which is perpendicular to Qq; and by the principles of mechanics, its efficacy in communicating a rotatory motion to the spheroid is proportional to the distance of its line of direction from the axis, that is, proportional to CF; whence the moment of the force at the point D becomes $3f.\frac{\mathrm{CE}\cdot\mathrm{CF}}{\mathrm{SC}}$.

Assume $r=\mathrm{SC}$, and let S denote the absolute force of the sun, then $f=\mathrm{S}\div r^2$; and if $k=$ the density at D, then kdm is the quantity of matter in the particle dm at D, and the moment of the force on that particle tending to produce in the spheroid a motion about its centre in the direction QP (which is the general direction of the motion produced by the forces on all the particles) is $-\frac{3\mathrm{S}}{r^3}.\ \mathrm{CE.CF}.\ k.dm$, the integral of which must be taken for the whole spheroid.

Draw DM parallel to Pp, and MN perpendicular to DF, meeting SC in O, and make

$$\mathrm{CM}=\mathrm{X},\ \mathrm{DM}=y,\ \mathrm{SCP}=\theta,$$

(θ being the complement of the sun's declination) then $\mathrm{CE}=\mathrm{DN}+\mathrm{NF}=y\cos\theta+x\sin\theta$, and $\mathrm{CF}=\mathrm{MN}-\mathrm{MO}=y\sin\theta-x\cos\theta$, whence the moment of the force impressed on D becomes

$$\frac{3}{r^3}\,kdm\left\{(x^2-y^2)\sin\theta\cos\theta+xy\,(\cos^2\theta-\sin^2\theta)\right\}.$$

In order to find the integrals $\int kx^2dm$, $\int ky^2dm$, $\int kxydm$ for every particle in the spheroid, let z be the co-ordinate perpendicular to the plane of the figure, and conceive the whole spheroid to be divided into an infinite number of thin slices parallel to the plane of yz, the thickness of each slice being dx; suppose, again, each slice to be divided into an infinity of parallelepipeds, parallel to the axis z, and terminated by the surface of the spheroid, the breadth of each being dy; and, lastly, let each parallelepiped be divided into an infinite number of lengths, each $=dz$. The element of the volume, dm, then becomes $dxdydz$; and consequently the sum of kx^2dm in respect of every particle is expressed by the triple integral $\iiint kx^2dxdydz$.

Assuming x^2, dx and dy to be constant, and integrating with respect to z, we obtain $kx^2dxdyz+\text{const}$. Let $a=$ the semi-diameter of the equator, $b=$ the polar semi-axis, and the equation of the spheroid is $\frac{x^2}{a^2}+\frac{y^2}{b^2}+\frac{z^2}{a^2}=1$, from which the limits of z must be found. This equation gives for a point at the surface, $z=\pm a\sqrt{1-\frac{x^2}{a^2}-\frac{y^2}{b^2}}$, and between those values of z the definite integral becomes

$$2\,kax^2dxdy\sqrt{1-\frac{x^2}{a^2}-\frac{y^2}{b^2}}.$$

This expresses the sum of kx^2dm for the parallelepiped corresponding to a given value of x.

If we next suppose x^2 and dx to be constant, and integrate this expression with respect to y, we shall have the sum of kx^2dm for the slice, the distance of which from the plane yz is x. Make $1-\frac{x^2}{a^2}=\frac{u^2}{b^2}$, or $u^2=b^2-\frac{b^2x^2}{a^2}$, and the expression becomes $\frac{2kax^2dx}{b}\sqrt{u^2-y^2}.\,dy$. In integrating this expression, the limits of y, in respect of any given value of x, are obtained from the equation of the section of the ellipsoid in the plane xy, namely $\frac{x^2}{a^2}+\frac{y^2}{b^2}=1$. This equation gives $y^2=b^2-\frac{b^2x^2}{a^2}$; whence, at the limits $y^2=u^2$, and therefore $y=\pm u$. Now, by a known formula, the integral $\int\sqrt{u^2-y^2}.dy$ from $y=-u$ to $y=+u$ is $\frac{1}{2}\pi u^2$ (π being the ratio of the circumference to the diameter); therefore the integral of x^2dm for the slice corresponding to a given value of x is $\frac{\pi kau^2x^2dx}{b}$; which, on substituting for u^2, its value $b^2-\frac{b^2}{a^2}x^2$, becomes

$$\pi k\frac{b}{a}(a^2x^2-x^4)dx.$$

We have, lastly, to integrate this expression from $x=-a$ to $x=+a$. The integral between those limits is $\frac{2\pi kl}{a}\left(\frac{a^5}{3}-\frac{a^5}{5}\right)$; whence we have ultimately, in respect of the whole spheroid,

$$\iiint kx^2dxdydz=\tfrac{4}{15}\pi ka^4b.$$

On going through the same process for y^2dm, or $y^2dxdydz$, and observing that the integral $\int y^2\sqrt{u^2-y^2}.dy$ from $y=-u$ to $y=+u$ is $\frac{1}{8}\pi u^4$, there results for the whole spheroid

$$\iiint ky^2dxdydz=\tfrac{4}{15}\pi ka^2b^3.$$

With respect to the remaining integral $\int xydm$, it is easy to see that its value in respect of the whole spheroid must be 0, for on integrating $kxydxdydx$ with respect to x, there results $\frac{1}{2}kx^2ydydz$, which vanishes on giving x all values between $-t$ and $+t$, t being any definite quantity.

From these values of $\int x^2dm$, $\int y^2dm$, $\int xydm$, we obtain the following expression for the moment of all the forces impressed on the spheroid,

$$\frac{3S}{r^3}\cdot\frac{4\pi}{15}ka^2b(a^2-b^2)\sin\theta\cos\theta.$$

Prop. 2. To determine the efficacy of the sun's attraction to turn the spheroid about its centre, the earth being supposed heterogeneous.

Conceive the spheroid to be composed of infinitely thin concentric layers, bounded by spheroidal surfaces, and suppose the ellipticity and density to be different for each layer, but both to be functions of the distance from the centre of the spheroid. Let α and β be respectively the equatorial and polar semi-diameters of the layer which contains a particle dm, $e=$ its ellipticity, and k its density. In order to find the moment of all the forces impressed on the spheroid, we must first find an expression in terms of β, for their moment on the elementary layer containing dm, and then integrate this expression from $\beta=0$ to $\beta=b$. Now, suppose all the matter of the spheroid exterior to the layer in question to be removed, and suppose also for a moment the matter in the interior of the spheroidal surface passing through dm to be all of the same density, k, then the moment of the impressed forces on the spheroid whose surface passes through dm, is by the last proposition

$$\frac{3S}{r^3}\cdot\frac{4\pi}{15}k\alpha^2\beta(\alpha^2-\beta^2)\sin\theta\cos\theta.$$

The variable part of this expression is $k\alpha^2\beta(\alpha^2-\beta^2)$. Now, since $\alpha=\beta(1+e)$, we have, on neglecting terms multiplied by e^2, which, by reason of the smallness of the earth's ellipticity are altogether insensible, $\alpha^2=\beta^2+2\beta^2e$ and $\alpha^2-\beta^2=2\beta^2e$, whence $k\alpha^2\beta(\alpha^2-\beta^2)=2k\beta^5e$. Suppose now the semi-axis β to receive an infinitely small increment, and to become $\beta+d\beta$; then since k and e are both functions of β, the expression $2k\beta^5e$ will become $2k\beta^5e+\frac{2d(k\beta^5e)}{d\beta}d\beta$. This is the variable part of the moment of the forces on the spheroid whose semiaxis is $\beta+d\beta$; consequently, in respect of the spheroidal layer which remains on subtracting the spheroid whose semiaxis is β, it becomes $\frac{2d(k\beta^5e)}{d\beta}d\beta$. Let the integral of this expression between the limits $\beta=0$ and $\beta=b$ be denoted by $2\,F(\beta)$; then the moment of all the forces impressed on the spheroid supposed heterogeneous is

$$\frac{3S}{r^3}\cdot\frac{8\pi}{15}F(\beta)\sin\theta\cos\theta.$$

Prop. 3. To determine the angular velocity φ generated by the sun's force, and the position of the equator after the infinitely small time dt.

By dynamics, the angular velocity of rotation is equal to the moment of the impressed forces divided by the moment of inertia of the mass to be moved. Now, the moment of inertia of a body, with respect to a given axis of rotation, is the sum of the products obtained by multiplying each particle of the body into the square of its distance from the axis; that is, in respect of the axis z, about which the impressed forces tend to turn the spheroid, the moment of inertia is $\int(x^2+y^2)dm$, supposing the spheroid homogeneous, and the density $k=1$. But it has been shewn that in this case $\int x^2dm=\frac{4}{15}\pi a^4b$, and $\int y^2dm=\frac{4}{15}\pi u^2b^3$; therefore the moment of inertia of the spheroid is $\frac{4}{15}\pi a^2b(a^2+b^2)$. And by prop. 1, the moment of the impressed forces is $\frac{3S}{r^3}\cdot\frac{4}{15}\pi a^2b(a^2-b^2)\sin\theta\cos\theta$, therefore

$$\varphi=\frac{3S}{r^3}\cdot\frac{a^2-b^2}{a^2+b^2}\sin\theta\cos\theta.$$

In the case of the heterogeneous spheroid the moment of inertia is thus found. As before, let α and β be the equatorial and polar semiaxes of the spheroidal surface passing through the particle dm, then if the matter within this surface be supposed of uniform density $=k$, the moment of inertia of this spheroid, by what is already shewn, is $\frac{4}{15}\pi k\alpha^2\beta(\alpha^2+\beta^2)$. But $\alpha^2+\beta^2=2\beta^2+2\beta e$, and $\alpha^2\beta=\beta^3+2\beta^3e$, therefore $\alpha^2\beta(\alpha^2+\beta^2)=2\beta^5+6\beta^5e$; and since e is a very small quantity, the second term of this expression is very small, and may be neglected in comparison of the first; therefore $k\alpha^2\beta(\alpha^2+\beta^2)=2k\beta^5$. For the spheroid whose semiaxis is $\beta+d\beta$, this quantity becomes $2k\beta^5+\frac{2d(k\beta^5)}{d\beta}d\beta$, and therefore in respect of the elementary spheroidal layer the semiaxes of whose interior and exterior surfaces are β and $\beta+d\beta$, it is $\frac{2d(k\beta^5)}{d\beta}d\beta$. Let $2F'(\beta)$ denote the integral of this quantity from $\beta=0$ to $\beta=b$, that is, let $\int\frac{d(k\beta^5)}{d\beta}d\beta=2F'(\beta)$, and the moment of inertia of the heterogeneous spheroid becomes $\frac{8\pi}{15}F'(\beta)$. But the moment of the impressed forces is by prop. 2, $\frac{3S}{r^3}\cdot\frac{8\pi}{15}F(\beta)\sin\theta\cos\theta$, therefore in the case of the heterogeneous spheroid,

$$\phi=\frac{3S}{r^3}\cdot\frac{F(\beta)}{F'(\beta)}\sin\theta\cos\theta.$$

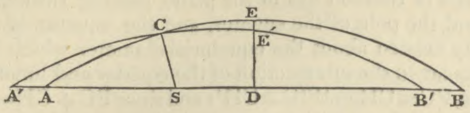
Let us assume $K=\frac{a^2-b^2}{a^2+b^2}$ in the case of the homogeneous spheroid, and $K=\frac{F(\beta)}{F'(\beta)}$ in the case of the heterogeneous spheroid, and we have for both cases

$$\phi=\frac{3S.K}{r^3}\sin\theta\cos\theta.$$

Now to find the place of the pole, and the position of the equator after the small interval of time dt, we must apply the first of the two theorems above premised. If the earth had no diurnal rotation, the sun's force would cause it to revolve about an axis passing through C perpendicular to the meridian P Qpq, or perpendicular to the plane of the paper, so as to bring the point Q nearer to the line SC, with a velocity $=\phi$. But the earth is already revolving about the axis Pp, with a velocity $=v$, and in the direction which raises the point q above the plane of the paper. Hence, by theorem 1, the new axis of rotation will be in the plane passing through Pp, perpendicular to the plane of the paper, and after the time dt will make with Pp an angle whose tangent $=\frac{\phi}{v}$, the pole P rising above the plane of the paper; and the new equator will intersect the former in the line Qq, and make with it an angle whose tangent is also $\frac{\phi}{v}$. The effect of the compound motion is thus to twist as it were the equator about the line Qq as an axis, or about that diameter of the equator which lies in the same meridian with the sun, instead of twisting it about the diameter perpendicular to that meridian, as would be the case if the earth had no diurnal motion.

Prop. 4. To find the amount of the solar precession after any given time.

Let AB be the intersection of the plane of the ecliptic, with the surface of sphere whose centre is at the centre of the earth; let ACB be the equator, and S the projection of the sun's place in the ecliptic. Now, the plane of the



equator being always perpendicular to the axis of rotation, when the axis changes its position the equator will also change its position, and the new equator will intersect the former in an angle equal to the deviation of the axis. Let A′CB′ be the new position of the equator, after the infinitely small time *dt*, intersecting the former in C, then the angle ACA′ is the measure of the momentary deviation of the axis, and AA′, which is the amount of variation in the place of the node, is the precession in the time *dt*.

From the known properties of spherical triangles we have sin SAC : sin ACA′ :: sin A′C : sin AA′. But because ACA′ is a very small angle, and AA′ a very small arc, the arcs may be taken instead of the sines; whence, since A′C=AC, the proportion gives $\mathrm{AA'}=\mathrm{ACA'}\dfrac{\sin \mathrm{AC}}{\sin \mathrm{SAC}}$.

But by the last proposition $\tan \mathrm{ACA'}=\dfrac{\phi}{v}=\dfrac{3\mathrm{S.K}}{vr^3}\sin\theta\cos\theta$, therefore, as the small arc may be substituted for its tangent,

$$\mathrm{AA'}=\frac{3\mathrm{S.K}}{vr^3}\,\frac{\sin \mathrm{AC}}{\sin \mathrm{SAC}}\sin\theta\cos\theta.$$

It will now be convenient to express this value of AA′ in terms of the sun's longitude and the obliquity of the ecliptic. Since the equator, as was shewn in the last proposition, is twisted about the diameter which is in the same meridian with the sun, it follows that the line joining S and C is a part of the meridian; whence ACS is a right angle, and SC (the sun's declination)$=90°-\theta$. Let l=AS, (the sun's longitude), and I=SAC, (the obliquity of the ecliptic), then, in the right angled spherical triangle SAC, we have cos SC . cos AC=cos AS, or $\sin\theta\cos \mathrm{AC}=\cos l$; and $\sin \mathrm{SC}=\sin \mathrm{SAC}\sin \mathrm{AS}$, or $\cos\theta=\sin \mathrm{I}\sin l$, therefore $\sin\theta\cos\theta=\dfrac{\sin \mathrm{I}\sin l\cos l}{\cos \mathrm{AC}}$. Again, in the same triangle we have tan AC=cos SAC tan AS, whence $\sin \mathrm{AC}=\cos \mathrm{AC}\cos \mathrm{I}\tan l$, and (dividing by sin SAC= sin I) $\dfrac{\sin \mathrm{AC}}{\sin \mathrm{SAC}}=\dfrac{\cos \mathrm{AC}\cos \mathrm{I}\sin l}{\sin \mathrm{I}\cos l}$. Substituting these values of $\sin\theta\cos\theta$ and $\dfrac{\sin \mathrm{AC}}{\cos \mathrm{AC}}$ in the above value of AA′, we get

$$\mathrm{AA'}=\frac{3\mathrm{S.K}}{vr^3}\cos \mathrm{I}\sin^2 l.$$

This is the solar precession in the element of time *dt*; consequently for a given time T we have

$$\text{solar precession}=\frac{3\mathrm{S.K}\cos \mathrm{I}}{v}\int\frac{\sin^2 l}{r^3}\,dt,$$

the integral being taken from $t=0$ to $t=\mathrm{T}$.

To prepare this expression for integration, r^3 and dt must be expressed in terms of l and known quantities. Let a=semiaxis major of the earth's orbit, ϵ=its eccentricity, T=a sidereal year, then r being the radius vector, and dl the angle described in the time dt, $\frac{1}{2}r^2dl$ is the space passed over by the radius vector in the element of the time, and by Kepler's law of the equable description of areas, we have $dt : \mathrm{T} :: \frac{1}{2}r^2dl$: area of orbit.

Now the area of the orbit is $\pi a^2\sqrt{1-\epsilon^2}$, therefore this proportion gives $dt=\dfrac{\mathrm{T}r^2dl}{2\pi a^2\sqrt{1-\epsilon^2}}$. But it is shewn in the article Astronomy, part iii. art. 10, that $\mathrm{T}=2\pi\sqrt{a}\div\sqrt{\mathrm{F}}$, where F is the attracting force at the mean distance *a*. But we have assumed S to denote the sun's force at the unit of distance; therefore, the forces being inversely as the squares of the distances, $\mathrm{F}=\mathrm{S}\div a^2$, whence $\mathrm{T}=\dfrac{2\pi a^{\frac{3}{2}}}{\sqrt{\mathrm{S}}}$

From this formula we get $\mathrm{S}=\dfrac{4\pi^2a^3}{\mathrm{T}^2}$, and therefore $\dfrac{\mathrm{S}.dt}{r^3}=\dfrac{2\pi a\,dl}{\mathrm{T}r\sqrt{1-\epsilon^2}}$. Again, assuming λ= longitude of sun's perigee, the polar equation of the ellipse gives $r=\dfrac{a(1-\epsilon^2)}{1+\epsilon\cos(l-\lambda)}$; whence $\dfrac{\mathrm{S}.dt}{r^3}=\dfrac{2\pi\{1+\epsilon\cos(l-\lambda)\}dl}{\mathrm{T}(1-\epsilon^2)^{\frac{3}{2}}}$, and the above expression becomes

$$\text{solar precession}=\frac{6\pi\mathrm{K}\cos \mathrm{I}}{\mathrm{T}v(1-\epsilon^2)^{\frac{3}{2}}}\int\sin^2 l\{1+\epsilon\cos(\lambda-l\}dl.$$

The expression under the sign of integration consists of two parts, of which the first $\int\sin^2 l\,dl=\frac{1}{2}(\mathrm{C}+l-\cos l\sin l)$. (See Fluxions, art. 153.) The second part, namely $\int\epsilon\sin^2 l\cos(l-\lambda)dl$, when integrated becomes $\epsilon\sin(l-\lambda)-\frac{\epsilon}{2}\sin(l+\lambda)-\frac{\epsilon}{6}\sin(3l-\lambda)$, but by reason of the smallness of ϵ these terms are insensible, and are therefore neglected. Rejecting also the terms in the divisor of the coefficient which are multiplied by ϵ^2, and observing that $\cos l\sin l=\frac{1}{2}\sin 2l$, we obtain, finally,

$$\text{solar precession}=\frac{3\pi\mathrm{K}\cos \mathrm{I}}{\mathrm{T}v}(\mathrm{C}+l-\tfrac{1}{2}\sin 2l).$$

The first term of this expression, which depends upon $\mathrm{C}+l$, or on the sun's longitude, is the constant or uniform precession. Its amount in one year is found by supposing l to be increased by 2π, and is consequently $\dfrac{6\pi^2\mathrm{K}\cos \mathrm{I}}{\mathrm{T}v}$. The second is periodic, and being proportional to twice the sine of the sun's longitude, it runs through its changes in half a-year. It is usually regarded as a part of solar nutation, and called *the solar equation of the equinoxes in longitude.*

Prop. 5. To find the diminution of the obliquity of the ecliptic produced by the sun's attraction.

Referring to the last diagram, make AE=EB=90°, and let ED be perpendicular to AB the ecliptic, and meet A′CB′ in E′, then EE′ is the small change in the inclination in the time *dt*. In the triangle ECE′, we have sin EE′ = sin CE sin ECE′. But EE′ being very small, the arc may be taken for the sine, and therefore EE′= sin CE sin ECE′.

Now $\sin \mathrm{CE}=\cos \mathrm{AC}=\dfrac{\cos l}{\sin\theta}$; and it has been already seen that $\sin \mathrm{ECE'}=\mathrm{ACA'}=\dfrac{\phi}{v}=\dfrac{3\mathrm{S.K}}{r^3v}\sin\theta\cos\theta$; therefore $\mathrm{EE'}=\dfrac{3\mathrm{S.K}}{r^3v}\cos\theta\cos l$, or since $\cos\theta=\sin \mathrm{I}\sin l$, $\mathrm{EE'}=\dfrac{3\mathrm{S.K}}{r^3v}\sin \mathrm{I}\sin l\cos l$. Multiplying by *dt*, and making the same substitutions as in the last proposition, we have

$$\int\mathrm{EE'}dt=\frac{6\pi\mathrm{K}}{\mathrm{T}v(1-\epsilon^2)^{\frac{3}{2}}}\sin \mathrm{I}\int\sin l\cos l\{1+e\cos(l-\lambda)\}dl,$$

whence neglecting as before terms multiplied by ϵ, and integrating, there results

$$\int \text{EE}'dt = -\frac{3\pi\text{K}}{2\text{T}v}\sin \text{I} \cos 2l,$$

for the solar nutation in obliquity. This expression, depending on twice the cosine of the sun's longitude, runs through all its changes in half a year; but its greatest value amounts to scarcely half a second, and is consequently altogether insensible to observation.

Prop. 6. To investigate the precessional motion of the equinoxes produced by the moon. Let

$\text{M} =$ moon's mass,
$\text{E} =$ earth's mass,
$\text{I}' =$ inclination of moon's orbit to the equator,
$l' =$ moon's distance from the intersection of her orbit with the equator,
$r' =$ radius vector of the moon's orbit,
$a' =$ semitransverse axis of moon's orbit,
$\epsilon' =$ eccentricity of the lunar orbit,
$\text{T}' =$ sidereal time of revolution.

Then, by following exactly the same reasoning as was pursued in *prop*. 4, there results for the retrograde motion of the points in which the plane of the lunar orbit intersects the plane of the equator (corresponding to the solar precession in *prop*. 4.), the expression

$$\frac{3\text{M}.\text{K}\cos \text{I}'}{v}\int \frac{\sin^2 l'}{r'^3}\,dt.$$

Now, we have $dt = \frac{\text{T}'r'^2dl'}{2\pi a'^2\sqrt{1-\epsilon'^2}}$, and $r' = \frac{a'(1-\epsilon'^2)}{1+\epsilon'\cos(\lambda'-l')}$ therefore $\frac{dt}{r'^3} = \frac{\text{T}'\{1+\epsilon'\cos(\lambda'-l')\}\,dl'}{2\pi a'^3\,1-\epsilon'^2)^{\frac{3}{2}}}$. But in the present case $\text{T}' = \frac{2\pi a'^{\frac{3}{2}}}{\sqrt{(\text{E}+\text{M})}}$ (for the mass of the moon cannot be neglected in comparison of that of the earth, as the mass of the earth is neglected in comparison of that of the sun), hence $\frac{1}{a'^3} = \frac{4\pi^2}{\text{T}'^2(\text{E}+\text{M})}$. The above expression therefore becomes

$$\frac{6\pi\text{M}.\text{K}\cos \text{I}'}{\text{T}'v(\text{E}+\text{M})(1-\epsilon'^2)^{\frac{3}{2}}}\int \sin^2 l'\{1+\epsilon'\cos(x-l')dl',\},$$

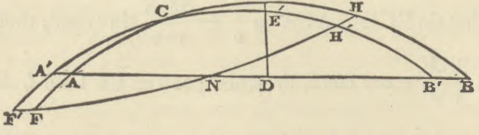
the integral of which (rejecting, as before, terms multiplied by ϵ') gives

$$\frac{3\pi\text{M}.\text{K}\cos \text{I}'}{\text{T}'v(\text{E}+\text{M})}(\text{C}+l'-\tfrac{1}{2}\sin 2l').$$

for the regression of the equator on the plane of the lunar orbit. Suppose l' to be increased by 2π, or a whole circumference, the regression caused by the moon's action in a sidereal revolution becomes $\frac{6\pi^2\text{M}.\text{K}\cos \text{I}'}{\text{T}'v(\text{E}+\text{M})}$.

It is now necessary to reduce this retrograde motion to the plane of the ecliptic.

Let AB be the ecliptic, ACB the equator, A′CB′ the new position of the equator, and FH the plane of the lunar orbit intersecting the new equator in F′ and H′, and the ecliptic in N. The mean effect of the moon's action in the course of a month, if the earth had no motion of rotation, would be to bring the equator nearer the plane of the lunar orbit, causing it to revolve about the line of its intersection with the lunar orbit; therefore by *Theorem* I., the momentary axis of rotation lies in the plane passing through that line and the pole of the equator, and the equator is consequently twisted about the equatorial diameter which is perpendicular to the intersection of the equator and lunar orbit. Hence, $\text{FC}=\text{CH}$ and $\text{F}'\text{C}=\text{CH}'$; and since $\text{FC}+\text{CH}=180°$, therefore FC and F′C are quadrantal arcs, and the two triangles CFF and CHH′ are in all respects equal. Now



$$\sin \text{FC} : \text{CF}'\text{F} :: \sin \text{FF}' :: \text{ACA}',$$

that is, $$1 : \sin \text{I}' :: \text{FF}' :: \text{ACA}',$$

and $$\sin \text{CA}'\text{A} : \sin \text{AC} :: \sin \text{ACA}' :: \sin \text{AA}',$$

that is, $$\sin \text{I} : \cos \text{AF} :: \text{ACA}' :: \text{AA}',$$

therefore,

$$\sin \text{I} : \sin \text{I}'\cos \text{AF} :: \text{FF}' : \text{AA}',$$

and consequently,

$$\text{AA}' = \frac{\text{F}'\text{F}\sin \text{I}'\cos \text{AF}}{\sin \text{I}}.$$

But AA′ represents the velocity along the ecliptic, and FF′ the velocity along the plane of the moon's orbit, and we have seen that the motion along this plane is $\frac{6\pi^2\text{K}.\text{M}\cos \text{I}'}{\text{T}'v(\text{E}+\text{M})}$, in the time T′, or a sidereal revolution. Dividing this by T′, we get the mean velocity in the plane of the orbit in the unit of time; whence $\text{FF}' = \frac{6\pi^2\text{K}.\text{M}\cos \text{I}'}{\text{T}'^2v(\text{E}+\text{M})}$.

For the sake of brevity let $\text{Q} = \frac{\pi^2\text{K}.\text{M}}{\text{T}'^2v(\text{E}+\text{M})}$, then $\text{FF}' = \text{Q}\cos \text{I}'$, and we have

$$\text{AA}' = \frac{\text{Q}\cos \text{I}'\sin \text{I}'\cos \text{AF}}{\sin \text{I}}.$$

We must now express cos I′ sin I′ cos AF, in terms of the obliquity and inclination of the lunar orbit to the ecliptic. Let $i = \text{ANF} =$ inclination of moon's orbit to the ecliptic, $n = \text{NA}$, the longitude of the node; then in the triangle ANF, we have by spherical trigonometry,

$$\cos \text{ANF} = \cos \text{NAF}\cos \text{NFA} + \sin \text{NAF}\sin \text{NFA}\cos \text{AF},$$

that is, since $\text{NAF}=\text{I}$, $\text{NFA}=\text{I}'$,

$$\cos i = \cos \text{I}\cos \text{I}' + \sin \text{I}\sin \text{I}'\cos \text{AF},$$

In like manner, in the same triangle,

$$\cos \text{I}' = \cos \text{I}\cos i + \sin \text{I}\sin i\cos n.$$

From these two equations we obtain this other,

$$\begin{aligned}\cos \text{I}'\sin \text{I}'\cos \text{AF} = {} & \cos \text{I}\sin \text{I}\cos^2 i \\ & -(\cos^2 \text{I}-\sin^2 \text{I})\cos i\sin i\cos n \\ & -\cos \text{I}\sin \text{I}\sin^2 i\cos^2 n,\end{aligned}$$

which, on substituting in it $\cos 2\text{I}$ for $\cos^2 \text{I}-\sin^2 \text{I}$, $\frac{1}{2}\sin 2i$ for $\cos i\sin i$, and $\frac{1}{2}+\frac{1}{2}\cos 2n$ for $\cos^2 n$, becomes

$$\begin{aligned}\cos \text{I}'\sin \text{I}'\cos \text{AF} = {} & \cos \text{I}\sin \text{I}(\cos^2 i-\tfrac{1}{2}\sin^2 i) \\ & -\tfrac{1}{2}\cos 2\text{I}\sin 2i\cos n \\ & -\tfrac{1}{2}\cos \text{I}\sin \text{I}\sin^2 i\cos 2n.\end{aligned}$$

Assuming i (the inclination of the moon's orbit) to be constant, which may be done in the present case without sensible error, the only variable in this expression is n, (the longitude of the node), which, on the supposition of i constant, is proportional to the time. Let τ denote the time of a revolution of the node, then for any time t, we have $n = \frac{2\pi t}{\tau}$. On making this substitution in the last equation, we obtain by means of it

$$\begin{aligned}\text{AA}' = \text{Q}\Big\{ & \cos \text{I}(\cos^2 i-\tfrac{1}{2}\sin\ i) \\ & -\frac{\frac{1}{2}\cos 2\text{I}}{\sin \text{I}}\sin 2i\cos\frac{2\pi t}{\tau} \\ & -\tfrac{1}{2}\cos \text{I}\sin^2 i\cos\frac{4\pi t}{\tau}\Big\}\end{aligned}$$

Now, if we assume $y =$ the regression of the equinoctial points on the ecliptic caused by the lunar action, and sup-

Precession of the Equinoxes.

pose y a function of t, then $AA' = \frac{dy}{dt}$, and the amount of this regression in a given time $= \int \frac{dy}{dt}\,dt$. Multiplying therefore the right hand side of the last equation by dt, and integrating, $\left(\text{observing that} \int \cos \frac{2\pi t}{\tau}\,dt = \frac{\tau}{2\pi} \sin \frac{2\pi t}{\tau}\right.$, and $\left.\int \cos \frac{4\pi t}{\tau}\,dt = \frac{\tau}{4\pi} \sin \frac{4\pi t}{\tau}\right)$, we obtain, finally, for the regression of the equinoctial points, or the precessional motion of the equinoxes, produced by the moon in the time t,

$$Q \left\{ \cos I\,(\cos^2 i - \tfrac{1}{2} \sin^2 i)\,t - \frac{\tau}{4\pi} \frac{\cos 2I \sin 2i}{\sin I} \sin \frac{2\pi t}{\tau} - \frac{\tau}{8\pi} \cos I \sin^2 i \sin \frac{4\pi t}{\tau} \right\} + \text{const.}$$

The first term of this expression increases uniformly with the time, and is called the *lunar precession*. The second term, being multiplied by $\sin \frac{2\pi t}{\tau}$, is periodic, and depends on the mean longitude of the moon's ascending node. It is called the *lunar equation of the equinoxes in longitude*. The third term is also periodic, but its numerical value is so small as to be insensible, and it is therefore omitted in the calculation. The lunar precession in a sidereal year is found by substituting T for t in the first term, and we have, therefore,

$$\text{lunar annual precession} = Q \cos I\,(\cos^2 i - \tfrac{1}{2} \sin^2 i)\,T.$$

Prop. 7. To find the diminution in the inclination of the equator to the ecliptic produced by the moon's action.

Let AB be bisected in D, and let DE be an arc perpendicular to AB, and meeting A′B′ in E′; then the alteration of obliquity produced by the moon in the time dt is represented by EE′. Now in the triangle CFF′ we have

$$\sin CF' : \sin CFF' :: \sin FF' : \sin FCF',$$

that is, $1 : \sin I' :: FF' : FCF'$;

and in the triangle CEE′,

$$\sin CE'E : \sin CE :: \sin ECE' : \sin EE'$$

that is, by reason of CE=AF (since FC=AE=90°) and ECE′=FCF′

$$1 : \sin AF :: FCF' : EE';$$

whence $EE' = FF' \sin I' \sin AF$. Now it was shewn in the last proposition that $FF' = Q \cos I'$, therefore

$$EE' = Q \cos I' \sin I' \sin AF.$$

To refer this to the ecliptic we have in the triangle NAF,

$$\sin NFA : \sin ANF :: \sin AN : \sin AF$$

which gives the equation

$$\sin I' \sin AF = \sin i \sin n;$$

and, as before we have

$$\cos I' = \cos I \cos i + \sin I \sin i \cos n;$$

whence multiplying the two equations together, and substituting $\frac{1}{2} \sin 2i$ for $\cos i \sin i$, and $\frac{1}{2} \sin 2n$ for $\cos n \sin n$, we get

$$\cos I' \sin I' \sin AF = \tfrac{1}{2} \cos I \sin 2i \sin n + \tfrac{1}{2} \sin I \sin^2 i \sin 2n,$$

and, consequently, writing for n its value $\frac{2\pi t}{\tau}$,

$$EE' = Q \left\{ \tfrac{1}{2} \cos I \sin 2i \sin \frac{2\pi t}{\tau} + \tfrac{1}{2} \sin I \sin^2 i \sin \frac{4\pi t}{\tau} \right\}.$$

Multiplying this by dt and integrating, we obtain for the diminution of the inclination, or *lunar nutation in obliquity*

$$-Q \left(\frac{\tau}{4\pi} \cos I \sin 2i \cos \frac{2\pi t}{\tau} + \frac{\tau}{8\pi} \sin I \sin^2 i \cos \frac{4\pi t}{\tau} \right).$$

Both terms of this expression are periodic; but the second is omitted in the calculation, as being too small to be sensible. Hence we have

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$$\text{lunar nutation in obliquity} = -Q \cdot \frac{\tau}{4\pi} \cos I \sin 2i \cos \frac{2\pi t}{\tau}.$$

Prop. 8. To compute the numerical value of the annual precession.

By prop. 4. the solar precession in one year $= \frac{6\pi^2 K \cos I}{Tv}$. Now Tv is the angle which any point of the earth describes about its axis of rotation in a sidereal year, or 366·26 days, and consequently $= 2\pi \times 366{\cdot}26$. The solar precession therefore becomes $\frac{3\pi K \cos (23^\circ\,28')}{366{\cdot}26}$ expressed in parts of the radius. To reduce it to seconds, we have, assuming radius $=1$, $\pi = 180^\circ = 180 \times 60 \times 60 = 648000$ seconds. Substituting this for π, and computing the above expression by the logarithmic tables we get

$$\text{solar annual precession} = K \times 4869''.$$

By prop. 6, the lunar precession in a sidereal year (on substituting for Q its value) is $\frac{6\pi^2 K \cdot M}{T'^2 v(E+M)} \cos I\,(\cos^2 i - \frac{1}{2} \sin^2 i)\,T$. But $T'v$ is the angle described by the diurnal rotation of the earth in one sidereal revolution of the moon, or 27·32 days (Astronomy, vol. iv.), and therefore $= 2\tau \times 27{\cdot}32$. We have also $i = 5^\circ\,8'\,47''{\cdot}9$, and, as before, $T = 366{\cdot}26$ days. Now assuming the moon's mass = 1-70th of the earth's mass, $M \div (E+M) = \frac{1}{71}$. By the substitution of these numbers, the lunar annual precession becomes

$$\frac{3\pi \cdot K \times 366{\cdot}26 \times \cos (23^\circ\,28') \times \{1 - \frac{3}{2} \sin^2 (5^\circ\,8'\,50'')\}}{27{\cdot}32 \times 27{\cdot}32 \times 71},$$

the calculation of which, reduced to seconds as before, gives

$$\text{lunar annual precession} = K \times 12176''.$$

Adding this to the solar annual precession, we obtain the effect produced by the joint action of the sun and moon, or

$$\text{luni-solar annual precession} = K \times 17045''.$$

It is now necessary to assign a value to the quantity K which depends on the law of the density of the earth. Supposing the earth homogeneous, we have $K = \frac{a^2 - b^2}{a^2 + b^2} = \frac{e}{1-e}$, e being the elipticity $= \frac{1}{301}$, (Figure of the Earth,)

whence $K = \frac{1}{300}$. This value of K gives

$$\text{luni-solar annual precession} = \frac{17045''}{300} = 56''{\cdot}82.$$

The observed quantity is only 50″·4; the difference being occasioned chiefly by the erroneous assumption of the homogeneity of the earth. If the earth be denser towards the centre, (and it is known to be so from other phenomena), the momentum of the protuberant parts will not be so great as if it were equally dense with the interior parts, and the precession will be less. From Cavendish's experiment, and experiments on the attraction of mountains, it has been ascertained that the mean density of the whole earth is about five times greater than that of water, and twice as great as that of the solid substances composing its exterior crust. But we are entirely ignorant of the law according to which the density varies from the surface towards the centre; and an infinity of hypotheses may be made which would give the observed precession, and at the same time satisfy the condition of a superficial density equal to half the mean density.

Prop. 9. To compute the numerical value of the solar and lunar nutation.

The solar nutation consists of two parts. The first is the solar equation of the equinoxes in longitude, or the second term of the expression for the solar precession in prop. 4, Precession of the Equinoxes.

Precession of the Equinoxes.

its value is $\frac{3\pi K}{Tv}\cos I\times\frac{1}{2}\sin 2l$. Substituting $2\pi\times 366{\cdot}26$ for Tv, and multiplying by $\frac{180\times 60\times 60}{\pi}$ to reduce to seconds, the computation gives

$$\text{1st part of solar nutation} = K\times 387''{\cdot}5\times\sin 2l.$$

The second part is the nutation in obliquity, found by prop. 5, the value of which is $\frac{3\pi K}{Tv}\sin I\times\frac{1}{2}\cos 2l$. This being computed in the same manner as the last gives

$$\text{2d part of solar nutation} = K\times 168''{\cdot}3\times\cos 2l.$$

Assuming the earth to be homogeneous, and consequently $K=\frac{1}{300}$, we have for the sum of the two parts

$$\text{solar nutation} = 1''{\cdot}29\sin 2l + 0''{\cdot}56\cos 2l,$$

both terms being so small as to be insensible to observation.

The lunar nutation is also composed of two parts; the first being the lunar equation of the equinoxes in longitude, or the second term of the expression in prop. 6; and the second the nutation in obliquity found in prop. 7. By prop. 6, the first of these parts is

$$\frac{3\pi K.M.\tau}{2T'^2v(E+M)}\cdot\frac{\cos 2I\sin 2i}{\sin I}\sin\frac{2\pi t}{\tau},$$

which, since $\tau=18{\cdot}6\times 366{\cdot}26$ days, becomes, on substituting for the different quantities their numerical values, and reducing to seconds,

$$K\times\frac{3\times 64800\times 18{\cdot}6\times 366{\cdot}26\times\cos(46^\circ 56)\sin(10^\circ 17'36)}{2\pi\times(27{\cdot}32)^2\times 2\times 71\sin(23^\circ 28)}\sin\frac{2\pi t}{\tau},$$

whence there is found from computation,

$$\text{lunar nutation in longitude} = K\times 6093''\times\sin\frac{2\pi t}{\tau}.$$

By prop. 7. the lunar nutation in obliquity becomes, on substituting for Q its value, and neglecting the sign,

$$\frac{3\pi K.M.\tau}{2T'^2v(E+M)}\cdot\cos I\times\sin 2i\times\cos\frac{2\pi t}{\tau}.$$

Comparing the coefficient of $\cos\frac{2\pi t}{\tau}$ in this expression with that of $\sin\frac{2\pi t}{\tau}$ in the above, it is obvious that the latter is found by multiplying the former by $\frac{\cos I\sin I}{\cos 2I}=\frac{\sin 2I}{2\cos 2I}$ $=\frac{1}{2}\tan 2I=\frac{1}{2}\tan(46^\circ 56')$. The multiplication gives

$$\text{lunar nutation in obliquity} = K\times 3260''\cos\frac{2\pi t}{\tau}.$$

Assuming that the earth is homogeneous, and consequently $K=\frac{1}{300}$, these two parts added together give

$$\text{lunar nutation} = 20''{\cdot}31\sin\frac{2\pi t}{\tau} + 10''{\cdot}88\cos\frac{2\pi t}{\tau}.$$

The observed values of the coefficients are 18″·36 and 9″·239, the differences between the observed and computed values, as in the case of the precession, arising from the assumption of the uniform density of the earth.

Prop. 10. To determine the motion of the pole of the earth's axis of rotation.

As the inclination of the equator to the ecliptic undergoes no permanent alteration in consequence of the action of the sun and moon, and as the precessional motion of the equinoxes is proportional to the time, it follows that, abstracting the effects of lunar and solar nutation, the pole of the equator must describe a circle about the pole of the ecliptic, the plane of which is parallel to the ecliptic, and of which the radius is equal to the sine of the obliquity, or = sin (23° 28′). The mean velocity corresponding to the regression of the equinoctial points, is 50″.4 in a year, and consequently the period of a revolution is about 25900 years. Now in order to take account of the lunar nutation (the solar, as has already been remarked, is scarcely sensible), it is only necessary to remark that the absolute velocity of the pole in its small circle, is to the velocity with which the equinoctial points regress in the ecliptic, as the radius of the small circle to the radius of the ecliptic, or as sin I : 1. Hence the motion of the pole in the plane of the small circle, is obtained by multiplying the expression in prop. 6, by sin I; and therefore the correction to be applied to the uniform motion of the pole, is the second term of that expression, multiplied by sin I, or sin I × lunar equation of the equinoxes in longitude. But by prop. 9, this term $=K\times 6093''\sin\frac{2\pi t}{\tau}$, therefore the corresponding motion of the pole =

$$K\times 6093''\sin(23^\circ 28')\sin\frac{2\pi t}{\tau}=K\times 2427''\sin\frac{2\pi t}{\tau}.$$

With respect to the second part of the nutation, it is obvious that any change of obliquity produces an equal change in the place of the pole on the meridian, and therefore, by the last proposition, the motion of the pole in this direction is $K\times 3260''\cos\frac{2\pi t}{\tau}$. Now let $K\times 2427''=a$, and $K\times 3260''=b$, and let the motion of the pole in the two directions be respectively denoted by x and y, we have then $x=a\sin\frac{2\pi t}{\tau}$, $y=b\cos\frac{2\pi t}{\tau}$; and consequently the equation

$$\frac{x^2}{a^2}+\frac{y^2}{b^2}=1;$$

which is the equation to an ellipse, and shews that the pole describes a small ellipse about its mean place in the course of a revolution of the nodes, as was discovered by Bradley from observation.

Prop. 11. From the observed values of the precession and nutation, to determine the ratio of the moon's mass to the mass of the earth.

The quantities most accurately determined from observation, from which the moon's mass can be found, are the whole annual precession p (=50″·4), and the coefficient of the lunar nutation in obliquity q (=9″·239). Let s = the solar annual precession, and m = the lunar annual precession, then $s=p-m$. Now, by prop. 7, $q=Q\frac{\tau}{4\pi}\cos I\sin 2i$, and, by prop. 6, $m=Q\cos I(\cos^2 i-\frac{1}{2}\sin^2 i)T$, whence by eliminating Q cos I, we get

$$m=\frac{q.4\pi.T(\cos^2 i-\frac{1}{2}\sin^2 i)}{\tau\sin 2i},$$

and on computing m from the values of T, τ and i above given, we find $m=q\times 3''{\cdot}735=34''{\cdot}51$; therefore, also, $s=p-m=15''{\cdot}89$.

Again, from prop. 4, we have $s=\frac{6\pi^2.K\cos I}{Tv}$, and from prop. 6, (on substituting for Q its value), $m=\frac{6\pi^2.K.M\cos I}{T'^2v(E+M)}$ $(\cos^2 i-\frac{1}{2}\sin^2 i)T$; whence

$$\frac{s}{m}=\frac{T'^2}{T^2(\cos^2 i-\frac{1}{2}\sin^2 i)}\cdot\frac{E+M}{M}.$$

By computing the coefficient of $(E+M)\div M$, and by means of the values s and m now found, this equation gives

$$\frac{E+M}{M}=81{\cdot}755,$$

whence it follows that the mass of the moon is to the mass of the earth in the ratio of 1 to 80·755.

The phenomena of the precession and nutation, and those of the tides, are the only astronomical facts which enable us to determine the moon's mass. From a long series of observations on the tides at the harbour of Brest, Laplace found the ratio of the masses of the moon and earth to be 1 : 75·77.

The regression of the equinoctial points amongst the fixed stars, and consequent precession of the equinoxes, being a motion which, though extremely slow (amounting only to a degree in about seventy-two years), increases constantly with the time, was detected at an early period in the history of astronomy, and its rate was determined with considerable accuracy by Hipparchus. Its physical cause was of course not suspected until after the discovery of gravitation; but Newton himself, by a process of reasoning, which, although not quite accurate, affords some of the most remarkable instances of his extraordinary sagacity (*Principia*, lib. iii., prop. 39), showed it to be a necessary consequence of the flattened form of the earth. D'Alembert was the first who gave a general and accurate solution of the problem, in his *Recherches sur la Précession des Equinoxes* (1749); and Euler also treated the subject in the *Berlin Memoirs* for the same year. Various solutions of the problem have since been given, amongst which may be mentioned those of Sylvabella and Walmesley in the *Philosophical Transactions* (vols. xlviii. and xlix.); that of Simson (*Miscellaneous Tracts*, 1751); that of Frisi in his *Theoria Geometrica Diurni Motûs* (*Opera*, tom. iii.); that of Lagrange in his *Memoir on the Libration of the Moon*, which obtained the prize of the Academy of Sciences of Paris for 1769; that of Landen (*Mathematical Memoirs*, 1780); and that of Vince (*Philosophical Transactions*, 1787). Of these solutions, that of Frisi deserves to be noticed as perhaps the most perspicuous and elegant. An excellent elementary demonstration is given by Mr Airy, the present astronomer-royal, in his *Mathematical Tracts* (1826 and 1831), of which we have freely availed ourselves in the present article; but for a complete investigation of the question in all its generality, we must refer the reader to the *Mécanique Céleste*, and still more particularly to a Memoir of Poisson, "Sur le Mouvement de la Terre autour de son Centre de Gravité," in the *Mémoires de l'Académie Royale des Sciences*, tome vii., 1829.

The nutation, as has already been remarked (see also Astronomy, vol. iv., p. 13), was detected by Bradley, from a comparison of observations which were undertaken with a view to determine the parallax of the fixed stars. Bradley assigned to the co-efficient or constant of nutation the value 9″, which till a late period was adopted by most astronomers. Laplace computed its value from theory to be 9″·63; but as this result could only be obtained by having recourse to hypotheses respecting the ellipticity and density of the earth, and also the mass of the moon, which may possibly differ considerably from the truth, it cannot be regarded as of much weight. There are, however, three other determinations of the constant (besides that of Bradley), from observation, which may be supposed to give its value with all the precision that is capable of being attained. The first is that of Von Lindenau, from about 800 observations of Polaris made between the years 1750 and 1815, and consequently including three revolutions of the moon's node; as well as from those made by Bradley, Maskelyne, Bessel, Carlini, Piazzi, and Von Lindenau himself. From these observations he found the value of the constant of nutation to be 8″·97718. The second determination is that of Dr Brinkley (*Philosophical Transactions*, 1821), deduced from his own observations with the Dublin Mural Circle; and the value which he found was 9″·25. The third determination, and that which has the greatest probability in its favour, is a very recent one by Dr Robinson of Armagh, undertaken at the instance of the British Association. It is deduced from 11,000 observations made at Greenwich with the mural circle, between the years 1812 and 1834, and embraces more than a complete revolution of the node. The result gives the constant of nutation = 9″·23913. (See the *Monthly Notices* of the Royal Astronomical Society for May 1838.) (T. G.)

Since the above was written M. Poinsot, member of the Institute of France, has proved (1858) from mathematical calculations, founded on his theory of couples, that by the law of gravitation, the earth's axis must describe an oscillation of 1·08 seconds in virtue of the attraction of the sun, and 16·9 seconds in virtue of that of the moon, or about 18 seconds in all in the course of nine years and three months, after which a similar oscillation takes place in a contrary direction. This quantity of 18 seconds all but exactly coincides with the results of observation; and his determination of the precession is equally exact, since he finds it to be 50·4 seconds. He has likewise proved that the precession would be the same if the earth, instead of being a solid spheroid, were hollow, or if its mass or volume were changed, provided its momentum of inertia remained the same.

PRECIOUS METALS.

Precious Metals, a designation given to gold and silver. These, though not the most useful of the metals, having been converted into coin and used from a remote period to perform the functions of money, have in consequence been generally regarded as of peculiar importance, and dignified with the epithet "precious."

The reader will find in the articles Gold and Silver in this work descriptive notices of these metals; and the mode in which they are obtained is explained in the article Mining. In this article we mean to confine ourselves to an inquiry into the magnitude of their supply, their consumption, and their probable future value in exchange. And as these metals serve as standards by which to measure the values of other things, and as the equivalents for which they are most commonly exchanged, it is plain that these inquiries involve considerations of the highest importance, and which deeply affect the interests of all classes. Unluckily, however, the difficulty of such investigations is at least as great as their importance. They are not, in truth, of a kind to afford any certain conclusions, and we must be contented with those that seem to present on the whole the greatest amount of probability.

Jacob,[1] and others who have engaged in inquiries relative to this subject, have carried their researches to a very remote epoch, and have tried to amuse their readers with estimates of the quantities of gold and silver in existence at different epochs, such as the commencement of the Christian æra, the year 1492, when America was discovered, and so forth. But though these estimates, and the researches which serve as their basis, may illustrate the learning and industry of their authors, no reliance can be safely placed on their accuracy. Even at present, when most matters that have reference to currency and commerce are the objects of study and research, and many of them are embodied in official returns, the difficulties in the way of accurate investigation are often all but insuperable. And

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[1] The author of an *Historical Inquiry into the Production and Consumption of the Precious Metals*, 8vo, 2 vols., London, 1831.

Supply of Precious Metals.

when such is now the case, what must be the chance of our coming to anything like correct conclusions in regard to the like subjects at remote periods, when these inquiries were almost entirely neglected, and when, in the lapse of ages, the few records that might have originally existed have either been much mutilated or wholly destroyed? The truth is, that the estimates of the amount of the precious metals extant in the world at the epochs referred to, are not worth the ink with which they are written. They may chance not to be wide of the mark, but there are no means of judging whether such is or is not the case. The investigations which they involve are buried in an obscurity which most likely will never be dispelled.

Dismissing, therefore, such unfruitful inquiries, we shall not in this article carry our researches farther back than the discovery of America, and shall principally confine ourselves to a consideration of the events of the last twelve or twenty years. Those, indeed, that belong to previous periods are principally interesting as they may serve to throw light on the latter.

Part I.—*Supply of the Precious Metals.*

Supply of precious metals.

Since the discovery of America, by far the greatest supplies of gold and silver have been derived from that continent. Previously to the publication of Humboldt's *Essai Politique sur la Nouvelle Espagne*, several estimates, some of which were framed by individuals of great intelligence, had been given of the quantities of gold and silver imported from America. They, however, differed widely from each other, and were all deduced from comparatively limited sources of information. When brought together, they exhibit the following results:—

Estimates of the Imports of the Precious Metals from America into Europe since 1492.

Authorities.	Periods.	Total Estimated Influx.	Annual Estimated Influx.
		Dollars.	Dollars.
Ustariz	1492–1724	3,536,000,000	15,241,379
Solorzano	1492–1628	1,500,000,000	11,029,411
Moncada	1492–1595	2,000,000,000	19,417,475
Navarete	1519–1617	1,536,000,000	15,673,469
Raynal	1492–1780	5,154,000,000	17,895,833
Robertson	1492–1775	8,800,000,000	31,095,406
Necker	1763–1777	304,000,000	21,714,285
Gerboux	1724–1800	1,600,000,000	21,052,631
The Author of *Recherches sur le Commerce*, Amst. 1776	1492–1775	5,072,000,000	17,922,261

Of these estimates, that which bears the name of Robertson is very greatly in excess of the others, and is certainly the widest of the mark. But in looking into the work of that judicious and excellent historian, he hardly seems to be responsible for the computation. It is, in truth, the estimate of the Spanish authorities to which he refers, and is not founded upon any investigations or inquiries of his own. (*History of America*, iii., p. 389, ed. 1778.)

Estimates of Humboldt.

But all previous estimates have been wholly superseded by those founded on the more extensive and laborious investigations of Humboldt. Besides being acquainted with all that had been written on the subject, and having ready access to sources of information unknown to the writers already alluded to, this illustrious traveller was well versed in the theory and practice of mining, and critically examined several of the most celebrated mines. He was therefore incomparably better qualified for forming correct conclusions as to the past and present productiveness of the mines than any of those who had previously speculated on the subject. His statements have indeed been accused of exaggeration, and there seem to be good grounds for believing that this charge is in some measure well founded, particularly as respects the accounts of the profits made by mining, and of the extent to which the supplies of the precious metals may be increased. But this criticism applies, if at all, in a very inferior degree to the accounts Humboldt has given of the total produce of the mines, and the exports to Europe. And making every allowance for the imperfection inseparable from such investigations, it is still true that the statements in question, and the inquiries on which they are founded, are among the most valuable contributions that have been made to statistical science.

According to Humboldt, the annual average supplies of the precious metals derived from America have been as follows:—

	Dollars a Year at an Average.		Dollars a Year at an Average.
From 1492 to 1500	250,000	From 1600 to 1700	16,000,000
„ 1500 to 1545	3,000,000	„ 1700 to 1750	25,500,000
„ 1545 to 1600	11,000,000	„ 1750 to 1803	35,300,000

(*Essai sur la Nouvelle Espagne*, iii. 428, 2d ed.) The following is Humboldt's estimate of the annual produce of the mines of the New World at the beginning of the present century:—

Annual Produce of the Mines of America at the Commencement of the Nineteenth Century.

Political Divisions.	Gold.		Silver.		Value of the Gold and Silver, in Dollars.
	Marcs of Castile.	Kilogs.	Marcs of Castile.	Kilogs.	
Viceroyalty of New Spain	7,000	1,609	2,338,220	537,512	23,000,000
Viceroyalty of Peru	3,400	782	611,090	140,470	6,240,000
Captain-Generalship of Chili	12,212	2,807	29,700	6,827	2,060,000
Viceroyalty of Buenos Ayres	2,200	506	481,830	110,764	4,850,000
Viceroyalty of New Granada	20,505	4,714	...	...	2,990,000
Brazil	29,900	6,573	...	...	4,360,000
Total	75,217	17,291	3,460,840	795,581	43,500,000

Taking the dollar at 4s. 6d., this would give L.9,666,000 for the total annual produce of the American mines. Humboldt further estimated the annual produce of the European mines of Hungary, Saxony, &c., and those of Northern Asia, at the same period, at about L.1,000,000 more; making, in round numbers, their entire production nearly L.11,000,000.

The quantity of gold produced in America at the beginning of the century was to the quantity of silver as 1 to 46; in Europe the proportions were as 1 to 40. The value of equal quantities of gold and silver were then in the proportion of 15 or 15½ to 1.

Estimates of Jacob.

From 1800 to 1809 the yield of the American mines continued to increase, and their produce, and that of the European and Russian mines, was then probably rather above than below L.12,500,000. But in the last-mentioned year the contest began, which terminated in the dissolution of the connection between Spain and her American colonies. The convulsions and insecurity arising out of this struggle, the proscription of the old Spanish families, to whom the mines principally belonged, who repaired with the wrecks of their fortunes, some to Cuba, some to Spain, and some to Bordeaux and the south of France, caused the abandonment of several of the mines, and an extraordinary falling off in the amount of their produce. There are no means of estimating the precise extent of this decline; but, according to Jacob, who collected and compared the existing information on the subject, the total average produce of the American mines, inclusive of Brazil, during the twenty years ending with 1829, may be estimated at L.4,036,838 a year, being less than half their produce at the beginning of the century! (Jacob, i. 267.)

It has, however, been supposed that Jacob rather exaggerated the falling off. And, at all events, the supplies of bullion obtained from Mexico and South America began soon after the publication of his work (1831) to increase; and notwithstanding the anarchy to which they have continued to be a prey, that increase has been maintained down to the present time (1858).

It appears, from the returns sent home by the British consuls, that the coinage of gold and silver in the Mexican mints amounted in 1847 to 16,923,948 dols., and in 1848 to 19,506,754 dols. But it is well known that considerable quantities of these metals are raised and exported from Mexico without being brought to the mints to be coined. And, taking this item into account, we shall not perhaps be very wide of the mark if we estimate the entire produce of the Mexican mines in 1847 and 1848 at about 19,000,000 and 21,500,000 dols., of which from 17,000,000 to 20,500,000 dols. were in silver.

Supplies of gold and silver in 1857 and 1858 in America.

The discovery of new mines, and the greater cheapness and more abundant supplies of quicksilver obtained from California, have conspired to increase the produce of the Mexican mines during the last half-dozen years. And though these circumstances have been to a considerable extent countervailed by the unsettled state of public affairs, and the greater insecurity that has prevailed during the period referred to, yet, on the whole, it appears to be pretty well established that there has been a material increase.

In 1850 the produce of the Peruvian mines was estimated at about 6,000,000 dols., and it is not supposed to have varied much in the interval.

The produce of the Bolivian mines is usually estimated at about a third part of the produce of those of Peru.

In 1857 the value of the gold and silver in coin, bars, and ore exported from Chili amounted, according to the custom-house returns, to 4,185,284 dols.; and we are assured that we shall not be far wrong if we estimate the total produce of the Chilian mines at about 5,000,000 dols.

The elaborate estimates of Birkmyre,[2] Chevallier (*Monnaie*, p. 228), and other authorities, in regard to the produce of the mines of Brazil, New Granada, and other parts

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[1] Birkmyre's estimate of the production of the precious metals in 1846 and 1850, the most elaborate and valuable of any hitherto published, appeared in the *Times* of the 19th May 1851. We subjoin some of its principal portions:—

Comparative Table, showing the Annual Produce (approximate Calculation) in value of fine Gold and Silver for 1846 *and* 1850, *the first being Two Years before the Discovery of the rich deposits of Gold in California; the latter, Two Years after the Discovery.*

Countries.	1846.			1850.		
	Gold.	Silver.	Total.	Gold.	Silver.	Total.
	L.	L.	L.	L.	L.	L.
California	...	...	...	12,000,000	62,088	12,062,088
United States	237,336	1,864	239,230	115,430	11,444	126,874
Mexico	249,753	3,457,020	3,706,773	382,901	5,383,333	5,766,234
New Grenada	252,407	42,929	295,336	252,407	42,929	295,336
Peru	96,241	1,000,583	1,096,824	96,241	1,000,583	1,096,824
Bolivia	60,337	460,191	520,548	60,357	460,191	520,548
Chili	145,585	297,029	442,614	145,585	297,029	442,614
Brazil	259,871	2,003	261,874	289,068	2,227	291,295
Total of North and South America...	1,301,560	5,261,619	6,563,179	13,341,989	7,259,824	20,601,813
Russia	3,414,427	167,831	3,582,258	4,175,860	171,817	4,347,477
Norway	...	32,346	32,346	...	35,607	35,607
North Germany	357	138,022	138,379	357	138,022	138,379
Saxony	...	198,200	198,200	...	198,200	198,200
Austria	282,750	282,654	565,404	288,708	286,971	575,679
Piedmont	17,841	7,444	25,285	17,841	7,444	25,285
Spain	2,498	227,499	229,997	2,498	440,210	442,708
United Kingdom	...	109,989	109,989	...	160,000	160,000
Africa	203,900	1,056	204,956	203,900	1,056	204,956
Borneo	305,900	1,584	307,484	305,850	1,584	307,484
Ava	100,000	517	100,517	100,000	517	100,517
Malacca	72,240	374	72,614	72,240	374	72,614
Sumatra	63,719	330	64,049	63,719	330	64,049
Annam or Tonquin	30,585	53,460	84,045	30,585	53,460	84,045
Various countries*	50,975	33,000	83,975	50,975	33,000	83,975
Total of Europe, Africa, and Asia ...	4,545,192	1,254,306	5,799,498	5,312,533	1,528,592	6,840,975
Total of North and South America...	1,301,560	5,261,619	6,563,179	13,341,989	7,259,824	20,601,813
Total	5,846,752	6,515,925	12,362,677	18,654,522	8,788,416	27,442,788

* Exclusive of China and Japan, which produce large quantities of gold and silver, the amount of which is quite unknown to Europeans.

"The quantities of gold and silver produced at the under-mentioned epochs were:—In 1801, the quantity of pure gold produced in America was 46,331 lb.; in Europe and Northern Asia (exclusive of China and Japan), 4,916 lb.; total produce, 51,247 lb. = 55,910 lb. British standard gold = L.2,612,200. In 1846 the quantity of pure gold produced in America was 25,503 lb.; in Europe, Africa, and Asia (exclusive of China and Japan), 89,171 lb; total produce, 114,674 lb. = 125,108 lb. British standard gold = L.5,846,772. In 1850, the quantity of pure gold produced in America was 261,731 lb.; in Europe, Africa, and Asia (exclusive of China and Japan), 104,219 lb.; total produce, 365,950 lb. = 399,247 lb. British standard gold = L.18,654,322. The above quantities are probably less than the actual production. The duties on gold in Russia on the produce of the private mines are heavy, varying from 12 to 24 per cent.; in Austria they amount to 10 per cent., in Brazil to 5 per cent., and are understood to lead to a great deal of smuggling. In other countries, such as the United States, where there are no duties, the gold and silver stated in the table are only the quantities brought to the mints to be coined, there being no means of determining the quantity used in jewellery and other arts and manufactures."

of America, differ very widely; and there is, in truth, little besides conjecture on which to form an estimate. Probably, however, it may amount, excluding California, to about 4,000,000 dols. The above results, when brought together, give for the estimated produce of the American mines:—

	dollars.
Mexico	23,000,000
Peru	6,000,000
Bolivia	2,000,000
Chili	5,000,000
Other parts	4,000,000
Total	40,000,000

This sum is equivalent, at 4s. 6d. per dol., to nearly L.9,000,000; the value of the silver produced being from five to six times greater than that of the gold.

It is perhaps needless to observe that all investigations into matters of this sort are liable to be affected by so many sources of error that, even when they are most skilfully and cautiously conducted, their results are not always to be depended upon. But, speaking generally, we are disposed to think that the previous estimates are rather within than beyond the mark. It is worthy of remark that they do not differ much from Humboldt's estimate (43,500,000 dols.) of the produce of the American mines in the early part of the century.

In Russia.

Russian Mines.—Small supplies of the precious metals have been for a lengthened period obtained from Russia. But since 1830, and more especially since 1840, the produce of the Russian mines and washings, but principally the latter, has been rapidly and largely increased. Thus the produce of gold from the Siberian washings and the mines of the Ural, which amounted (according to the official returns) to 3875 kilog. in 1826, had increased in 1840 to 8736 kilog., and in 1847 to 27,362 kilog. Since then, however, the produce has rather fallen off; and during the three years ended with 1854, their average yield amounted to only 22,768 kilog. a year.[1] Formerly the value of the silver supplied by Russia greatly exceeded that of the gold; but since 1830 this has not been the case; for, while the produce of gold has been so very greatly increased, that of silver has varied but little (from 17,000 to 18,000 kilog. a year), so that the value of the former is now about twenty times that of the latter. The following table, extracted from the work of M. Otreschkoff, is founded on official returns, and gives a view of the production of the precious metals in Russia down to 1855:—

Account of the Quantity and Value of the Precious Metals produced in Russia from 1810 *to* 1855.

Years.	Gold.		Silver.		Annual Average of Total Prod.
	Kilog.	Francs.	Kilog.	Francs.	Francs.
1810 to 1825...	16,485	54,830,448	189,189	42,067,480	6,459,856
1825 „ 1848...	231,543	772,445,780	443,262	98,563,008	37,869,948
1848 „ 1851...	75,547	252,034,380	53,959	11,998,348	88,000,908
1851 „ 1855...	92,085	307,206,156	68,426	15,215,200	80,605,339
Totals......	415,610	1,386,516,764	754,836	167,844,036	...

The Russian authorities have ascribed the falling off in the produce of the mines and washings since 1847 to the exhaustion of the deposits and the unskilfulness of those engaged in the business. But though this be most probably the case to some extent, it is believed that it has been in part also occasioned by the heavy taxes imposed on the gold raised by private parties. These vary in amount according to the productiveness of the mines and washings, from about 12 to 24 or 25 per cent., and are most oppressive.

While, however, it may be fairly assumed that these heavy duties have tended to lessen the produce of gold, there can be little doubt that their principal effect has been to defeat themselves by tempting the parties concerned to adopt every means for their evasion, which the notorious corruption of the revenue officers renders an easy matter. And in addition to the influence of these circumstances over the private mines, the depredations and carelessness of the parties employed to work the crown mines tells quite as much over their produce: so that we need not be surprised that it has been doubted whether from a third to a half, or more, of the gold furnished by the Russian mines and washings be not omitted in the official returns. But, taking the deficit at a fourth part only, and supposing the official produce of the washings and mines to amount at present (1858) to about 70,000,000 fr. a year, the real produce would be equal to 87,500,000 fr., or L.3,500,000 sterling. It is said that the Russian government intend to throw open the crown mines and washings to the public, and at the same time to make a large reduction in the duties on the produce obtained from the private mines. This would be sound policy; and if it be adopted, a considerable increase in the supplies of gold and silver may be anticipated.

In Europe.

Produce of Gold and Silver in other parts of Europe.—It might have been supposed that the late extraordinary influx of the precious metals from California and Australia would have given a serious check to their production in Europe; such, however, has not been the case, but on the contrary it has considerably increased within the last ten or twelve years.

Our readers are aware that lead ore always contains a greater or less quantity of silver; and when the value of the latter is sufficient to repay the expense, it is usual to extract it by means of the process of "refining." This process has latterly been much improved, and is now profitably applied to ores to which it was formerly unsuitable. And as silver in Europe is mostly obtained from lead, this has been a principal source of its late increase.

In 1845 some rich mines of argentiferous lead were discovered in the provinces of Murcia and Granada in Spain, not far from Alicant; the yield of silver from which, and the mines in other parts of the peninsula, is believed to amount to L.500,000 or L.600,000 a year. The produce of the Austrian and German gold and silver mines has also increased, and small quantities are furnished by Piedmont, France, and other parts of the Continent.

The reader may perhaps be surprised to learn that, in consequence principally of the improved process of refining already referred to, no fewer than 532,866 oz. of silver were obtained from lead in the United Kingdom in 1857, which, at 5s. an oz., was worth L.133,216, 10s.[2]

The total annual production of the precious metals in Europe, exclusive of Russia, may be roughly estimated to have amounted in 1857 and 1858 to L.1,500,000 or L.1,600,000 a year.

Total supply of gold and silver in 1857 from old sources.

On the whole, therefore, it may reasonably be concluded that the aggregate production of the precious metals (excluding the produce of the Californian and Australian gold fields) in America, Asiatic Russia, and Europe in 1857, or rather in each of the three years ending with 1857, amounted to about L.14,050,000, viz.:—

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[1] Otreschkoff, *De l'Or et de l'Argent*, &c., i. 179. The author is a councillor of state in the service of the Czar.

[2] During the year 1857, 5190 tons argentiferous ores were imported, mostly from Chili, which produced 846,569 oz. of silver, worth, at 5s. an oz., L.211,642. This, however, is to be reckoned in the produce of Chili rather than of England. (Hunt's *Mining Records for* 1858, p. 30.

America	L.9,000,000
Asiatic Russia	3,500,000
Europe	1,550,000
Total	L.14,050,000

And deducting from this sum the total estimated produce of the same countries in 1809, when the American mines had attained the maximum of their productiveness previously to the revolutionary disturbances (L.12,500,000), there is an increase of L.1,550,000.

But though, compared with its former amount, this may appear to be a considerable increase, yet, if we compare it with the vast increase that has taken place since 1809 in the population, commerce, and wealth of Europe and America, it will at once be seen to be quite inconsiderable. We believe, indeed, that no small portion of the extraordinary progress that has taken place of late years has been owing to the impulse given to emigration, and to most sorts of industrial undertakings, by the discovery of the precious metals in California and Australia. But if we suppose that the advances we have witnessed might have been effected without this impulse, it is quite obvious that the increased supply of the precious metals from the old sources would not have sufficed to meet the additional demands for coin and for the bullion which is required in the arts. And though the greater scarcity and value of the precious metals would, under the supposed circumstances, have led to the employment of various substitutes in their stead, their increased price, as compared with the mass of ordinary products, would have been too manifest to escape general notice, and would have had a most injurious influence. But the fortunate discovery of the Californian and Australian gold-fields have prevented these results from being realized; and while there is no longer any fear of injury from a rise in the value of gold and silver, many evil results are anticipated from that fall in their value which is said to be imminent. Probably, however, this apprehension may also turn out to be ill-founded.

In addition to the supplies of the precious metals already specified, further quantities are supplied by China and other parts of Asia, Japan, the Eastern Archipelago, &c., and also by various parts of Africa. There is, however, no authentic information in regard to this produce; and excepting small supplies of gold dust brought from some parts of the African coast, the bullion of the countries referred to has but little influence in the markets of the civilized world. M. Otreschkoff estimates, or rather conjectures, that the produce of gold and silver in Asia (exclusive of Russia), the Eastern Archipelago, Oceanica, &c., amounted, at an average of the four years ending with 1854, to 114,527,820 fr. (L.4,581,000) a year, and that of Africa to 13,980,672 fr. (L.560,000) a year. (*De l'Or et de l'Argent*, &c., i. 287, 293.)

Supplies from California and Australia.

Supplies of Gold from California and Australia.—The gold in these regions is found in the debris of the quartz rocks in which it has been imbedded, and in the rocks themselves. In the former case it is found in the hollows to which it has been carried down by rains or streams, at different depths, sometimes in grains or *flakes*, and sometimes in lumps or *nuggets*, of varying but occasionally of very considerable magnitude. Gold may be sought or dug for (hence *diggings*) either by single or associated individuals; but when quartz rock is crushed to obtain gold, expensive machinery is usually employed, and the work is for the most part carried on by companies. The business of the diggings has very much of the character of a lottery, with many blanks and a few large prizes; but in the crushing of quartz the returns are less irregular, and the business partakes more of the character of an ordinary branch of industry.

The Californian deposits were discovered late in May or early in June 1848; and notwithstanding the remoteness of the country, and the fact of its being almost destitute of inhabitants, above 5000 persons were attracted to the spot by the end of the season, who are said to have realized above L.1,000,000 sterling. The news of the discovery and of the unexampled richness of the gold-fields having spread on all sides with electrical rapidity, occasioned an extraordinary influx of immigrants from most parts of the world into California. The supplies of gold attained to an unexampled magnitude; cities rose in the wilderness as if by enchantment; the great bay of San Francisco, which had hitherto been entirely deserted, was crowded with ships and steamers from the most distant countries; and California speedily became one of the states of the Union, and has now a large population.

But here, as elsewhere, we have to regret the want of accurate information in regard to the production of gold. It appears, however, from the custom-house returns that during the years 1856 and 1857, gold of the value of 51,142,269 and 49,340,186 dols. was shipped from San Francisco. And, in addition to these quantities, large amounts, of which no account is taken, are conveyed away by parties returning to Mexico, to the Eastern States, Europe, and China. Of these various estimates have been made. But the prevalent opinion in the best-informed quarters seems to be that, when they are included, and allowance is also made for the quantity retained at home, the total yield of gold in California in 1856 and 1857 may be moderately reckoned at from 60,000,000 to 65,000,000 dols., or from L.13,300,000 to L.14,400,000, or nearly L.14,000,000 at an average.

But vast as it certainly is, this production has been equalled and sometimes surpassed by that of Australia. The deposits in the latter were not discovered till 1851, and they were so very rich, and the influx of immigrants so extraordinary, that the gold-fields of Victoria only are estimated to have produced in 1852 no fewer than 4,247,152 oz.; which, at the then price of 70s. an oz., gives a gross amount of L.14,866,799. This, however, has been the *maximum* amount of production hitherto attained. In 1857 the same gold-fields furnished only 2,606,040 oz. According to the carefully-compiled and valuable returns of Mr Khull of Melbourne, the yield of gold in Victoria since 1852 has been as follows, viz.:—

Year.	Ascertained Ounces.	Unrecorded Ounces.	Total Ounces.	Price per Oz.	Value.
1852	3,159,322	1,088,325	4,247,152	70s.	L.14,866,799
1853	2,274,152	816,199	3,090,342	75	11,588,782
1854	1,831,434	361,264	2,192,699	80	8,770,796
1855	2,234,296	729,864	2,964,073	80	11,856,292
1856	2,530,383	1,003,144	3,533,527	80	14,134,108
1857	2,341,147	264,893	2,606,040	80	10,424,160

In addition to the gold obtained from Victoria, a supply which in 1852 amounted to nearly L.3,000,000 was obtained from the Sydney or New South Wales district. The produce from this source has, however, rapidly declined, and is now (1858) so inconsiderable as hardly to be worth notice.

Total supply of gold and silver in 1857.

It would therefore appear that the entire annual produce of the precious metals in different parts of the civilized world might, in 1857, be estimated as follows, viz.:—

America, excluding California	L.9,000,000
Asiatic Russia	3,500,000
Europe	1,550,000
California	14,000,000
Australia	11,000,000
Total	L.39,050,000

The question in regard to the probable continuation, increase, or diminution of this supply is of the greatest interest. Unfortunately, however, nothing but the vaguest conjectures can be offered with respect to it. Those who think that the supplies of the precious metals are likely to increase may allege that, being very widely diffused, fresh deposits will be successively brought to light; that the processes followed in the diggings, in the crushing of quartz rocks, and in the smelting and refining of the metals, will be further improved; and that the increase of population will make a still greater amount of labour be devoted to the search after these metals. But while we admit that there is a good deal of probability in these statements, still we question whether the result which they point at will be realized. Though gold be very generally distributed, it is extremely doubtful whether there be many places in which the deposits are so rich and so extensive as in California and Australia; and even in these the produce, as already seen, is either stationary or has begun to decline. The myriads of adventurers that are attracted to prolific diggings being all animated by the "*auri sacra fames*," and putting forth their entire energies, can hardly fail, in no very lengthened period, to rifle the richest beds. And when this is done,—when the excitement inspired by the original discovery is worn off, and the great prizes in the gigantic lottery recur only at distant intervals,—then, unless new and equally promising discoveries should be made, a serious check will be given to the gold-seeking mania. The process of quartz-crushing is believed to produce only moderate profits, and is not of a kind to collect crowds of competitors. The few fortunes that have been realized in California and Australia have not been made by the miners, but by the merchants and others who have supplied their real or imaginary wants, and bought their gold-dust and nuggets on advantageous terms. Of those engaged on their own account in the search for gold, very few have retired from the pursuit with anything like a competence. The great majority have hardly realized the wages current in the districts before the deposits were discovered; and the conviction seems to be everywhere gaining ground that more is to be made by cultivating the surface of the earth than by digging in its bowels or crushing its rocks.

Probable continuance of supply.

Earnings of the gold-seekers.

We have already seen that in 1856, when the produce of the gold-fields of Victoria was greater than it has been since 1852, it amounted to L.14,134,000. By far the largest portion of this immense sum is to be regarded as wages, or as belonging to the diggers and other adventurers engaged in its production. But a considerable portion must also be considered as the profit upon or return to the capital employed in the diggings, in crushing quartz rocks, in defraying the export duty (L.375,426 in 1856), with the expense of conveying the gold to Melbourne, and so on. It is not possible to say what these various items may amount to; but taking them at the low estimate of one million only, we have a sum of L.13,134,000 to be divided among those engaged in the gold-fields. Now, it appears from the official return that the population of the latter amounted, on the 26th December 1856, to no fewer than 115,343 men (including 18,104 Chinese), and 65,667 women and children.[1] And dividing the produce (under deduction of profits, &c.), or L.13,134,000, among the men employed, it gives a sum of nearly L.114 for the average wages of each. And this, considering the hardships and privations to which they are exposed, and the high price of most articles, is in truth but a poor remuneration. Inasmuch, however, as those employed were mostly adventurers, a few of whom made comparatively large sums, it follows that the earnings of the majority must have been proportionally reduced. It is, indeed, well known that a great many made, if anything, only the merest trifle. And nothing but the spirit of gambling, or the hope by which every one is inspired, that eventually he will stumble upon a nugget or a rich deposit, could induce them to continue in so poor a business.

The yield of the gold-fields fell off, as previously seen, from L.14,134,000 in 1856 to L.10,424,000 in 1857; and deducting from the latter one million for profits and expenses of all sorts, we have L.9,424,000 to be divided among the diggers and others employed in its production. And as the population of the gold-fields amounted, on the 28th February 1857, to 175,585, of whom 111,425 were men, and the residue women and children, it follows, supposing it to have continued at about the same level throughout the year, that the average earnings of the men would amount to L.84, 10s. each, which is less than the wages of most sorts of skilled labour in this country. The earnings of the Californian gold-seekers have not been greater. These facts have told already, and will tell more, the more they become known, on the European population of the gold-fields. The spirit of adventure and gambling is no doubt very powerful, but the knowledge of the vast preponderance of blanks in the gold-digging lottery cannot fail to reduce the numbers of those who embark in it. Immigration has already sustained a severe check; and it is not improbable that in the end the gold-fields will be principally wrought by Chinese labourers for such capitalists as may carry on the business as an ordinary and not very productive branch of industry. The general poverty of the soil of Victoria, and the injurious regulations which prevent its settlement, will tend to retard this result. But unless some new and more productive deposits, something to whet and excite the spirit of adventure, should be discovered, it is not easy to see how the depopulation of the gold-fields should be prevented.

It may be said perhaps that we have omitted in the previous statements to notice the supplies of gold that may be expected to be derived from the newly-discovered deposits along the Fraser River, in British Columbia, adjoining Vancouver's Island. Hitherto, however, no means have been afforded by which to form any estimate of the productiveness of these deposits. And independent of this circumstance, we do not think that we should be warranted in laying much stress on their discovery. To whatever extent they may be wrought, it seems most likely that those of California will be neglected in a corresponding degree. Except from the latter, there has been as yet no considerable influx of immigrants into British Columbia. And unless in the improbable event of the gold-fields in the latter being decidedly more productive than those in the former, there are but slender grounds for thinking that their aggregate produce will be materially increased. On the contrary, the better opinion seems to be, that it will be reduced by the population resorting in preference to agriculture, for which California is extremely well fitted, and the ordinary pursuits of industry.

We are therefore inclined to anticipate a falling-off rather than an increase in the supply of gold. But no great stress can reasonably be laid on any conclusion, whether on one side or another, in regard to matters which are liable to be affected by an infinite variety of circumstances which can neither be foreseen nor appreciated beforehand.

In all speculations in regard to the probable future supply of gold, it should be carefully borne in mind that any considerable fall in its value would certainly check its production, and consequently tend to lessen or prevent its further fall. It is plain, for example, that a decline of 10 per cent. in the value of gold would, *cæteris paribus*, occasion the abandonment of all those mines, diggings, washings,

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[1] Papers relating to the Discovery of Gold in Australia, printed by order of the House of Commons, 25th August 1857, p. 68.

Consumption of the Precious Metals.

Consumption of the Precious Metals.

crushings, &c., which yield only a nett profit of that amount. It is true, indeed, that the production of gold, as at present carried on, having far more of a gambling character than pertains to most branches of industry, the principle now stated would not operate so speedily as might perhaps be anticipated. But of its ultimate operation there can be no question; and it may therefore be laid down, that any reduction in the value of gold, which is not accompanied by a corresponding improvement in the method of its production, inevitably tends to correct itself, or to check or hinder its further reduction.

In the event, however, of an increase being destined to take place in the produce of the precious metals, we are disposed to believe that it will take place in silver rather than in gold. The disturbances that have so long prevailed in Mexico, and the other *ci-devant* colonies of Spain, cannot be perpetual. And when the reign of good order and security has been once more established in them, whether it be by the efforts of the inhabitants themselves, or, which is most probable, by their absorption into the United States, industry will again revive. And under such circumstances, and considering the extent and riches of the silver mines of these countries, the fair presumption is, that the supplies of silver would be largely increased. We should not, indeed, be at all surprised if, in the course of some twenty years or less, a cry were to be set up in regard to the fall of silver as compared with gold; and that the governments of such countries as may have a silver standard should be called upon to abandon it for one of gold.

But these are events of which it is not possible to cast the horoscope. They will gradually manifest themselves, but not to *à priori* inquirers.

PART II.—*Consumption of the Precious Metals.*

Consumption of precious metals.

In order to form a reasonable conjecture in regard to the probable influence of this vast supply of the precious metals, it is necessary to inquire into their uses and probable consumption. And this inquiry, we regret to say, is still more difficult, and more likely to be infected with errors, than the inquiry in regard to their production.

The precious metals are used as coin or currency to facilitate exchanges; as wealth which may be conveniently kept or hoarded; and they are used in the arts in the shape of plate, and in gilding, and so on.

The quantities employed in these functions are very large indeed. They vary, however, in different countries and periods with the circumstances peculiar to each; such, for example, as the greater or less abundance of paper money, and the degree in which the use of coins is lessened by the various devices resorted to for economizing currency; the fashion as to plate and furniture; the feeling of security at the time; and a number of other circumstances all liable to great and sometimes sudden changes.

Sum employed as money.

The gold and silver employed in this country as currency, and in the customary reserves in the hands of the bankers, is supposed to amount to from L.70,000,000 to L.75,000,000.[1] In France the precious metals employed in the same way probably amount to nearly double the sum now mentioned, or to L.130,000,000 or L.140,000,000.[2] And we believe that we may safely estimate the entire sum employed as currency in Europe, America (North and South), Australia, the Cape of Good Hope, and Algeria, at from L.490,000,000 to L.510,000,000, or L.500,000,000 at a medium.[3] Now, supposing this sum to be employed as above stated, as currency, we have first to inquire into its probable wear and tear and loss, and then into the probable rate of its increase. And taking into account the extraordinary extension of navigation and emigration, and the proportional risk of loss from shipwreck and other casualties, we are disposed to think that the annual wear and tear and loss of coin may be estimated at about 1½ per cent. of the entire mass of the currency; which, taking the latter at L.500,000,000, would amount to L.7,500,000 a year.

It is difficult to form any probable estimate of the rate at which the bullion used as currency may be likely to increase, supposing its value not to fall off. The extremely rapid increase of refinement and population in most parts of the civilized world, and especially in America and Australia, is known to every one. And it seems pretty certain that some important countries which have hitherto made comparatively little progress, are about to enter on a new career of industry and enterprise. In Russia, for example, the measures that are in progress for the construction of railways and the emancipation of the peasantry can hardly fail to awaken the dormant energies of the latter, and give new vigour to their exertions. And the capacities of that country are so very great that it is not easy to imagine, were its resources at all developed, to what an extent its wealth and population might be increased.

At present some of the finest, best situated, most extensive, and of old the most populous and flourishing countries in the world, groan under the deadly influence of the superannuated but destructive despotism of the Turks. It is difficult, however, to suppose, despite the efforts that may be made to bolster it up, that this miserable fabric of superstition and tyranny should hold together much longer. And were it overthrown, and anything like an efficient government established in its stead, a fruitful and all but boundless field would be laid open to industry and enterprise.

But without insisting on such prospective considerations, and looking only to the advances that are now being made, we do not think that we shall exaggerate if we estimate the increase of currency that is now going on at 2 per cent. on its gross amount (L.500,000,000), or at L.10,000,000 a year.

It is impossible, however, supposing this estimate not to be very wide of the mark at present, to conjecture how long the currency will go on increasing in this ratio. It may, as we have seen, be safely taken for granted that the sphere of civilization and commerce is destined rapidly to extend. But its expansion will no doubt be accompanied with various contrivances for economizing the use of metallic money; so that the quantity of it in circulation may not increase for any very lengthened period at the rate above stated. If it did, it would absorb an immense supply of gold. In barbarous countries, and in those which are entering on the career of civilization, the coins afloat may increase at the rate of 3 or 5 per cent., or more. But in countries which are more advanced their increase may be nothing, or less perhaps than even 1 per cent.

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[1] It has been estimated as high as L.90,000,000; but the best authorities look upon this estimate as greatly beyond the mark.

[2] It has been estimated by Levasseur (p. 106) and others at no less than L.160,000,000! But this includes a portion of the coins that have been hoarded, and which can no longer be reckoned in the currency.

[3] It would be inconsistent with the objects of this article, and with the limits within which it must be confined, to engage in a discussion of the numerous and often conflicting statements and details on which this estimate has been founded. Some information with respect to it may be found in Chevalier's valuable treatise *De la Monnaie* (p. 326, &c.), Paris, 1850; in Stirling's *Gold Discoveries*, p. 182; in the learned and excellent tract of Tegoborski, *Essai de la Découverte des Gites Auriferes en Californie et en Australie*, &c., p 65; Levasseur, *De la Question de l'Or*, p. 106; in the work of Otreschkoff, *De l'Or et de l'Argent*; and a host of other publications. The precious metals in circulation in Russia in the early part of 1851 were estimated in the *Petersburg Gazette* (October 12, 1852) at 326,000,000 roubles, equal, at 40d. per rouble, to L.53,800,000. The greater part (190,000,000 roubles) of this currency consisted of gold.

Sum employed in the arts.

It is equally difficult to acquire any satisfactory information in regard to the quantity of bullion consumed in the arts. Jacob estimated its amount in Europe and America in 1830 at about L.5,900,000 a year. But it has since been repeatedly shown by various intelligent writers that this estimate was in many respects wide of the mark, and that on the whole it was a good deal under-rated. And supposing the consumption of the precious metals in the arts to have amounted to L.6,500,000 or L.7,000,000 in 1830, it must now be very much greater. Everywhere, indeed, but more especially in England, America, Germany, and Russia, there has been an extraordinary increase of population and wealth during the last eight-and-twenty years. Plate and plated articles for use and ornamental purposes are now in extensive demand among all but the very lowest orders. Vastly more persons are raising themselves from poverty to competence and affluence than at any former period; and these are universally large buyers of plate and other costly articles. Horace, were he now amongst us, would not venture to repeat his boast, that—

> "Non ebur, neque aureum
> Meâ renidet in domo lacunar." Lib. ii., Od. 18.

A taste for gilded saloons, magnificent glasses, and the gorgeous furniture of the age of Louis XIV., is at present all but universally diffused, and must have added greatly to the consumption of gold, which has been still further augmented by its increased outlay on the gilding of earthenware and china, harness, books, &c.[1] At the first blush of the matter, some of these items may not appear to the careless observer to be of much importance; but those who reflect a little on the subject, and who consider the immense and rapidly-increasing demand for the articles referred to in this country and Europe generally, and in America and Australia, will be satisfied that the total consumption of the precious metals, and especially of gold, in the way now mentioned, must be quite immense.

We incline to think that the value of the precious metals in Great Britain in 1857, in the shape of plate, watches, jewels, and trinkets of all descriptions, may be safely estimated at about L.4 to each individual of the entire population, making in the aggregate a sum of about L.88,000,000, to which, if we add L.12,000,000 for Ireland, the whole will amount to L.100,000,000. And vast as this sum may appear, we believe it is inside the mark. Silver spoons and forks, silver tea-services, with trays, &c., are now universally met with throughout the middle as well as the upper classes; while most families, of any antiquity or consideration of any kind, possess large quantities of ornamental as well as useful plate. In the Continent and the United States the bullion invested in the way now stated is very great indeed. In Italy and some other countries the lower classes, especially the women, though not generally so well off as in England, spend more money upon massive rings, chains, brooches, and such like articles, which they regard much as girls in England do their deposits in the savings-bank, as a reserve fund or capital.

We are aware that Jacob says, that "In the present day in this country the quantity of gold and silver in actual existence, including utensils, ornaments, jewelry, trinkets, and watches, is three or four times as great as the value of those metals which exists in the form of money." (*Historical Inquiry*, i. 210.) And as the value of the precious metals in Great Britain, in the shape of coin, is certainly not less at present (1858) than L.70,000,000 or L.75,000,000, the value of the bullion in plate, jewellery, &c., ought, on this hypothesis, to amount to at least L.210,000,000 or L.280,000,000! But there can be no manner of doubt that the lowest of these sums would be far beyond the mark. Tegoborski, indeed (*Gites Aurifères*, &c., p. 66), who is supported by Humboldt (*Nouvelle Espagne*, iii., p. 465, ed. 1827), estimates the value of the bullion vested in plate, watches, jewellery, &c., at only half the amount vested in coin. But this estimate, though not perhaps very far wrong if applied to the poorer countries of Europe, would undoubtedly, if applied to Great Britain, be as much under as that of Jacob is above the mark.

But, without pretending to an accuracy which, on such subjects, is unattainable, we run little risk in concluding that the expenditure of bullion in the arts—that is, in plate, jewellery, gilding, &c.—in Europe, America, and Australia, cannot at present (1858) be under, if it do not exceed, L.15,000,000 or L.16,000,000 a year. But of this a portion, estimated at about one-fifth, or 20 per cent., is supposed to be obtained from the fusion of old plate, the burning of lace, picture-frames, &c. And hence, if we deduct from the L.15,000,000 used in the arts 20 per cent for the old bullion, we have L.12,000,000 for the tota quantity of the supplies from the mines annually disposed of in this way; a considerable portion of which, including that used in the gilding of rooms, earthenware, books, harness, buttons, &c., cannot be again recovered or applied to any useful purpose.

And however great it may appear to be, this amount will be largely increased with the increase of population and the spread of refinement in the arts, and still more by anything like a considerable fall in the value of bullion.

Total consumption of gold and silver.

Hence it would appear, putting these items together, that the annual consumption of bullion as currency, and in the arts, amounts to about L.29,500,000, viz.:—

Wear and tear and loss of coin,............	L.7,500,000
Increase of currency.........................	10,000,000
Used in the arts..................................	12,000,000
Total	L.29,500,000

It will be difficult to show that these estimates are beyond the mark; and supposing them to be nearly correct, it follows, deducting the above sum from the previously estimated produce of the mines (L.39,050,000 – L.29,500,000), that we have a surplus of L.9,550,000 to defray the sums required for hoarding, for exportation to the East, &c. And there certainly seems to be little reason for thinking that a supply of this amount will do more than meet the demands upon it.

It may be said, perhaps, that we must have exaggerated the consumption of the precious metals, inasmuch as the sum which we suppose is annually consumed considerably exceeds the entire produce of the mines previously to the supplies from California and Australia. But, while we admit the fact to be as stated, we deny the inference which is attempted to be drawn from it. The truth is, that while the discovery of the Californian and Australian deposits has added in so great a degree to the supply of bullion, it has also added very largely to its consumption. It has given an unparalleled stimulus to emigration and commerce. The population of California and Victoria has increased in a ratio hitherto unheard of, or from next to nothing a dozen years ago, the former to 507,000 in 1856 (American Almanac for 1858), and the latter to 463,000 on the 31st December 1857. But despite this increase, wages, owing to the general desire to speculate on one's own account, continue to be extravagantly high. In California in 1856 miners readily obtained from 10s. to 25s. a day, according

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[1] Estimates have been made of the expenditure upon some of these items, but the data on which they are founded are too vague to entitle them to much attention.

Consumption of the Precious Metals.

to their skill and capacity for enduring fatigue; common labourers from 8s. to 12s. a day; and house-servants from L.5 to L.6 a month. For a while most articles were proportionally high, so that these extravagant wages were not so advantageous to the parties receiving them as might have been supposed. But there has latterly been a great fall in the price of manufactured goods and colonial produce; while, owing to the progress of agriculture, provisions have also been greatly reduced. Lodgings are still very dear, but not so exorbitant as formerly. In Australia, the state of things for a while after the discovery of the gold-fields, was not very dissimilar; wages, however, though still very high, are now (1858) a good deal lower there than in California; while in other respects there is but little difference between the two. And if, in addition to these unprecedented circumstances, we take into account the unsettled character of the population, with the absorbing pursuit of wealth on the one hand, and the utter recklessness of expenditure on the other, we must be satisfied that the currency of these countries cannot be otherwise than excessive as compared with their population.

The powerful influence of the late gold discoveries is not, however, confined to California and Australia. The emigration to these countries, and the new and rapidly-increasing markets which they afford, have told effectually here, and indeed in every commercial country. In England the rise of wages cannot be estimated at less than from 10 to 30 per cent., while in Ireland it has been a good deal more. And though the rise of wages in the latter be in part ascribable to the famine of 1846–47, and in a still greater degree to the emigration to the United States, yet, as this emigration has been powerfully promoted by the efflux of emigrants from the Atlantic states to California, it is clear that the gold of the latter has been at bottom a prominent cause of the improvement in the condition of the Irish peasantry. The same may be said of the emigration from Germany, which has latterly become of first-rate importance. At an average of the seven years ended with 1852, it amounted to 103,591 individuals a year; the numbers in 1851 and 1852 being respectively 120,708 and 155,730, of which by far the greater portion was destined for the United States. (*Report of Emig. Com. for* 1853, p. 104.) In 1854 the emigrants to the latter from Germany only, amounted to no fewer than 223,862; and though not so great since, they are still very numerous, having amounted in 1857 to 91,781. (Hunt's *Com. Mag.*, June 1858, p. 768.)

The rise of wages consequent on these extraordinary mutations, and the increased exports of produce which they have occasioned, have exercised a powerful influence in the United States as well as in Europe. And there, consequently, as well as here, a greater supply of bullion is required to serve as currency. And while this influence is operating on the one hand, on the other the swarms of *parvenus* who are every day rising to opulence, contribute to swell the demand for all sorts of things, but especially for plate and plated goods, jewellery, and such like articles. And what is probably of still greater importance, the metallic basis of the currency is everywhere being enlarged; and the conviction is rapidly gaining ground in the United States as well as in Europe, that no paper currency can be safe unless effectual measures be taken to maintain such a supply of the precious metals in the countries in which it circulates as may be necessary to ensure its immediate conversion into coin.

Consumption of the Precious Metals.

Burying of gold and silver in Europe.

Burying of Gold and Silver.—It is singular that, in estimating the consumption of gold and silver, Jacob did not make any allusion to the practice which has uniformly prevailed in all countries harassed by intestine commotions or exposed to foreign invasions, of burying treasure in the earth. Of the sums so deposited a very considerable proportion has been altogether lost, and this has no doubt been one of the principal means by which the stock of the precious metals has been kept down to its present level. Every one is aware that during the middle ages *treasure trove*, or money dug from the ground, formed no inconsiderable part of the revenues of this and most other countries.[1] And though the burying of money has long ceased in Great Britain, such has not been the case among our neighbours. Wakefield tells us that down to 1812 the practice was common in Ireland;[2] and though much fallen off in the interval, it continues to this day to be occasionally resorted to in that part of the kingdom. It has always prevailed, sometimes to a less and sometimes to a greater extent, in almost every part of the Continent.[3] The anarchy and *brigandage* that accompanied the revolution of 1789 made the practice be carried to an extraordinary extent in France; and there owing to various causes, which are too obvious to require being pointed out, it still maintains a broad and firm footing. So much so is this the case that, to use the words of a distinguished authority, "*En France nous enfouissons notre argent dans nos coffres, ou nous le cachons dans les murs de nos maisons et les sillons de nos champs, selon les vieilles coutumes de l'Orient. Il y a peut être un milliard* (FORTY MILLIONS sterling) *de notre numeraire rendu ainsi sterile.*"[4] And yet we doubt whether the burying of treasure be at present as prevalent in France as in many parts of Germany, and in Hungary, Russia, Italy, Spain, and European Turkey. The feeling of insecurity that has prevailed in all these countries, especially since 1848, has given a stimulus to this practice which nothing can countervail. Of the many millions that were distributed among the countries round the Black Sea during the recent campaigns in that quarter, the greater portion is believed to be as much withdrawn from circulation as if it had never been dug from the mine.

It is impossible, of course, to form any estimate of the sums that are thus annually placed as it were in mortmain. They vary from year to year, and are always greatest when wars or revolutionary disturbances are in progress, or when their occurrence is anticipated, or but little confidence is placed in the permanence of existing institutions. There can, at all events, be no question that the sums which have been disposed of in the way now stated in the different continental countries of late years have been quite enormous—greater, perhaps, than those absorbed by any of the other channels of expenditure.

Exportation of the precious metals to the East.

Besides the countries already mentioned, there is a vast portion of the earth's surface, including Turkey in Asia, Arabia, Persia, India, China, and other eastern territories, into which bullion has been largely imported from the remotest æra. During the intercourse of the Phœnicians, Greeks, and Romans, with the East, gold and silver, obtained from the mines of Spain and other European countries, always formed important articles of export to Arabia and India. The same notions of the mischievous influence of the exportation of these metals that have prevailed in modern times were also prevalent in antiquity; and various efforts were in consequence made to hinder its taking place. That such had been the practice in the earlier periods of Roman history, is evident from the statement of Cicero,[1] and the prohibition was repeatedly renewed, though with very little effect, by the emperors. Tiberius complained to the Senate that the wealth (meaning gold and silver) of the state was irrecoverably consigned to foreign and hostile nations in exchange for luxuries and female ornaments.[2] Pliny computed the annual drain of cash to India only for these objects at fifty million sesterces, or L.400,000;[3] and to India, China, and Arabia, at double that sum, or L.800,000.[4] And the drain thus early commenced, though varying in intensity, has continued, with but little interruption, down to the present times. Since the establishment of the East India Company in 1600, gold and silver have usually been among the best and safest articles of export to the East. And despite the vast quantities of these metals, but more especially of silver, that have thus been poured into India, they appear of late years to be in greater request than ever in that and the adjacent countries. The supplies thrown upon their markets, like the water poured into the sieves of the Danaids, completely disappear, or are so absorbed that the demand for fresh supplies continues without any abatement.

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[1] Blackstone, *Com.*, b. i., cap. 8, § 13.

[2] *Account of Ireland*, i., p. 593.

[3] Storch, *Economie Politique*, i., p. 222, 1823.

[4] Dupuynode, *De la Monnaie, Du Credit*, &c., i. 182, Paris, 1853; one of the best of the late French publications on the important subjects of which it treats.

Humboldt estimated that, of the entire produce of the American mines at the commencement of this century, amounting, as already seen, to 43,500,000 dols., no less than 25,500,000 were sent to Asia,—17,500,000 by the Cape of Good Hope, 4,000,000 by the Levant, and 4,000,000 through the Russian frontier. And though it be generally believed by later authorities that this estimate was beyond the mark,[5] still there is no manner of doubt that the drain of bullion to the East was then, and for several years before and after, of the most formidable dimensions. Gradually, however, it began to diminish, partly in consequence of the decrease in the supplies of bullion from America subsequently to 1808, and partly, and we believe principally, from the great and sudden increase in the exports of cottons and other manufactured goods to India which followed the opening of the trade in 1813. Such, indeed, was the influence of these and other concurring causes, that in 1832 and 1833 the export of bullion from England to India had not merely ceased, but the tide had actually begun to set in the opposite direction. This abnormal state of things did not, however, continue for any very lengthened period. For a few years there was no very decided movement of bullion either from Europe to the East, or from the East to Europe. But this approach to an equilibrium has wholly passed away. Within the last dozen years the drain of bullion from Europe to the East has again set in with renewed force, and is become deeper and broader than at any former period. And yet, despite their continued influx, there is no general rise of prices nor anything to show that India is becoming saturated with the precious metals, or even with silver. On the contrary, the supply appears to be as deficient as ever; and it is doubtful whether this apparently bottomless abyss be not of itself sufficient to swallow up the largest portion, if not the whole, of the late extraordinary additions to the supply of bullion. The following returns supply the latest and most authentic information in regard to the exportation of bullion to the East:—

I. *An Account of the Quantities of Gold and Silver respectively exported to India, China, and Egypt, during each of the Ten Years ending with* 1852, *distinguishing between British and Foreign Coin, and between Coin and Bullion.*

Countries.	Years.	British Gold Coin.	Foreign Gold Coin.	Gold Bullion.	Total of Gold.	British Silver Coin.	Foreign Silver Coin.	Silver Bullion.	Total of Silver.
		Ounces.	*Ounces.*	*Ounces.*	*Ounces.*	*Ounces.*	*Ounces.*	*Ounces.*	*Ounces.*
To the British Possessions in India.........	1843	7,877	...	...	7,877	18,180	122,450	333,779	494,409
	1844	5,944	...	...	5,944	...	...	...	...
	1845	115	...	...	115	...	...	...	...
	1846	2,518	...	...	2,518	...	800	...	800
	1847	2,014	...	...	2,014	...	359	...	359
	1848	1,208	...	...	1,208	1,287	12,850	...	14,137
	1849	651	...	...	651	...	...	...	...
	1850	9,628	...	...	9,628	920	193,826	134,000	328,746
	1851	5,155	...	...	5,155	...	137,620	145,833	283,453
	1852	16,356	...	...	16,356	77,000	626,864	379,893	1,083,757
To China...................	1843	...	...	...	...	...	661,297	...	661,297
	1844	...	...	...	...	...	263,828	...	263,828
	1845	...	...	...	...	...	187,614	...	187,614
	1846	...	...	...	...	...	26,406	...	26,406
	1847	...	...	...	...	...	...	...	...
	1848	...	...	...	...	...	...	...	...
	1849	...	...	...	...	...	...	...	...
	1850	1,917	...	...	1,917	60	62,000	...	62,060
	1851	34	...	...	34	...	38,800	8,500	47,300
	1852	...	...	...	...	800	...	...	800
To Egypt.................	1843	2,500	...	...	2,500	...	15,000	...	15,000
	1844	40	...	...	40	40,000	600	...	40,600
	1845	250	...	...	250	4,200	7,000	...	11,200
	1846	3,186	...	...	3,186	...	...	...	...
	1847	12546	200	...	12,746	2,500	9,000	...	11,500
	1848	2420	...	...	2,420	...	...	...	...
	1849	921	...	...	921	14,000	40,000	...	54,000
	1850	13,919	...	...	13,919	105,280	141,177	145,488	391,945
	1851	70,437	...	...	70,437	126,420	2,319,688	3,808,289	6,254,397
	1852	62,341	152	...	62,493	140,783	8,850,613	2,580,240	11,571,636

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[1] "Exportari aurum non oportere, cum sæpe antea Senatus, tum me consule gravissime judicavit." (*Oratio* pro L. Flacco, cap. 28.)

[2] Taciti, *Annal.*, lib. iii., cap. 53.

[3] "Digna res, nullo anno imperii nostri minus H. S. quingenties exhauriente India, et merces remittente." (*Hist. Nat.*, lib. vi., cap. 23.)

[4] "Minimaque computatione millies centena millia sestertium India et Seres, peninsulaque illa (Arabia) imperio nostro adimunt. Tanto nobis deliciæ et fœminæ constant." (Ibid., lib. xii., cap. 18.)

[5] "Humboldt, cela n'est plus douteux, estimait trop haut la valeur de l'or et de l'argent, qui s'écoulaient au commencement de ce siècle d'Europe en Asie, et portaient trop bas la déperdition qu'ils éprouvaient, dans la même temps, par le frottement et leur conversion en objets d'orfevrerie et de bijouterie." (Dupuynode, *De la Monnaie*, &c., i., p. 35.) There is no longer any doubt in regard to the accuracy of the latter part of this statement; and it is pretty generally supposed that the first part is also well founded.

Consumption of the Precious Metals.

II. *Total Exports of Bullion from Great Britain to the East for each of the Seven Years ending* 1857 *(from Tables compiled by James Lowe, Esq., of Austin-Friars).*

Years.	Gold.	Silver.
	L.	L.
1851	102,280	1,716,100
1852	921,739	2,630,238
1853	880,202	4,710,665
1854	1,174,299	3,132,003
1855	948,272	6,409,889
1856	404,749	12,118,985
1857	269,275	16,795,232
Total for seven years	4,700,816	47,513,112
Annual average	671,545	6,787,587

Total Exports of Bullion from the Mediterranean Ports to the East, for each of the Five Years ending with 1857.

Years.	Gold.	Silver.
	L.	L.
1853	93,528	848,362
1854	48,456	1,451,014
1855	243,239	1,524,240
1856	74,039	1,988,916
1857	259,986	3,350,689
Total for five years	719,248	9,164,221
Annual averages	143,849	1,832,844
Total annual averages	815,394	8,620,431
Total annual average of gold and silver, L.9,435,825.		

To which have to be added the exports by the Black Sea, the Russian and Turkish frontiers, &c. But the exports of bullion to the East in the current year (1858) have greatly fallen off; and will not exceed L.5,700,000. (See *post.*)

It is of importance to observe that, of the silver exported from England in 1857, nearly a third part, or L.5,451,698 went to China.

III. *Account of the Imports and Exports of Treasure into and from India, during each of the Twenty-three Years ending with* 1856–7.

Years.	Imports.	Exports.	Excess of Imports.
1834–35	L.1,893,023	L.194,741	L.1,698,282
1835–36	2,146,465	108,109	2,038,356
1836–37	2,036,167	263,934	1,772,233
1837–38	2,610,101	340,656	2,299,445
1838–39	3,010,920	347,906	2,663,014
1839–40	1,945,264	470,523	1,474,741
1840–41	1,786,253	366,486	1,419,767
1841–42	1,841,335	515,076	1,326,259
1842–43	3,443,292	215,797	3,227,495
1843–44	4,794,678	746,076	4,048,602
1844–45	3,752,472	1,106,840	2,645,532
1845–46	2,495,959	816,028	1,679,931
1846–47	2,939,922	713,870	2,226,052
1847–48	1,973,391	1,426,038	547,353
1848–49	4,204,503	2,539,743	1,664,760
1849–50	3,396,807	971,244	2,425,563
1850–51	3,811,809	541,289	3,270,520
1851–52	5,052,059	919,089	4,132,970
1852–53	6,831,377	1,055,230	5,776,147
1853–54	4,871,956	1,483,296	3,388,660
1854–55	2,028,258	1,267,035	761,223
1855–56	11,301,288	601,177	10,700,111
1856–57	14,413,699	1,253,428	13,160,271
Total excess of imports			L.74,347,287
Average annual excess of imports			3,232,490

The following table, which has been obligingly furnished to us by the statistical department of the East India House, shows the countries from which the bullion (distinguishing between gold and silver), imported into India during the six years ended with 1855–56, was derived, and those to which the bullion exported was sent:—

IV. *Imports into the whole of India (Bengal, Madras, and Bombay), distinguishing between Gold and Silver, and distinguishing also the Countries and Regions with which the Trade has taken place, from* 1850–51 *to* 1855–56.

Year.	Presidency.	United Kingdom.		Foreign Europe.		America.		China.		All other Places.		Total.			Nett Imports of Treasure into India, Deducting Exports.
		Gold.	Silver.	Gold.	Silver.	Gold.	Silver.	Gold.	Silver.	Gold.	Silver.	Gold.	Silver.	Total Gold and Silver.	
		L.	L.	L.	L.	L.	L.	L.	L.	L.	L.	L.	L.	L.	L.
1850–51	Bengal	14,649	356,974	...	16,253	...	3556	153,203	288,426	151,083	205,338	318,935	870,547	1,189,482	...
	Madras	4,626	98,962	...	2,124	...	...	...	...	28,847	125,546	33,473	226,632	260,105	...
	Bombay	3,085	24,734	...	...	...	...	541,847	861,807	257,970	672,778	802,902	1,559,319	2,362,221	...
	Totals	22,360	480,670	...	18,377	...	3556	695,050	1,150,233	437,900	1,003,662	1,155,310	2,656,498	3,811,808	3,270,519
1851–52	Bengal	45,080	870,194	...	47,505	...	13,104	233,408	654,910	192,835	249,435	471,323	1,835,147	2,306,470	...
	Madras	26,654	70,102	...	11,128	...	...	...	...	49,915	139,599	76,569	220,829	297,398	...
	Bombay	...	28,985	...	...	...	...	460,318	953,155	330,568	675,163	790,886	1,657,304	2,448,190	...
	Totals	71,734	969,281	...	58,633	...	13,104	693,726	1,608,065	573,318	1,064,197	1,338,778	3,713,280	5,052,058	4,132,970
1852–53	Bengal	117,865	1,569,041	59,357	675	...	1,179	235,359	954,122	308,248	148,141	720,829	2,673,158	3,393,987	...
	Madras	11,088	353,574	...	17,400	...	...	...	...	38,413	156,461	49,421	527,435	576,856	...
	Bombay	1,500	287,959	...	3,640	...	...	333,300	908,027	230,114	1,095,995	564,914	2,295,621	2,860,535	...
	Totals	130,373	2210,574	59,357	21,715	...	1,179	568,659	1,862,149	576,775	1,400,597	1,335,164	5,496,214	6,831,376	5,776,149
1853–54	Bengal	6,645	890,283	...	147,686	...	614	91,504	57,371	387,889	503,994	486,038	1,599,948	2,085,986	...
	Madras	17,488	367,834	...	3,521	...	...	...	...	69,526	119,122	87,014	490,477	577,491	...
	Bombay	28,385	335,001	...	4,411	...	...	166,482	336,408	333,217	1,004,576	528,084	1,680,396	2,208,480	...
	Totals	52,518	1,593,111	...	155,618	...	614	257,986	393,779	790,632	1,627,692	1,101,136	3,778,281	4,871,957	3,388,662
1854–55	Bengal	1,700	9,449	975	24,279	4739	...	150,916	40,366	160,274	252,426	318,604	326,520	645,124	...
	Madras	7,219	68,503	...	...	...	...	...	...	52,305	66,193	59,524	134,696	194,220	...
	Bombay	...	1,026	...	4,815	...	...	174,253	7,094	330,541	671,183	504,794	684,118	1,188,912	...
	Totals	8,919	78,978	975	29,094	4739	...	325,169	47,460	543,120	989,802	882,922	1,145,334	2,028,256	761,224
1855–56	Bengal	10,400	2,612,814	92,112	374,145	...	3,395	634,221	173,227	393,930	1,185,607	1,130,663	4,349,188	5,479,851	...
	Madras	59,069	654,491	100	24,235	5950	...	...	...	70,447	38,192	135,566	716,918	852,484	...
	Bombay	170	360,008	...	17,943	...	...	874,320	58,578	375,070	3,282,856	1,249,560	3,719,385	4,968,945	...
	Totals	69,639	3,627,313	92,212	416,323	5950	3,395	1,508,541	231,805	839,447	4,506,655	2,515,789	8,785,491	11,301,280	10,700,107

Consumption of the Precious Metals.

Consumption of the Precious Metals.

IV. *Exports of Treasure from India (Bengal, Madras, and Bombay), distinguishing between Gold and Silver, and distinguishing also the Countries and Regions with which the Trade has taken place, from* 1850–51 *to* 1855–56.

Year.	Presidency.	United Kingdom.		Foreign Europe		America.		China.		All other Places.		Total.		
		Gold.	Silver.	Gold.	Silver.	Gold.	Silver.	Gold.	Silver.	Gold.	Silver.	Gold.	Silver.	Total Gold and Silver.
		L.	L.	L.	L.	L.	L.	L. *	L.	L.	L.	L.	L.	L.
1850–51	Bengal.....	160	...	...	...	...	...	20,000	...	777	255,392	937	275,393	276,330
	Madras	...	10,000	...	...	...	...	...	...	605	93,536	605	103,535	104,140
	Bombay...	4	...	...	...	...	700	...	1,000	470	158,645	474	160,345	160,819
	Totals	164	10,000	...	...	...	700	20,000	1,000	1,852	507,573	2,016	539,273	541,289
1851–52	Bengal.....	430	6,375	...	...	...	...	...	...	69,650	174,133	70,080	180,508	250,588
	Madras.....	...	...	...	...	...	...	...	...	500	215,268	500	215,268	215,768
	Bombay ...	...	246	...	...	...	...	195	3,380	390	448,521	585	452,147	452,732
	Totals	430	6,621	...	...	...	...	195	3,380	70,540	837,922	71,165	847,923	919,088
1852–53	Bengal.....	128,494	125	...	...	...	...	4,600	675	12,384	330,097	145,478	330,897	476,375
	Madras.....	300	...	...	...	...	...	...	...	...	36,082	300	36,082	36,382
	Bombay ...	...	...	...	...	...	...	5,330	20,921	17,697	498,524	23,027	519,445	542,472
	Totals	128,794	125	...	...	...	...	9,930	21,596	30,081	864,703	168,805	886,424	1,055,229
1853–54	Bengal.....	...	7,151	...	...	...	...	1,836	258,863	2,446	167,617	4,282	433,631	437,913
	Madras. ...	...	...	...	...	...	...	20	...	275	115,362	295	115,362	115,657
	Bombay ...	...	...	...	2,004	...	...	10,229	449,096	2,459	465,937	12,688	917,037	929,725
	Totals	...	7,151	...	2,004	...	...	12,085	707,959	5,180	748,916	17,265	1,466,030	1,483,295
1854–55	Bengal.....	10,587	28,818	...	...	...	...	...	35,706	625	315,830	11,212	380,354	391,566
	Madras.....	935,531	...	...	...	...	...	...	120	3,255	424,907	96,786	425,027	521,813
	Bombay ...	24,700	7,244	...	...	...	...	17,545	135,451	1,190	167,523	43,435	310,218	353,653
	Totals	128,818	36,062	...	...	...	...	17,515	171,277	5,070	908,260	151,433	1,115,599	1,267,032
1855–56	Bengal.....	...	...	...	10,000	...	...	...	837	100	101,599	100	112,436	112,536
	Madras.....	5	37	...	...	...	...	...	...	...	70,687	5	70,724	70,729
	Bombay...	...	...	...	...	...	...	6	69,207	2,097	346,598	2,103	415,805	417,908
	Totals	5	37	...	10,000	...	...	6	70,044	2,197	518,884	2,208	598,965	601,173

* Not stated whether gold or silver.

Causes of the drain of bullion to India.

It is difficult to account for the long-continued and heavy drain of bullion to India. It would seem, however, to be principally owing to the following circumstances, viz. :—1. To the country having no mines of its own ;[1] 2. To the great amount of the population, their early civilization and poverty, and their habit of wearing ornaments of silver and gold ; and, 3. To that burying and hoarding of the precious metals which is perhaps more prevalent in India than anywhere else.

1. The influence of the first of these causes of the importation of the precious metals into India is too obvious to require any illustration.

2. The influence of the second cause of the importation referred to is of the most powerful kind. From the remotest period the people of India have been in a considerably advanced state of civilization, which, owing to the early institution of castes and other circumstances, has continued in a comparatively stationary state. Owing also to the economical habits of the people, and the facility with which they have obtained subsistence, their wages have always been, and continue to be, extremely low. And from the combination of these and other causes, the businesses carried on in India have, with few exceptions, been generally on a petty scale ; and while comparatively few large payments have to be made, the everyday transactions of an immense population, though individually small, amount in the aggregate to a very great sum. And hence the extraordinary demand for silver to serve as coin in retail transactions, and for *cowries*, inferior in value even to the smallest coins.

And in addition to the very great sums required for currency, another, and also a very large sum, is absorbed in jewellery or trinkets. The habit of wearing rings, bracelets, brooches, hair-pins, and such like personal ornaments of gold and silver, but generally the latter, is universal in India, and cannot fail to occasion a very large expenditure. There are no data on which to build up an approximate estimate of the gross amount of the sums invested in the coin in circulation and in trinkets in India. It has, however, been said that it is quite conceivable it should come up to 400,000,000 sterling ;[2] and to those who bear in mind that the population is not less perhaps than from 150,000,000 to 160,000,000, and that metallic ornaments are worn by all but the most degraded persons, this conjectural estimate may not appear to be in any degree extravagant.

But if it be not very far from the mark, the wear and tear or abrasion and loss upon so great a sum, being taken at only 1 per cent., would require an influx of bullion to the extent of L.4,000,000 a year. And as this source of loss may be regarded, so to speak, as a constant quantity, it is plain that if, owing to circumstances affecting the commerce of the Peninsula, or any other cause, this supply

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[1] This statement may not, perhaps, be strictly correct. It is affirmed that gold and silver have been produced in India ; but if so, it is admitted on all hands that the production has been so inconsiderable as to be unworthy of notice.

[2] Newmarch in *Tooke on Prices*, vi., p. 723.

Consumption of the Precious Metals.

should be diminished for a few years, the demand for bullion would be proportionally increased as soon as the disturbing force had ceased to operate.

3. We have already noticed the burying or hoarding of treasure in Europe. But the practice has been carried to a still greater extent in India, Persia, Turkey in Asia, and other eastern countries, than anywhere in the western world. Despotism and a want of security have always prevailed in these countries. The inhabitants have in consequence been accustomed to regard the money they have committed to the earth as their only real wealth, and have availed themselves of every opportunity to place portions of their means beyond the grasp of their avaricious and tyrannical masters. And as many of the hoards so deposited will never be brought to light, the practice has undoubtedly been a principal cause of the constant flow of bullion to the East.[1]

Bernier, "that most curious traveller," as he is called by Gibbon,[2] remarks on this subject as follows, viz. :—"Avant que de finir, je dirai d'ou peut venir que cet empire du Mogol étant ainsi une abyme d'or et d'argent, comme jai dit dans le commencement, on ne voit neanmoins pas qu'entre le peuple il y en ait davantage qu'ailleurs, au contraire le peuple y paroit moins pecuniex et l'argent s'y trouvent plus rare qu'en beaucoup d'autres endroits.

"La premiere raison est qu'il s'en consomme beaucoup a fondre et refondre tous ces anneaux de nez et d'oreilles, chaines, bagues, et brasselets des pieds et des mains que portent les femmes; et principalement dans cette incroyable quantitè de manufactures où il en entre tant, que se perd, et qu'on ne sçait ce qu'il devient, comme dans toutes ces broderies, alachas ou étoffes de soye rayes, &c. &c." And then, having adverted to the injustice and exactions to which the mass of the people are exposed, he goes on to state,—"D'ou vient qu'un chacun est dans une crainte perpetuelle de ces sortes de gens, et surtout des Gouverneurs, plus qu'une esclave de son maitre. Que pour l'ordinaire ils affectent de paroitre gueux et sans argent, très-simples dans le vestement, logement, ameublement, et encore plus dans le boire et le manger. Qu'ils apprehendent même souvent de se mesler trop avant dans le negoce, dans la crainte qu'ils ont qu'on ne les croye riches et qu'on ne leur trâme quelque piece pour les ruiner; si bien qu'enfin ils ne trouvent point de meilleur remede que de cacher et enfouir leur argent bien secretement et bien profondement en terre, sortant ainsi hors du commerce ordinaire des hommes, et perissant enfin là dedans, sans que le Roy ni l'etat, ni que ce soit en profite. Ce qui arrive non seulement entre les païsans et artisans, mais ce qui est plus considerable entre toutes sortes de marchands, soit Mahometans soit Gentils; mais principalment entre les Gentils qui sont presque seuls les maitres du negoce et de l'argent, infatuez qu'ils sont de cette croyance, que l'or et l'argent qu'ils cachent durant leur vie leur servira après la mort; et c'est à mon avis la veritable raison pourquoi il paroit, si peu d'argent en commerce parmi le peuple." (Bernier, *Voyage dans les Etats du Grand Mogul*, i., pp. 306–311, Amst. 1710.)

And at a later date, Mr Luke Scrafton has referred to the same practice in still stronger terms:—"In India," says he, "the Hindoos bury their money underground, often with such secrecy as not to trust their own children with the knowledge of it; and it is amazing what they will suffer rather than betray it. When their tyrants have tried all manner of corporal punishments upon them, they threaten to defile them; but even that fails; for, resentment prevailing over the love of life, they frequently rip up their bowels or poison themselves, and carry the secret to their graves. And the sums lost in this manner in some measure account why the silver of India does not appear to increase, though there are such quantities continually coming into it, and none going out." (*On the Government of Hindostan*, p. 16.)

The comparative security that was lately enjoyed by the natives in most parts of India may have done something to lessen this habit. But one so widely diffused and so deeply rooted, could not be easily or speedily modified. And though the illegal exactions of their rulers were curbed and partially put down in the countries directly under the Company's government, there was in Oude and many other parts of India, previously to the late insurrection, a great deal of disorder, oppression, and robbery. And since that unfortunate outbreak insecurity and disorders of all sorts have immeasurably increased, and have proportionally stimulated the practice of hoarding. The rebellion raging in China has had similar effects; and we have been assured by those who, from experience and observation, are well qualified to form an opinion on such a subject, that it may be moderately estimated that in India and China, during the half-dozen years ending with 1857, a sum of not less than L.100,000,000 sterling has been consigned to the earth.

Trade of the United Kingdom with India and China.

But in addition to those now noticed, which, though varying in intensity, may be regarded as being to a considerable extent constant in their operation, the state of the trade between Europe and America and the East has latterly been such as to lead to an unusual increase in the exports of the precious metals to the latter. This has been occasioned by the value of the imports of the commodities of India and China into this country and the United States very greatly exceeding the value of the manufactured and other produce exported to them, and leaving a large balance which could not be cancelled otherwise than by an equivalent exportation of bullion. This is evident from the following statement, viz. :—

Countries.	1854.	1855.	1856.	1857.
	L.	L.	L.	L.
Exports from United Kingdom to India, incl. Singapore......	9,643,693	10,622,118	11,419,004	12,562,996
Exports from United Kingdom to China, incl. Hong Kong...	1,000,716	1,277,944	2,216,123	2,449,982
Totals..............	10,644,409	11,900,062	13,635,127	15,012,978
Imports from India, incl. Singapore, into United Kingdom.	11,466,967	13,284,470	18,069,350	19,590,404
Imports from China incl. Hong Kong, into U. Kingdom...	9,125,040	8,746,590	9,421,648	11,448,639
Totals..............	20.592,007	22,031,060	27,490,998	31,039,043
Excess of imports over exports........	9,947,598	10,130,998	13,855,871	16,026,065

A portion amounting to about L.3,000,000 or L.3,500,000 of the excess of imports consists of remittances from India on account of the home expenses of the East India Company. But after this portion is deducted, the excess of imports is still very great, amounting to about L.6,500,000 or L.7,000,000 a year in 1854 and 1855, and to no less than from L.10,000,000 to L.13,000,000 a year in 1856 and 1857.

There has been, during the present year (1858), an increase to the extent of about L.4,000,000 in the amount of the exports of British produce to India (L.3,695,000 in the first ten months). But this increase has been in great measure, if not wholly, owing to the military operations now going on in India, and affords no grounds for estimating what the exports may amount to after tranquillity has been restored.

Trade of United States with India and China.

The same excess of imports over exports which characterizes the trade between Great Britain and India and

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[1] For accounts of the discovery of concealed treasures see D'Herbelot, *Bibliotheque Orientale*, i. 206, and ii. 347, ed. 1777.

[2] *Decline and Fall*, i., p. 267, ed. 1838.

China, distinguishes also, though in a less degree, the trade between the United States and these countries. Thus in the year ending 30th June 1857, the value of the exports of all sorts of produce from the United States to India and China amounted to 5,373,067 dols., and that of the imports to 19,123,146 dols.; leaving a balance of no less than 13,750,079 dols.,[1] or about L.3,300,000 to be provided for by drafts on London and other places indebted to America.

Trade between India and China.

From the period when we have authentic accounts of the trade between India and China, it is found that the exports of cotton and other produce from the former to the latter have usually exceeded the imports; so that China, which has mines of the precious metals, has been one of the principal sources from which India had drawn her supplies of bullion. But down to 1830 the drain from the former to the latter was confined within reasonable limits. Subsequently, however, owing to the growing taste for the opium of India, and its enormously increased consumption in China, the exports of bullion from the latter to India were increased to such an extent as to lay the Chinese under very serious difficulties. It appears, for example, that at an average of the seventeen years ending with 1850–51, the annual value of the merchandise exported from India to China amounted to L.4,564,400 a year, and that of the merchandise annually imported, to only L.643,210, leaving a balance of no less than L.3,921,190 a year to be paid in bullion and in drafts on London and other places indebted to China; and this balance has increased during the intervening period, though, owing to the disturbances that have lately prevailed in India as well as in China, the recent state of the trade between them affords no just example of its state in ordinary years. We may, however, mention that in 1856 the imports of opium into China from India amounted to about 66,500 chests, which, at 420 dols. per chest, gives a gross sum of about L.6,200,000 for this item only.[2] Under such circumstances, it might have been supposed that, whether there were or were not a demand for the bullion of the West in China, India at all events would be pretty well supplied with bullion brought from the latter. But, as already seen, this is very far indeed from being the case. Notwithstanding the great increase in the exports of British produce to India, the imports of Indian produce into the United Kingdom are still greater; while the annexation of the Punjab and other provinces, and the peculiar state of India, has greatly increased the internal demand for bullion.

But while China has on the one hand a considerable balance against her on the trade with India, she has, on the other, a still larger balance in her favour on the trade with Europe and America; so that latterly her imports of bullion have greatly exceeded her exports. This has been mainly owing to the trifling amount of the exports of British produce and manufactures to China, which, though much augmented of late years, did not amount to L.2,500,000 (L.2,449,982) in 1857, being only between one-fourth and one-fifth part of the value of the imports from China in that year. The latter, however, were then unusually large, the imports of silk only having risen from 2,838,047 lb. in 1853, to 6,664,532 lb. in 1857, while the price of the silk rose at the same time about 50 per cent.; and hence it is that of the silver exported from England in 1857, the following amounts went to China, viz:—

Singapore, in transit for China	L.875,583
Hong Kong	2,048,795
Canton	28,592
Shanghai	2,398,728
Total	L.5,451,698

But the importation of Chinese silk having been overdone, has sustained so severe a check that the imports in the present year (1858) will not probably exceed 2,000,000 lb.,[3] obtained at a greatly reduced price. It is therefore all but certain that the late heavy balance against us in the trade with China has already been very materially reduced; and hence the great reduction, already noticed, in the exports of bullion to the East generally in 1858, and more especially in those to China, which will not probably exceed L.1,500,000. But despite its fluctuations, the drain of bullion from Europe (or Australia) and America to China must necessarily continue so long as the immense importations of tea, silk, and other Chinese products are not fully balanced by the exports; and there are various circumstances which make it doubtful whether this will speedily be the case. The events now (December 1858) in progress must, however, have a considerable influence, which it is yet too soon to appreciate. But the increased facilities given to trade by the late treaty, and more especially the abolition of the tolls and duties by which foreign products were prevented from penetrating into the interior, can hardly fail, provided they are *bona fide* carried out, to add considerably to the imports, and will consequently bring them nearer to an equality with the exports.

Down to rather a recent period the importation of opium into China, and its cultivation in the empire, were both forbidden by law. But as everybody knows, and we have seen, the prohibition of importation has long ceased to be of any practical efficiency; and during the last two or three years it has been openly admitted at most ports on moderate payments being made to the authorities. In the arrangements which have recently been made with the Chinese, there is one that legalizes the importation of opium at a duty of 30 taels per picul of 133⅓ lb.

Whether, however, its free importation will increase the demand for the opium of India is not so very clear. Opium is already cultivated to a great extent in China, and its growth is said to be rapidly increasing. There could not, indeed, be any conceivable motive after its importation had been permitted, for attempting to prohibit its being raised at home. And if, as many anticipate, the native supplies of opium should, notwithstanding their alleged inferiority in point of quality, eventually suffice for the consumption, India will lose her market for opium, and government will be deprived of the revenue of nearly L.5,000,000 a year it has latterly yielded, in the most unobjectionable manner, to the East India Company. The existing drain of bullion from China to India would, under such circumstances, either wholly cease, or be greatly reduced.

But it is important to bear in mind that, though changes in the trade between China and India, and between these countries and Europe, may lead to changes in the transmission of bullion from the one to the other, these changes, in as far as Europe and the East generally are concerned, can be temporary only. Owing, as already seen, to the want of mines, and the peculiar and deeply-rooted habits of its vast population, India must always have a very extensive demand for bullion, and to it, consequently, it will be sure to find its way. The supplies sent to it may not be paid for by shipments of its goods direct to Europe; but if not, they will be paid for indirectly by imports from China and other countries having payments to make to India.

Impolitic regulation in regard to the currency of India.

Some of the circumstances peculiar to India to which we have previously adverted, are such that by far the larger portion of the currency must necessarily consist of silver coins; and in 1835 they were made the only legal tender. But though not legal tender, gold coins continued to circulate in India; and a proclamation issued in 1841 directed them to be received at the public treasuries. Little attention was paid to this measure at the time; but after the discovery of the gold deposits in Australia, it became probable, if gold coins continued to be received by the public departments, that eventually none else would be paid into them, and that silver would cease to be employed except in petty payments. This contingency appears to have alarmed the government; and notice was accordingly given on the 22d December 1852, that from and after the 1st January next (1853) gold coins would not be received on account of taxes or other payments due to the public. Silver has consequently again become in fact as well as in law the sole legal tender of India. A good deal of controversy has taken place in regard to this measure. It is plain that, by continuing to act on the proclamation of 1841, government would have practically set aside the law of 1835, which made silver the only legal tender; and would thus have made itself responsible for the losses that might in consequence have resulted to individuals, and for the risk of having its own revenues reduced by the anticipated fall in the value of gold.

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[1] Report on the Commerce and Navigation of the United States for the year ended 30th June 1857, printed by order of Congress.

[2] *Papers on the Trade of various Places*, &c., 1857, p. 27. In 1857 the imports are said to have amounted to above 76,000 chests. (Crawfurd's Lecture at Leeds.)

[3] 1,849,918 lb. in the first ten months, against 5,270,330 lb. in the same period of last year.

But these appear to be most inadequate grounds for the course that was adopted. There are no sufficient reasons for supposing that any material, or indeed sensible injury, would have resulted either to the government or to individuals from the contingencies referred to; and there are at the same time various circumstances which make it much to be regretted that an attempt should have been made to exclude gold from the currency of India. Silver coins, being the only ones fitted to serve the purposes of the great bulk of the inhabitants, must always be in extensive demand in all parts of the peninsula. But had gold also been allowed to circulate as coin, it is most likely that it would have been extensively employed in making large payments, and it would also have been extensively hoarded. Even as it is, leaf and bar gold have been of late largely imported into India from China, to be used in the arts or buried. In 1855–6, for example, the imports in question amounted to no less than L.1,508,541; the fair presumption being, that but for the suppression of gold as currency, they would have been very much greater. And if so, the increased demand for gold would, on the one hand, have in so far counteracted that fall in its value which has been so generally apprehended; while, on the other, it would, by lessening the demand for silver, have checked any tendency it may have had to rise. And for these, and other reasons that will readily suggest themselves to the reader, it would be good policy to re-introduce a gold currency. It is contrary to all principle, and indeed to the plainest dictates of common-sense, to exclude it by forcible means from a field where it would otherwise be largely used, the more especially as by doing this we create an unnatural demand for silver at the very time when it is supposed to be rising in value as compared with gold.

Besides the powerful influence that the reverting to a gold currency would have in opening a new demand for gold, and lessening the existing demand for silver in India, there can be little doubt that gold will become in greater request in the latter. It is believed by many that the late outbreak in India will be the harbinger of a better order of things throughout that wide region; and if such should be the case, and its wealth and civilization be augmented, gold would be more largely used than at present in the arts or in the manufacture of jewellery and ornaments of all kinds, as well as in the effecting of large payments. Hence, on the whole, we are inclined to anticipate that at no distant date the exports of silver to the East will be diminished and those of gold increased. Such a result would be materially hastened by any considerable increase in the value of silver as compared with that of gold. But, independently altogether of a contingency of this sort, which depends on a great variety of circumstances, it seems fair to infer that the restoration of tranquillity in India will be accompanied by a decrease in the imports of silver and an increase in the imports of gold,—a result which would be further and effectually promoted by government again making and receiving payments in gold.

Substitution of gold for silver

Hitherto, both gold and silver coins have been legal tender in the United States, France, and some other countries. Wherever such is the case, the value of the coins in respect of each other has to be fixed by authority; that is, it has to be enacted that debts may be discharged by payments either of gold or silver money, at the rate of so many dollars to the eagle, francs to the Napoleon d'or, shillings to the sovereign, and so on, as laid down in the mint regulations of the different countries. But however correct at the periods when they are made, these valuations speedily become incorrect; and whenever such is the case, it is for everybody's advantage to make all his payments in the metal which happens to be overvalued as compared with the other. And hence the use of gold as money in preference to silver in England, and of silver in preference to gold in France and the United States.

In the improbable event of the mint valuations of gold and silver continuing for any considerable period to be nearly identical with their real values, the former would be sure to be preferred as money to the latter in all but petty transactions. Being much more valuable in proportion to its bulk and weight than silver, gold is more easily concealed and carried about. Where notes circulate of a low value, the advantage now referred to on the side of gold is less obvious. But such low notes are in all respects most objectionable; and where, as in England, there are no notes in circulation for less than L.5, and in France for less than 50 francs, the use of gold as money is accompanied with so many advantages that we are disposed to think it would maintain its place even though it were somewhat underrated as compared with silver. Inasmuch, however, as gold has so many natural grounds of preference on its side, the true plan is to make it the only standard, and to use silver merely as a subsidiary currency. This plan has been followed since 1817 in this country with the most complete success; and there is no reason to doubt that it may be elsewhere adopted with equal advantage.

in France.

The late extraordinary demand for silver in India has been quite enough to make gold be substituted for it in those countries in which they are equally legal tender. In France, for example, where the metallic currency consisted, down to 1850, almost wholly of silver, it now consists principally of gold. This is evident from the following account of the gold and silver coined in that empire from 1850 down to 1857, both inclusive:—

Years.	Gold.	Silver.		Total.	
	Fr.	Fr.	c.	Fr.	c.
1850...	85,192,390	86,458,485	20	171,650,875	20
1851...	269,709,570	59,327,308	90	329,036,878	90
1852...	27,028,270	71,918,445	50	98,946,715	50
1853...	312,964,020	20,099,488	20	333,063,508	20
1854...	526,528,200	2,123,887	20	528,652,087	20
1855...	447,427,820	25,500,305	50	472,928,125	50
1856...	508,281,996	54,422,214	...	562,704,209	...
1857...	572,561,225	3,809,611	...	576,370,836	...
Total..	2,749,693,49	323,659,745	50	3,073,353,235	50[1]
Equal in sterling to	L.109,987,740	L.12,946,389		L.122,934,129	

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[1] Levasseur, *Question de l'Or*, 8vo, p. 105, Paris, 1858.

Consumption of the Precious Metals.

Substitution of gold for silver in the United States.

In the United States the coinage of gold has increased in a somewhat similar ratio, having risen from 9,007,761 dollars in 1849 to 62,614,492 dollars in 1851, and 59,343,465 dollars in 1856. Hence gold coin is now used in these two countries, as it is used in England, in all considerable payments which are not effected by notes or cheques; while large portions of the silver coin that has in consequence been disengaged have found their way to the East.

This substitution of gold for silver, while it materially enlarges the field for the employment of the former, proportionally narrows that for the employment of the latter. And hence a very considerable permanent addition may be made to the comparative supply of gold without its value, measured in silver, being materially affected. In the end, no doubt, the values of both metals will be proportioned, independently of variations of demand, to the respective costs of their production. But before this equalization can take place, they must be distributed among the various countries of the world according to the circumstances peculiar to each, including therein their peculiar aptitudes for different purposes, and the novel conditions of their supply.

In Holland, as well as India, that substitution of gold for silver coin which is taking place in the United States and France has been hindered by the intervention of government, which has declared, in opposition to all sound principle, that silver only shall be legal tender. The value of the gold that has been consequently liberated in Holland has been estimated at about 172,000,000 florins, most part of which has been absorbed in the new gold currency of France. We may add that the additional quantity of silver required, through the cessation of gold as currency, for the supply of the Dutch mints slightly affected the price of the former, which, however, very soon fell to about its old level.

It would not be safe to lay much stress on any speculations that may be formed in regard to the more extensive employment of gold as money in Austria and Germany. Much depends on the continuance of tranquillity. But if it be preserved, and the government of Austria succeed in withdrawing any considerable amount of paper from circulation, gold will, no doubt, be partially substituted in its stead; and it is all but certain, supposing no measures are taken to prevent it, that eventually gold will supersede silver in all but the smallest payments throughout the great majority of the German states.

A further substitution of gold for silver may probably be effected by using gold coins of less value than formerly. In the United Kingdom, for example, gold might be advantageously coined into 5s. pieces. It would be inconvenient, perhaps, to have gold coins worth less than this; but of this value their employment would be beneficial, as well by economizing the use of silver, as by their being more convenient and easily carried about.

Supposing that the substitution of gold for silver now referred to were fully effected, and that the production of gold as compared with silver were to go on as it has done since the discovery of the Californian and Australian gold-fields, the value of silver, measured in gold, could hardly fail to rise. This, however, would in great measure depend on the demand for silver for the East continuing at about its late average amount, or on its not falling off. And there are but slender grounds for thinking that gold and silver will continue for any considerable period to be produced in the same proportions that they have been during the last ten years. As already seen, the presumption appears to be rather in favour of the future increase of silver than of gold.

Consumption of the Precious Metals.

Estimate by Bank of England of additions made to the bullion of Europe since 1851.

We may perhaps, before proceeding further, notice in this place the following estimate which the Bank of England laid before the committee of the House of Commons on banks in 1857-58:—

Estimated Increase of the European Stock of Bullion in the Seven Years 1851–1857, *both inclusive.*

Years	Imports from Producing Countries.		Exports to the East from Great Britain and the Mediterranean.	
	Gold.	Silver.	Gold.	Silver.
1851...	L.8,654,000	L.4,076,000	L.102,000	L.1,716,000
1852...	15,194,000	4,712,000	922,000	2,630,000
1853...	22,435,000	4,355,000	974,000	5,559,000
1854...	22,077,000	4,199,000	1,222,000	4,583,000
1855..	19,875,000	3,717,000	1,192,000	7,934,000
1856...	21,275,000	4,761,000	479,000	14,108,000
1857...	21,366,000	4,050,000	529,000	20,146,000
Total..	L.130,876,000	L.29,870,000	L.5,420,000	L.56,676,000

GOLD.

The total import of gold in seven years has been, say		L.130,000,000
The exports of gold bullion and British gold coin to India, China, Australia, the Cape, Brazils, the West Indies, United States, &c., may be taken at...		22,500,000
Which would leave as the increase to the European stock of gold		L.107,500,000

SILVER.

The exports of silver to India and China have been	L.56,676,000	
The imports from the producing countries	29,870,000	
Making the amount of silver abstracted from the European stock		26,800,000
And the estimated increase in the European stock of bullion		L.80,700,000

In some respects this estimate might be advantageously modified. But supposing it to be, as it may be presumed it is, nearly accurate, still it is obvious that, to get the total addition made to the stock of European bullion during the seven years ending with 1857, we must add to the addition from importations the bullion produced in Europe during the above period. And the latter being taken at L.1,550,000 a year, makes an aggregate sum of L.10,850,000, which, added to the above balance of L.80,700,000, makes the total increase amount to L.91,550,000.

But, though immense, the demands this fund has had to sustain have been equally immense. We have already seen that the coinage of gold in France during the eight years ending with 1857, amounted to no less than L.109,987,740; and during the seven years ending with 1857, the period referred to in the Bank of England estimate, it amounted to L.87,085,201. A portion of this gigantic sum was derived from Dutch, English, and other European coin imported into France, and very considerable portions have been exported, partly to the Crimea, and thence to the adjacent Asiatic countries, for supplies for the French forces in that quarter, and partly to the East by way of Egypt, Smyrna, &c. Still, however, we feel satisfied that we shall be far within the mark if we assume that France has absorbed L.35,000,000 of new gold, during the period in question, in the shape of coin, which is partly employed as currency, and partly hoarded.[1] And if we be nearly right in this assumption, it follows that only L.56,550,000, or L.8,080,000 a year, remains to supply all Europe,—1*st*,

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[1] See in confirmation of the statement now made, Levasseur, *La Question de l'Or*, p. 106.

Consumption of the Precious Metals.

with new coins (*ex* France), and to make good the wear and loss of the old coins;[1] 2*d*, To supply the sums required for use in the arts; and 3*d*, To supply those that are hoarded and carried away in the pockets of emigrants, &c. &c.

The last item now referred to is of much more importance than is generally supposed. Taking the entire number of emigrants from Europe to the United States, Australia, and all other places at 400,000 a year, it is pretty certain that they do not take with them, at an average, less than from L.2 to L.3 in coin, besides plate, watches, rings, &c. Some estimates make the exports of bullion by emigrants much greater than this; but even on this very moderate hypothesis it will amount to L.1,000,000 a year in coin only.

Hence, as compared with the outgoings, the supply of bullion in Europe during the last seven or eight years, far from being in excess, has been scanty rather than otherwise. And without a diminution of the former, or an increase of the latter, most people amongst us will be but little sensible of the influence of Californian and Australian gold.

Past and probable future influence of the increased supply of bullion on prices and on its value

The previous statements seem to be sufficient to show that the present supply of the precious metals is not more than adequate to meet the existing demand, and that therefore there is no ground for anticipating a fall in their value unless the supply should be increased or the demand diminished.

It is now ten years since the increased supplies of gold from California, and seven since those from Australia, have been poured into the markets of Europe and America; and yet there has not, during that period, been anything like a general rise of prices. On the contrary, the prices of most articles are as low at this moment (December 1858) as they were at the same time in 1850, while several are a good deal lower. And of the few that have risen in price since the latter epoch, there is not one of which the rise may not be satisfactorily explained by something peculiar to itself, and affecting either its demand or the conditions of its supply, or both. Thus, the rise that has taken place in the rate of wages in Great Britain and in Ireland is wholly ascribable, partly to the greater demand for labour, partly to the extent to which emigration has been carried, and partly to the potato rot and the consequent famine in Ireland. There is, in truth, nothing whatever, in comparing the prices of to-day with those of ten years ago, to entitle any one to affirm that the value of gold and silver has undergone the smallest change in the interval.

It has been attempted to show that gold has fallen in value, by alleging that the value of silver, as compared with it, has increased. But a rise may take place in the comparative value of silver without its being occasioned by a corresponding fall in the valne of gold. The value of silver is affected by a variety of circumstances peculiar to itself; and if it have really increased during the last half dozen years, such increase may be satisfactorily accounted for by the extraordinarily increased demand for it in the East. It is, however, very doubtful whether there has been any rise in the value of silver as compared with gold. We subjoin an account of the price of silver per oz. in London, in the months of March, July, and November annually since 1852, viz.:—

Consumption of the Precious Metals.

	Price per Ounce.		
Years.	March.	July.	November.
1852	$60\frac{1}{8}$d.	$60\frac{1}{4}$d.	$61\frac{7}{8}$d.
1853	$61\frac{3}{8}$	$61\frac{1}{2}$	$61\frac{7}{8}$
1854	$61\frac{7}{8}$	$61\frac{3}{4}$	$61\frac{1}{2}$
1855	$60\frac{7}{8}$	$61\frac{1}{2}$	$60\frac{7}{8}$
1856	60	$61\frac{1}{4}$	$62\frac{1}{8}$
1857	$61\frac{3}{4}$	$61\frac{5}{8}$	$61\frac{1}{2}$
1858	$61\frac{5}{8}$	...	...

It does not appear from this table that the price of silver has risen during these seven years. It appears to have fluctuated much less than might have been anticipated, its extremes being 60 and $62\frac{1}{8}$, making its value, as compared with that of standard gold (at L.3, 17s. 6d. an oz.),[2] as 15·5 to 1, and 14·97 to 1; but at an average of the entire period there has been no sensible variation.

That there is but little probability that prices will be raised by a continuance of the present supplies of gold and silver, may be inferred from what took place after the discovery of America in 1492. It appears from the researches of Adam Smith[3] and other authorities, that the influx of the precious metals had exerted its full effect upon prices previously to or about 1640; and yet this influx was much greater then and subsequently than it had been at any previous period. According to the best information attainable, the average annual importation of the precious metals from America into Europe, from 1492 down to 1810, may be estimated as follows:—

Period	Amount
From 1492 to 1500	L.54,300 a year
„ 1500 „ 1545	651,600 „
„ 1545 „ 1600	2,389,200 „
„ 1600 „ 1700	3,475,200 „
„ 1700 „ 1750	4,887,000 „
„ 1750 „ 1803	7,667,160 „
„ 1803 „ 1810	9,016,920 „

Annual average of the entire period (1492–1810), L.4,109,191.

In 1640 or 1650, when the bullion of America had produced its full effect on prices in Europe, its annual influx amounted to about L.3,000,000. And yet, though its influx was nearly trebled between that epoch and 1803, it is admitted on all hands that, down to the last-mentioned year, there was no general rise of prices.[4] The increased demand of Europe was fully sufficient to take off this great increase of supply without any fall taking place in the value of silver. Indeed, it is contended by some high authorities that, instead of falling, it rose in value during the period referred to.

There can be no manner of doubt, not merely that the quantity of the precious metals employed in Europe and America is incomparably greater now than in the seventeenth and eighteenth centuries, but that the demand for additional quantities is also incomparably greater. And when it is seen that their value continued stationary from 1650 to 1800, despite the immense additional supplies that were thrown upon the market, there is, it is plain, little ground for wonder that their late increase, great as it has been, has not affected their values, or for anticipating that they will materially decline in the course of the next half century.

A fall in the value of the precious metals would, on the whole, be advantageous.

Should it, however, turn out that we are mistaken in these conclusions, and that a considerable fall in the value of the precious metals is about to commence, it is satisfactory to know that there are no really tenable grounds for supposing that such fall will be publicly injurious. It is indeed impossible for any change to take place in the measure of value without its exercising an injurious influence over a greater or less number of individuals. But if the loss it may inflict on A., B., and C. be counteracted by the advantages which it confers on X., Y., and Z., its effect in a public point of view, may not be perceptible. It is easy, however, to see that, in the case now under consideration, the inconveniences resulting from a fall in the value of gold and silver would be a good deal more than compensated by the advantages of which it would be productive.

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[1] A very considerable addition has been made to the metallic currency of the United Kingdom during the last ten years. Owing, however, to our gold coins being exempted from seignorage, they have no greater value than an equal weight of standard bullion, and are exported indifferently with the latter. Hence the accounts of the sums coined throw, if taken by themselves, little or no light on the increase or diminution of the currency.

[2] The price paid by the bank for standard gold.

[3] *Wealth of Nations*, M'Culloch's edition, 1 vol. 8vo, p. 88.

[4] Prices rose in this country subsequently to 1793; but this was entirely owing to the difficulties which the war that was then commenced threw in the way of importation, the waste of capital, and the shock given to industrial undertakings which it occasioned, and the disorders of all sorts incident to national struggles.

1. In the first place, we may observe that the mischievous influence resulting from a fall in the value of the precious metals depends in great measure on the rapidity with which it is brought about. If it were to take effect suddenly, and without giving any distinct warning of its approach, it would be much more injurious than if it took effect slowly and gradually; for, in the former case, it is difficult to take any measures by which to mitigate or avert the impending evil, whereas, in the latter, abundant opportunities are afforded for that being done; and though these were not availed of, a change that is brought about by a slow and all but insensible progress, is but little felt, at least when compared with one that takes place suddenly or rapidly. Now it is sufficiently certain, supposing the value of the precious metals to be in the end reduced, that that reduction will be a very slow process; and that any one likely to be injuriously affected by its occurrence will have ample time to concert measures to secure himself, in as far as practicable, against its operation. That we are warranted in coming to this conclusion is obvious. When an unprecedented influx of bullion has been going on for ten years without having had any appreciable influence over its value, it would be contradictory to suppose that it is at all likely to be speedily and seriously affected by a continuance of the influx.

2. But supposing that these anticipations should not be realized, and that the supplies of the precious metals should be largely and rapidly increased, and their value reduced, the results are not of a kind that should be deprecated. "In every kingdom," says Hume, "into which money begins to pour in greater abundance than formerly, everything takes a new face: labour and industry gain life, the merchant becomes more enterprising, the manufacturer more diligent and skilful, and even the farmer follows his plough with greater alacrity and attention. But when gold and silver are diminishing, the workman has not the same employment from the manufacturer and merchant, though he pays the same price for everything in the market; the farmer cannot dispose of his corn and cattle, though he must pay the same rent to the landlord: the poverty, beggary, and sloth that must ensue are easily foreseen." (*Essay on Money.*)

Hume appears to have supposed that the stimulus he has so well described, which is given by an influx of money to industry, is occasioned by the additional money coming first into the hands of capitalists, and enabling them to extend their businesses and employ more work-people. But though this would have some influence, the philosophical historian seems to have overlooked the mode in which an increase in the quantity, and a fall in the value of money, principally contributes to excite industry and enterprise. Such fall proportionally diminishes the many fixed money payments that are borne by the industrious classes. The prices of commodities vary with variations in the value of money; whereas taxes, rents, mortgages, and other pecuniary burdens, continue stationary for longer or shorter periods. The latter are rated or specified in certain amounts of money,—those to whom these are due being obliged to receive them in payment, though the value of money should have fallen 5, 10, or even 50 per cent. since the date of the contract or engagement in which the payments originate; while those by whom they are due are bound to pay them, however much the value of money may have risen. Hence the powerful influence of variations in its value over the different classes of society. When it declines, the debtor portion, or those who have fixed money payments to make, are benefited at the expense of the creditor portion, or those who have such payments to receive; and conversely when it rises. Fundholders, annuitants of all sorts, landholders during the currency of the leases of their estates, mortgagers, the army and navy, &c., suffer according to the diminution in the value of money; for, though their incomes and claims continue nominally the same, their value is really reduced, and they no longer have their former command over necessaries and conveniences. But while the farmer pays the same rent for his farm, and the same taxes to government, he sells his produce for a price increased proportionally to the reduced value of money. And while manufacturers, merchants, and tradesmen pay the same duties on their goods, the same port and market dues, the same tolls, the same rent for shops and warehouses, the same rate of interest for capital borrowed, and so on, they obtain increased prices for whatever they have to sell. In other words, the condition of these classes is improved at the expense of their landlords and creditors, and of annuitants, and other receivers of incomes which are either temporarily or permanently reduced through the fall in the value of money. The greater the fall, the more advantageous for them; and conversely.

Now, as fixed or stationary payments include the interest of the public debt, as well as the many outgoings of government which do not readily accomodate themselves to changes in the value of money, with the rents of farms and houses let on lease, or under equivalent agreements, feu-duties, the interest of mortgages, and other stationary loans, the payments to private annuitants and clergymen, the fees of lawyers, physicians, &c., it is obvious that, in a country like this, they must amount in the aggregate to a vast sum. No doubt it sometimes, and indeed not unfrequently happens, that individuals belong to both classes, or that they have fixed payments to receive as well as to make, and that therefore neither the gain to the one party, nor the loss to the other, from fluctuations in the value of money, is so great as might be at first supposed. Still, however, there is no room for doubting that the greater proportion by far of fixed payments is made to the classes not engaged in business or in industrial undertakings by those who are; and hence the advantage which any considerable fall in the value of money confers on the latter,—that is, on those whose well-being, and that of the public, are commonly supposed to be identical. Such fall, by lightening the burden of taxation and of all fixed charges, increases universally the productiveness of industry and the rate of profit. And it is hardly necessary to add that this increased profit operates as a spur to production, that it quickens all the operations of trade, and occasions an increased demand for labour.

The opposite effects follow when, instead of falling, the currency becomes more valuable. Taxes and fixed charges being then augmented in an equal degree, the profits of those by whom they are principally borne are proportionally reduced, industry is depressed, and the situation of the productive classes changed for the worse. But though there cannot, as it appears to us, be a doubt that a fall in the value of money, however injurious to large classes, is on the whole advantageous, we hope it will not be thence inferred that we are disposed to approve in any degree of an intentional reduction of its value. Money being the standard or measure of value, to interfere with it, whether in the way of increase or diminution, would be an act of extreme injustice. Government is bound to protect, in as far as possible, the rights and interests of all classes of its subjects; and it cannot, without trampling on its most sacred duty, adopt, to benefit one part of them, any measure which might be injurious to another part. But a fall in the value of the precious metals caused by the greater facility of their production, or by the discovery of new sources of supply, is a wholly different matter. It depends in no degree on the theories of philosophers or the decisions of statesmen or legislators, but is the result of circumstances that are beyond human control. And though, like a fall of rain after a long course of dry weather, it may be prejudicial to certain classes, it is beneficial to an incomparably greater number, including all who are actively engaged in industrial pursuits; and is, speaking generally, of great public or national advantage.

On the whole, therefore, we are warranted in concluding—1. That there has been no fall in the value of the precious metals, and more especially in that of gold, during the ten years ending with 1857; 2. That there do not appear to be any good grounds for anticipating a speedy or considerable fall in the value either of gold or silver; and 3. That supposing a fall in the value of gold were to take place, its advantageous would much more than countervail its disadvantageous influence. (J. R. M.)

PREDESTINATION, the supposed decrees of God by which he has from all eternity unchangeably appointed whatsoever comes to pass; and has more especially fore-ordained certain individuals of the human race to everlasting happiness, and passed by the rest, and fore-ordained them to everlasting misery. The former of these are called the elect, and the latter are called the reprobate.

This doctrine is the subject of one of the most perplexing controversies that has occurred amongst mankind. But it is not altogether peculiar to the Christian faith. The opinion, that whatever occurs in the world at large, or in the lot of private individuals, is the result of a previous and unalterable arrangement by that Supreme Power which presides over nature, has always been a favourite opinion amongst the vulgar, and has been believed by many speculative men. Thus, in that beautiful scene in the sixth book of the *Iliad*, Hector, taking leave of his wife and child, speaks thus:—

> "Andromache, my soul's far better part,
> Why with untimely sorrows heaves thy heart?
> No hostile hand can antedate my doom,
> Till fate condemns me to the silent tomb.
> Fix'd is the term to all the race of earth,
> And such the hard condition of our birth.
> No force can then resist, no flight can save;
> All sink alike, the fearful and the brave."

The ancient Stoics, Zeno and Chrysippus, whom the Jewish Essenes seem to have followed, asserted the existence of a Deity, that, acting wisely, but necessarily, contrived the general system of the world; from which, by a series of causes, whatever is now done in it unavoidably results. This series, or concatenation of causes, they held to be necessary in every part; and that God himself is so much the servant of necessity, and of his own decrees, that he could not have made the smallest object in the world otherwise than it now is, much less is he able to alter any thing.

According to the words of Seneca,—"The same chain of necessity constrains both gods and men. Its unalterable course regulates divine as well as human things. Even he who wrote the Fates, the Maker and Governor of all things, submits to them. He did but once command, but he always obeys." The stoical fate, however, differs from the Christian predestination in several points. The Stoics regarded the divine nature and will as a necessary part of a necessary chain of causes; whereas the Christians consider the Deity as the lord and ruler of the Universe, omnipotent and free, appointing all things according to his pleasure. Being doubtful of the immortality of the soul, the Stoics could have no idea of the doctrine of election and reprobation; nor did they ever doubt their own freedom of will, or power of doing good as well as evil, as we shall presently see the Christian predestinarians have done.

Mohammed introduced into his Koran the doctrine of an absolute predestination of the course of human affairs. He represented life and death, prosperity and adversity, and every event that befalls a man in this world, as the result of a previous determination of the one God who rules over all; and he found this opinion the best engine for inspiring his followers with that contempt of danger, which, united to their zeal, has extended the empire of their faith over the fairest portion of the habitable globe.

The controversy concerning predestination first made its appearance in the Christian church about the beginning of the fifth century. Pelagius a British, and Cœlestius an Irish monk, both lived at Rome during that period, and possessed great celebrity on account of their piety and learning. They taught that the opinion is false which asserts, that human nature is necessarily corrupted by a depravity derived from our first parents. They contended that men are born at present in a state as pure as that in which Adam was originally created; and that they are not less qualified than he was for fulfilling all righteousness, and for reaching the most sublime eminence of piety and virtue. They maintained that the external grace of God, which is given unto all, and attends the preaching of the gospel, is necessary to call forth the attention and the exertions of men; but that we do not want the assistance of any internal grace to purify the heart, and to give it the first impulse towards what is good. Having fled into Africa on account of the Goths, who at that time (A.D. 410) invaded Italy, Cœlestius remained at Carthage as a presbyter; but Pelagius went into the East, where he settled, and prospered under the patronage of John, Bishop of Jerusalem, to whom his sentiments were agreeable. On the contrary, the celebrated Augustin, Bishop of Hippo, strenuously asserted the depravity of human nature since the fall of the first man, the necessity of a special interposition of divine grace to enable us to do any one good action; and consequently, that none could obtain salvation excepting those whom God has thought fit to elect, and upon whom he bestows this grace. The dispute was carried on with great zeal. Zozimus, Bishop of Rome, decided at first in favour of Pelagius and Cœlestius, whose followers were called *Pelagians;* but he afterwards altered his opinion, and by the activity of Augustin, the council of Ephesus was called, at which the opinion of his antagonists was formally condemned.

In the course of the same century these opinions assumed a variety of forms and modifications. One party, called *Predestinarians*, carried Augustin's doctrine fully farther than he himself had ventured to do in express words; and asserted that God had not only predestinated the wicked to punishment, but also that he had decreed that they should commit those very sins on account of which they are hereafter to be punished. Another party moderated the doctrine of Pelagius, and were called *Semipelagians*. Their peculiar opinion is expressed in a different manner by different writers; but all the accounts sufficiently agree. Thus, some represent them as maintaining that inward grace is not necessary to the first beginning of repentance, but only to our progress in virtue. Others say that they acknowledged the power of grace, but said that faith depends upon ourselves, and good works upon God; and it is agreed upon all hands that these Semipelagians held that predestination is made upon the foresight of good works. The assistance of Augustin, though then far advanced in life, was called in to combat these tenets, and he wrote several treatises upon the subject. In all these he strenuously maintained that the predestination of the elect was independent of any foresight of their good works, but was according to the good pleasure of God only; and that perseverance comes from God and not from man. Thereafter the doctrine of St Augustin, as he is often called, became general. He was the oracle of the schoolmen. They never ventured to differ from him in sentiment; they only pretended to dispute about the true sense of his writings.

The whole of the earliest Reformers maintained these opinions of Augustin. They assumed, under Luther, a more regular and systematic form than they had ever formerly exhibited. But as the Lutherans afterwards abandoned them, they are now known by the name of *Calvinistic Doctrines*, from John Calvin of Geneva. This reformer asserted, that the everlasting condition of mankind in a future world was determined from all eternity by the unchangeable decree of the Deity, arising from his sole good pleasure or free will. Being a man of great ability, industry, and eloquence, Geneva, where he taught, and which was a free state, soon became the resort of a very large number of the men of letters belonging to the Reformed churches, and was a kind of seminary from which missionaries issued to propagate the Protestant doctrine throughout Europe. Their success was such that, excepting a small part of Germany, the principles of all the Reformed churches are professedly Calvinistic or Predestinarian.

The opponents of the doctrine of predestination among the Protestants usually receive the appellation of *Arminians* or *Remonstrants.* They derive the first of these appellations from James Arminius, who, in 1602, was appointed professor of theology at Leyden. (*Relatio Historica de Origine et Progressu Controversiarum in fœderato Belgio de Prædestinatione* Philippi à Limborch.) He was violently opposed by Gomer his colleague, and he died in 1609. After his death, the controversy was conducted with great eagerness on both sides. The Calvinists, however, gradually prevailed. A synod was called at Dort, in 1618, to which the most celebrated divines of different countries were invited. There, in a great measure, by the authority and influence of Maurice, Prince of Orange, the Arminians were condemned as heretics; for by this time ambitious and powerful men found themselves politically interested in this religious contest. The Arminians presented to this synod a remonstrance, containing a statement of their faith upon the subjects in dispute; and from this they derived the appellation of *Remonstrants.* This statement contained the following five articles:—1. That God from all eternity predestinated those to everlasting salvation whom he foresaw would believe in Christ unto the end of their lives, and predestinated obstinate unbelievers to everlasting punishment. 2. Jesus Christ died for the whole human race, and for every individual of it, but believers alone reap the benefit of his death. 3. No man can produce faith in his mind by his own free-will, but it is necessary that man, who is by nature wicked and unfit for acting or thinking aright, should be regenerated by the grace of the Holy Spirit, imparted by God for Christ's sake. 4. This divine grace constitutes the source, the progress, and the fulfilment, of all that is good in man, but it is not irresistible in its operation. 5. Believers, by the assistance of the Holy Spirit, are abundantly fitted for every good work; but whether it is possible for those who have once been truly such to fall away, and to perish finally, is not clear, and must be better inquired into by searching the sacred Scriptures.

In opposition to these, a counter remonstrance was presented, containing the opinions of the Calvinists, which was approved of by the synod. The substance of it was afterwards adopted, and in nearly the same expressions, into the *Confession of Faith* compiled by the assembly of divines which met at Westminster in 1643, and which every clergyman and probationer for the ministry in Scotland is at present required to subscribe previous to his admission. To give as clear and fair an idea as possible of the Calvinistic doctrine upon this head we transcribe the following passage from that Confession:—" God from all eternity did, by the most wise and holy counsel of his own will, freely and unchangeably ordain whatsoever comes to pass; yet so, as thereby neither is God the author of sin, nor is violence offered to the will of the creatures, nor is the liberty or contingencies of second causes taken away, but rather established. Although God knows whatsoever may or can come to pass upon all supposed conditions; yet hath he not decreed anything because he foresaw it as future, or that which would come to pass upon such conditions. By the decree of God, for the manifestation of his glory, some men and angels are predestinated unto everlasting life, and others are foreordained to everlasting death. These angels and men, thus predestinated and foreordained, are particularly and unchangeably designed; and their number is so certain and definite that it cannot be either increased or diminished. Those of mankind that are predestinated unto life, God, before the foundation of the world was laid, according to his eternal and immutable purpose, and the secret counsel and good pleasure of his will, hath chosen, in Christ, unto everlasting glory, out of his mere free grace and love, without any foresight or faith, or good works, or perseverance in either of them, or any other thing in the creature, as conditions or causes moving him thereunto; and all to the praise of his glorious grace. As God hath appointed the elect unto glory, so hath he, by the eternal and most free purpose of his will, foreordained all the means thereunto. Wherefore, they who are elected, being fallen in Adam, are redeemed by Christ, are effectually called unto faith in Christ, by his spirit working in due season; are justified, adopted, sanctified, and kept, by his power through faith unto salvation. Neither are any other redeemed by Christ effectually called, justified, adopted, sanctified, and saved, but the elect only. The rest of mankind, God was pleased, according to the unsearchable counsel of his own will, whereby he extendeth or withholdeth mercy as he pleaseth for the glory of his sovereign power over his creatures, to pass by, and to ordain them to dishonour and wrath for their sin, to the praise of his glorious justice."

There are two kinds of Calvinists or Predestinarians, viz.:—the *Supralapsarians*, who maintained that God did originally and expressly decree the fall of Adam as a foundation for the display of his justice and mercy; whilst they who maintain that God only *permitted* the fall of Adam, are called *Sublapsarians*, their system of decrees concerning election and reprobation being, as it were, subsequent to that event. But, as Dr Priestley justly remarks, if we admit the Divine prescience, there is not, in fact, any difference between the two schemes; and accordingly that distinction is now seldom mentioned.

Nor was the Church of Rome less agitated by the contest about predestination than were the first Protestants. The council of Trent was much perplexed how to settle the matter without giving offence to the Dominicans, who were much attached to the doctrine of St Augustin, and possessed great influence in the council. After much dispute, the main object came to be, how to contrive such a decree as might give offence to nobody, although it should decide nothing. Upon the whole, however, they seem to have favoured the Semipelagian scheme. Amongst other things, it was determined that good works are of themselves meritorious to eternal life; but it is added, by way of softening, that it is through the goodness of God that He makes His own gifts to be merits in us. Catarin revived at that council an opinion of some of the schoolmen, that God chose a small number of persons, such as the blessed Virgin, the apostles, and others, whom He was determined to save without any foresight of their good works; and that He also wills that all the rest should be saved, providing for them all necessary means, but they are at liberty to use them or not. This is called the *Baxterian* scheme in England, from one of its promoters there. But at all events, the Council of Trent seems to have been extremely anxious that any opinions entertained amongst them concerning predestination might have as little influence as possible upon practical morality. "Let no man," say they, "whilst he remains in this mortal state, presume that he is among the number of the elect, and that therefore he cannot sin, or sin without repentance; for it cannot be known who are elected without a special revelation from God." (Sect. vi., c. 13.)

The Jesuits at first followed the opinion of St Augustin; but they afterwards forsook it. Molina, one of their order, was the author of what is called the *middle scheme*, or the doctrine of *a grace sufficient for all men*, but subject to the freedom of the human will. Jansenius, a doctor of Louvain, opposed the Jesuits with great vigour, and supported the doctrine of St Augustin. He wrote in a very artful manner, declaring that he did not presume to state his own sentiments upon the subject. He pretended only to explain and publish the sentiments of that great father of the church St Augustin. But the Jesuits, in consequence of that inviolable submission to the authority of the Pope which they always maintained, had sufficient interest at Rome to procure the condemnation of the opinion of Jansenius; with this addition subjoined, however, that nothing was thereby intended to be done in prejudice of the doctrine of St Augustin. This produced an absurd dispute about the Pope's infallibility in matters of fact. The Jansenists affirmed that the Pope had made a mistake in condemning the opinions of Jansenius as different from those of St Augustin, whereas in truth they are the same, and the one cannot be condemned without the other; but the Jesuits affirmed that the Pope is no less infallible in points of fact than he is in questions of faith, and he, having decided that the opinions of Jansenius are different from those of St Augustin, every good Catholic is bound to believe accordingly that they are different. Some of the ablest supporters of predestination have appeared amongst the Jansenists, and particularly amongst the gentlemen of Port-Royal.

With regard to Great Britain, the earliest English Reformers were in general Sublapsarian, although some of them were Supralapsarians. But the rigid Predestinarians have been gradually declining in number in that church, although they still subscribe the Thirty-Nine Articles of their faith, which are unquestionably Calvinistic. The celebrated Scotch Reformer John Knox, having been educated at Geneva, established in this country the doctrine of predestination in its strictest form; and it has probably been adhered to with more strictness in Scotland than in any country in Europe.

Concerning this and many other theological questions men will continue to vex themselves; and until they will devise some means of explaining how the finite and the infinite are related, there is positively no hope of a solution to such difficulties. Such an explanation may safely be asserted to be impossible to man, and hence he must rest contented with the little knowledge which is within his reach. Questions such as predestination are entirely out of the sphere of his faculties of knowing—however vital to his faith,—because one of the relations of knowledge always implies an apprehension of the infinite.

PREDICATE. See LOGIC.

PREEZ, or PREETZ, a market-town of Denmark, in the duchy of Holstein, on the Schwentine, at the foot of a small lake 8 miles E.S.E. of Kiel. Its principal building is the convent, founded in 1216, to which the town owes its origin, and which is now an establishment for unmarried ladies of noble birth. It is connected with the town by a shady walk, and contains a fine church and cloisters. Pop. 4750.

PRE-EXISTENCE. See METEMPSYCHOSIS.

PREMIUM. See INSURANCE.

PREMONSTRATENSIANS, a religious order of regular canons instituted in 1120 by St Norbert, and thence called *Norbertines.* The first monastery of this order was built by Norbert in the Isle of France, three leagues to the west of Laon, which he called *Præmonstratum;* and hence the order itself derived its name, though as to the occasion of the name the writers of the order are divided. At first the religious of this order were so very poor that they had only a single ass, which served to carry the wood they cut down every morning, and was sent to Laon for the bread purchased. But they soon received so many donations, and built so many monasteries, that in 30 years after the foundation of the order, they had above 100 abbeys in France and Germany; and in process of time the order so increased that it had monasteries in all parts of Christendom, amounting to 1000 abbeys, 300 provostships, a vast number of priories, and 500 nunneries; but they are now greatly diminished. The rule they followed was that of St Augustin, with some slight alterations, and an addition of certain severe laws, the authority of which did not long survive their founder. The order was approved by Honorius II. in 1126, and again by several succeeding Popes. At first the abstinence from flesh was rigidly observed. In 1245 Innocent VI. complained of its being neglected to a general chapter. In 1288 their general, William, procured leave of Pope Nicholas IV. for those of the order to eat flesh upon journeys. In 1460 Pius II. granted them a general permission to eat meat, excepting from Septuagesima to Easter. The dress of the religious of this order was white, with a scapulary before the cassock.

The Præmonstratenses, or monks of Premontre, vulgarly called *white canons*, came first into England in the year 1146. Their first monastery, called *New-house,* was erected in Lincolnshire by Peter de Saulia, and dedicated to St Martial. In the reign of Edward I. this order had 27 monasteries in England, and in Henry VIII.'s time they had 35.

PRENZLOW, or PRENZLAU, a town of Prussia, in the province of Brandenburg, on the Ucker, at the foot of the lake of the same name, from which it issues, 57 miles N.N.E. of Berlin. Of its seven churches, the most important is that of St Mary, a Gothic building with two towers, containing a fine altar-piece by Rode. There is also here a gymnasium, several hospitals, and mineral baths. Woollen, linen, and cotton fabrics; straw-hats, leather, tobacco, &c., are manufactured here; and an active trade is carried on in corn. In 1806, 20,000 Prussians, under the Prince of Hohenlohe, surrendered to the French at Prenzlow. The celebrated landscape-painter Philip Hackert was born here. Pop. 12,973.

PREPOSITION. See GRAMMAR.

PRESBYTERIANISM.

Definition.

Presbyterianism[1] is that form of ecclesiastical polity according to which the chief power is vested in a court of presbyters. A church recognising as its government a body of presbyters, whose office includes the twofold function of teaching and ruling, is commonly designated Presbyterian, although the system which bears this name has been variously modified in its development according to events in the history of the nation, or of the religious community adopting it. But under every form which it has assumed, Presbytery has its points of vital difference from every other kind of ecclesiastical rule with which it competes. These by a common analysis have been reduced to three, if we exclude the Erastian theory on the one hand, according to which the state, identifying itself with the church, may avail itself of any species of government over it; and the Romish system on the other, according to which, as prelates take the place of the apostles, so the Roman pontiff, succeeding to Peter in his alleged primacy, becomes the vicar of our Lord upon the earth. The latter, indeed, if we except the claim to universal supremacy and infallibility, and if we view it simply as the subjection of bishops to the jurisdiction of a superior, is a species of Episcopacy, not without its analogies beyond the pale of the Romish Church both in ancient and modern times. But if we regard Episcopacy and Independency as the two other main forms of ecclesiastical government, Presbytery differs from the former in refusing to acknowledge any such succession to the apostleship on the part of bishops as would constitute them an office separate from and superior to presbyters; and from Independency, in claiming for presbyters the official authority which it lodges in the common membership of the church, and in asserting such a connection between the different congregations of a church as renders them amenable to a common jurisdiction.

Theory of Presbyterianism.

Theory.

Three elements exist in the Presbyterian system,—the authority of the presbyters, more especially as subordinate to no office-bearer of higher rank in the church; the representation of the laity in its government; and the provision made for its external unity in courts of review.

The authority of the presbyter.

I. In regard to the *authority* claimed for the presbyter: 1. It is of *divine appointment*, not merely in so far as the office itself, from the official titles bestowed upon those exercising it, from the official qualifications demanded of them, and from the recognition of their official dignity enjoined in Scripture, is a divine institute, but inasmuch as they derive their power, not from the people, but from Christ as the Head of the church.[2] Proceeding upon such facts as, that the people have received no commission to exercise ecclesiastical power, but a command to obey it, and accordingly cannot convey what they themselves have not received; and that the rulers of the church are described as the gift of Christ, and occupy a special relation to him as his messengers and ambassadors, Presbyterians generally maintain that the official authority of the presbyter directly emanates from Christ, though the call to exercise it comes through the channel of the people. In this respect, obedience to ecclesiastical rule is enforced upon the conscience by the highest spiritual sanctions,—as an arrangement not springing from mere expediency, but expressly appointed by God.

2. The office of the presbyter is *distinct* and *peculiar*. It is not competent for every member of the church to assume at his pleasure the functions either of teaching or of ruling in the church. From the peculiar gifts requisite; from the special forms by which in the primitive church men were set apart to the office; from the distinction so often traced between those who bore rule in it and those who owned subjection to them; from the importance of the work, as comprehending the preaching of the gospel, the administration of sacraments, and the maintenance of discipline; and from the names which the rulers of the church receive in Scripture,—it is argued that the presbyterate is not a work merely which any man may take upon him to perform as he deems himself competent for it, but an office to be exercised only by men specially called and ordained to it. Presbyterians accordingly agree with Episcopalians in denying that the private members of the church have a right to share directly in the government of it. Some of the arguments employed to this effect are to be found in the article Episcopacy.

3. The authority of the presbyter is entirely *ministerial*. His office, whatever sacredness it may possess as the direct institute of God, and however clearly discriminated from the ordinary privileges enjoyed by every member of the church, is at the same time under restrictions which, fairly observed, would effectually preclude spiritual despotism. The administration of elders is only binding so far as it accords with the rules prescribed in Scripture, which, by defining, limits their authority, while by the same principle it secures the rights of the individual conscience, as subject to Christ, its only Lord. The considerations by which this view of the office is sustained are founded on those statements of Scripture which expound the duties connected with it. The apostles, the highest office-bearers ever known in the Christian church, represent themselves as the servants of Christ, entitled to obedience only as they acted under his instructions, and without any claim to "dominion" over the faith of the church. (2 Cor. i. 24.) More especially in regard to Presbyters, the injunction is given, that they should act not as "lords over God's heritage, but examples to the flock." The power to regulate ecclesiastical proceedings and religious worship, so as to prevent confusion on points where no express rule is prescribed, may be regarded as vouchsafed to them under the general precept, that all things should be done "decently and in order." Presbyterians, however, protest against the notion, that the church has any authority to institute new rites and ceremonies for which no warrant from Scripture can be adduced. Even in the highest exercise of their authority, when assembled as a judicatory, and called to issue decisions on matters of faith, the rulers of the church can exercise only a ministerial function: "It belongeth to synods and councils *ministerially* to determine controversies of faith and cases of conscience." (Westminster *Confession of Faith*, xxxi. 3.)

4. The duration of the office must correspond with the existence of the church that needs its services; in other words, it is *perpetual*. It is not, like the apostleship of the new, or the prophetic order under the old dispensation,

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[1] Under this article are comprehended notices of the various Presbyterian churches formerly dispersed throughout this work under the initial letters of their designations. The notice of the United Presbyterian Church is the article Seceders of the last, remodelled and abridged for the present edition by the author, the Rev. James Taylor, D.D., Glasgow.

[2] See *Divine Right of Church Government*, by London Ministers, chap. x.

instituted in provision for a special emergency or condition of the church. The instructions bequeathed in inspired epistles for the guidance of presbyters imply the permanence of their office to the end of time. No intimation occurs that the presbyterate is ever to cease; whereas the requirement by which it was essential to the office of an apostle that he should have "seen the Lord," involved obviously its discontinuance when the generation of his contemporaries should have passed away. The very ends for which the Christian church exists require a commissioned agency for the due accomplishment of them. The government and spiritual edification of its members, together with the obligation resting upon it to seek the conversion of all beyond its pale, involve labours too important to be left merely to the waywardness of private zeal. A special agency destined to continue so long as the necessity for it exists, is required for the work. Directions, moreover, are expressly given respecting the qualifications which the presbyter must possess, and the method by which he must be ordained, in such terms as imply the permanence of his office in the church.

5. Finally, according to the Presbyterian system, the presbyterate is *the highest standing office* in the church. This position, of course, is in collison with the distinctive principle of Episcopacy, which asserts that the bishop is an ecclesiastical functionary not merely of a different order, but of a higher grade as compared with the presbyter, and that it is exclusively the prerogative of the former to govern and to ordain. On the contrary, Presbyterians hold that the distinction between bishop and presbyter is invalid; that by their commission all ministers are equal in official rank and authority, and that the ultimate appeal in cases of dispute and discipline must be made, not to the single president of a diocese, but to a court of presbyters. In support of this view, they have been accustomed to show that the grounds on which the claim of the bishop to a separate and superior office is maintained are without weight, that the identity of the bishop and presbyter is clearly recognised in Scripture, and that the rise of diocesan Episcopacy can be historically traced on patristic testimony to no divine and apostolical appointment, but to usages which were engrafted on the primitive simplicity of the church.

No scriptural warrant for an episcopal order

There are five leading arguments urged in support of Episcopacy, the cogency of which the Presbyterian feels that he cannot acknowledge. The appeal made to *the analogy* of the Jewish hierarchy in support of a threefold order in the ministry, may be met by the reply, that the alleged analogy has no foundation in Scripture; that the New Testament never speaks of the rulers of the church as a priesthood, but as a ministry; and that such predictions as are contained in Ps. cxxxii. 16, Is. lxvi. 21, and Jer. xxxiii. 18, even though proved to intimate the blessings which the church would enjoy under the Christian dispensation, come far short of announcing that a threefold hierarchy would exist in it. The typical language employed in such predictions no more proves that priests, in the proper sense of the term, are to officiate in the new economy, than that burnt-offerings are to be presented in it; while all the passages usually quoted from prophecy in support of the parallel between the temple priesthood and the Christian ministry may refer to no office higher than the ordinary priesthood, the antitype of which may be found in the presbyter. Moreover, not merely is it destitute of a scriptural warrant; the analogy fails either by excess or defect. It proves too much if we assume as true the premises of the syllogism, as it would involve the supremacy of a single head in correspondence with the high priest over the whole church, not a body of prelates enjoying an independent jurisdiction. But it is in truth extremely defective; for of the three alleged grades in official dignity, the high priest did not belong to an order distinct from the priests, while the Levites, in no sense, were invested with sacred orders. Not more conclusive is the argument founded on *the distinction* between *the twelve apostles and seventy disciples*, for the latter discharged only a temporary service; and at the best two orders only would thus be established, unless, in despair of otherwise vindicating the analogy, the Episcopalian is prepared to maintain that the Lord himself represented the episcopal order,—a hypothesis the reverse of advantage to those who urge it; for if we overcome our repugnance to the presumption which it seems to breathe, and concede for the moment its validity, it follows that, as our Lord has never abdicated his office, the Episcopal order must be confined to his own person still. Nor are the *functions exercised by Timothy and Titus as evangelists* any foundation for the belief that a permanent office superior to presbyters should now be recognised. Timothy is expressly declared to have been an evangelist, while Titus, from the analogous work he performed, held the same status. They are never described as bishops respectively of Ephesus and Crete; their continual journeyings from place to place are inconsistent with the idea of a resident bishopric; they did nothing for which a presbyter, especially on the high authorization of an apostle, was incompetent; the injunction given to ordain elders does not absolutely imply that they were to do it alone without other presbyters, while, if they did it alone, because no presbyters previously existed in the place, it was an extraordinary conjuncture, yielding no precedent in ordinary circumstances, and but a specimen of the prerogative which a presbyter in every similar conjuncture may exercise; the reference that the apostle makes to the gift which Timothy had received through "the laying on of the hands of the presbytery," is inconsistent with the belief that he had received ordination to a higher dignity,—episcopal consecration to the episcopal order, for in this case the appeal would surely have been made, not to the lower, but to the higher ordination; and lastly, if it be inferred that he must have been superior to presbyters in virtue of a permanent office and not of a special commission, because he was to instruct presbyters, it would follow that Paul held a higher office than Timothy, who took instructions from him, and that Timothy as a bishop was no successor of the apostles, although the succession of the bishops to the apostleship, in respect of jurisdiction, is a main plea in favour of Episcopacy. Great stress cannot be laid on the argument from the *apocalyptic angel.* The precise functionary referred to cannot be easily determined, opinions varying on the point, from that of De Wette, who understands by the term "the guardian angel of the community," down to that of Ewald, who understands by it an official no higher than a clerk or sexton; the most plausible method of fixing the nature of the office intended is the analogy drawn by Vitringa, Bengel, and Delitzch, in virtue of the name "angel," from the presiding officer in the Jewish synagogue, whose chief duty was to conduct public devotion, and whose office, therefore, corresponded more with that of a presbyter than of a diocesan bishop. When it is argued that, since the term is singular, and many churches must have existed in these cities, each church having its separate presbyter, it must therefore denote an officer enjoying a common relation to all those churches and superintendence over all those presbyters; it is urged in reply, that, even considering an individual to be meant, we may regard him as the moderator in the court of presbyters; that the word "angel" may refer to a collective body,—"the consessus, or order of presbyters," as even Stillingfleet supposes,—for since they are declared to be the "stars" giving light to these churches, surely the presbyters, as well as any diocesan bishop, subserved this purpose, and the same term "angel" is obviously employed under a similar collective signification in Rev. xiv. 6, where it must denote the whole body of officers commissioned to preach the gospel; and that nothing occurs in all that is said of these angels attributing to them a rank and power above the presbyter. But the defence of Episcopacy is sometimes chiefly based on an alleged *succession from the apostles.* To state the argument fairly, it is not contended that, in respect of miraculous gifts, bishops could represent the apostles after the age of miracles had closed, but in four different respects,—the power of ordination, the exercise of rule, the preaching of the Word, and the administration of the sacraments,—the official functions and dignity of the apostleship might be transmitted to bishops. Now, in disposing of this crowning plea for Episcopacy, Presbyterians submit various considerations which may in substance be included under four positions,—*First*, in the apostleship viewed as a whole, qualifications are discovered so peculiar as to forbid any reference to it as the prototype of the episcopal order in the primitive church, for it was required of an apostle that he should have seen the Lord, possess the gift of inspiration, and have power to work miracles. These qualifications did not constitute him an apostle, for they might have been predicated respectively of several private members of the church; as, for instance, "of the five hundred brethren at once" who saw Christ, of Philip the evangelist, who wrought miracles, and of his daughters, who were inspired to prophesy. But without such qualifications he could not be an apostle; and accordingly an office to which they were essential is absolutely intransmissible. *Secondly*, Even in the functions common to an apostle with any successor, there was a peculiarity which bars appeal to the former as a precedent for Episcopacy; in preaching, the apostles spoke with the authority of inspiration, in ruling and ordaining they acted by commandment from the Lord, and more especially in all they did they sustained a relation, not to a diocese, but to the world. *Thirdly*, Separate the ordinary functions of their office from this peculiar element attaching to it, and there is nothing in them which a presbyter, according to Scripture, may not perform. Presbyters preached, governed, dispensed the sacraments, and, as in the case of Timothy, ordained. *Lastly*, If bishops are the substitutes for infallible apostles, submission to their authority must be essential to salvation. One apostle tell us, "He is not of God who heareth not us." If there be no salvation beyond the pale of Episcopal jurisdiction, neither can there be any faith, any holiness, any true religion. A theory must be erroneous which, by logical necessity, involves a conclusion at variance with the facts of history and observation as well as the dictates of Christian charity.

The identity of bishop and presbyter.

On such grounds, Presbyterians contend that no office corresponding to a diocesan bishopric has the sanction of Scripture. They go further, and maintain that there is the clearest evidence of the identity of the bishop with the presbyter in the apostolic church. For, in the first place, the titles of presbyter and bishop are used indiscriminately and convertibly in reference to the same persons. Thus, in Acts xx. 17–28, the "elders" whom Paul sent for to Miletus, are addressed by him as "bishops;" and among the qualities required of "the *presbyters*" whom Titus, under the instructions of the same apostle, was to ordain, it is said "a *bishop* must be blameless." (Tit. i. 5–7.) This convertibility of the two terms continued, according to Neander, till far on in the second century. Reference also is made (Phil. i. 1) to "bishops and deacons." Unless in this salutation to the bishops presbyters are addressed, how are we to explain the omission of the intermediate office, while a plurality of "bishops" in one church is incompatible with the idea that any diocesan jurisdiction belonged to each? In the epistles of Clemens Romanus, the same enumeration of but two offices in the church occurs. To the same effect is another argument, that the office-bearer who receives the name ἐπίσκοπος in Scripture is uniformly represented as superintending, not presbyters, but the congregation; "take heed to all the *flock* over which the Holy Ghost hath made you *bishops* (ἐπισκόπους)." (Acts xx. 28; 1 Pet. v. 2, 3.) Moreover, the same qualifications are exacted both of bishops and presbyters. It is only needful to compare 1 Tim. iii. 2–7 with Tit. i. 6–10, in order to feel persuaded that the apostle speaks of the same office under the title bishop in the former case, and presbyter in the latter; and hence the reasoning of Jerome (*Ep.* 83, *ad Oceanum*); "in both epistles, whether bishops or presbyters (although among the ancients *bishops and presbyters must have been the same*, for the one name is expressive of rank, and the other of age), the husbands of one wife are required to be chosen to the sacred office." In the apostolic church bishops and presbyters had a common ordination (Acts xx. 17–28; Tit. i. 5–7). Their duties, too, are identical; the terms expressive of the highest rule being applied to the presbyters (Heb. xiii. 7, 17; 1 Thess. v. 12; Acts xx. 28); while not only did they administer the ordinances of the church, but they occupied a place in its highest councils (Acts xv. 23). Nor is it difficult to prove that presbyters in the church of the apostles had full power to ordain. Nowhere in the manifold directions given to presbyters does a single inhibition occur against the exercise of this right. There is nothing in the nature of it on account of which presbyters should be deprived of it. The employment of six different terms in the New Testament to express ordination is inconsistent with the supposition that it denotes anything more than simply setting apart to official duty, or that it is an act so very peculiar as to require a particular and superior office in order to its performance. To adduce instances in which apostles and evangelists ordained, is not to prove that presbyters were prohibited from doing so; while in the case of Apollos (Acts xviii. 27), and even of Paul himself, whether at Damascus or at Antioch, no trace whatever of a diocesan bishop appears as the source of the official commissions which on these occasions they received. But the ordination of Timothy is directly traced to the court of the presbyters. (1 Tim. iv. 14.) Calvin, at first doubtful as to the import of the term "presbytery," and disposed in his *Institutions* to leave it uncertain whether it denoted an office or a court, comes ultimately, in his commentary on the passage, to a decided conclusion in favour of the latter meaning. Should it signify an office, and if we are to read in connection "the gift of the presbyterial office," it destroys the argument for Episcopacy from the functions of Timothy. He was after all a presbyter and no bishop. But it is an admitted canon in exegesis that we must interpret any term according to the analogy of the other instances in which it occurs. "Presbytery" never signifies an office; twice elsewhere it signifies a council. Its application to presbyters in their associated capacity is therefore perfectly natural and legitimate. It might be added that, by several incidental allusions, yielding inferences not less strong because indirect, the character and authority of the presbyterial office as supreme and permanent are strikingly confirmed: no bishops are mentioned in connection with the council at Jerusalem; collections for the poor in that city are transmitted not to bishops, but to "presbyters;" and apostles, when they indicate their status in regard to the common standing offices of the church, deem it an honour to be enrolled in the rank of presbyters. (1 Pet. v. 2.)

Rise of Episcopacy.

Presbyterians do not shrink from the admission, that diocesan Episcopacy began early, spread rapidly, and seems to have obtained general prevalence before the civil establishment of Christianity in the Roman empire. Before the expiration of the apostolic period, a much more serious departure from the simple order and purity of the primitive church was noticed and denounced both by Paul and John (2 Thess. ii. 7; 1 John iv. 3). It is not so very wonderful, therefore, that, as regards this part of ecclesiastical polity, the craving for pre-eminence, so natural to the hu-

Theory.

man bosom, should have speedily suggested and introduced innovations upon the original parity of the eldership. Meeting occasionally for deliberation on the interests of the several churches within a city or province, the presbyters would adopt the mode common to all assemblies of securing order by appointing a president. Talent, weight of character, and mature experience, would be the gifts likely to determine their choice. Successful presidency in one meeting might establish a claim to re-election in subsequent meetings, till elevation to the chair on such occasions become a dignity for a lifetime. Other elements came into play as the church pursued its course of degeneracy: ambition tempted the clergy to swell by adventitious pomp the importance of their office; the claim to priesthood was preferred; and ecclesiastical arrangements took shape from the gradation of offices which the Jewish Church seemed to exhibit, and from the difference of rank in the cities where a pastorate was exercised, till the whole system, beginning with parochial episcopacy as the first step, was completely developed in the spiritual monarchy of Rome.

Nor is this explanation of the rise of Episcopacy reckoned a mere theory by the friends of Presbytery. It rests, in their judgment, upon authenticated facts and the testimony of the early fathers. Passages could be cited from several fathers, and from the decrees of councils, from which it is undeniable that the episcopate could not have originally extended beyond one church. In a single territory of small extent, so many bishops are represented as labouring and teaching, that their jurisdiction could not have exceeded the limits of a parish; for in Africa alone, according to Du Pin, 690 bishoprics are specified in ancient documents; and some bishops had nothing more as their diocese than a small village, a single fortress, or a solitary monastery, or cities even where no Christians at all permanently resided. Upon this humble rudiment of ecclesiastical authority, the higher pretensions and wider rule of prelatic supremacy were established. Presbyterians appeal to Augustine and Hilary in support of their views, but more especially to Jerome in his commentaries on Titus i. 5. The following is an analytic review of the contents of the important statement which that learned father makes:—“1. Jerome expressly denies the superiority of bishops to presbyters by *divine right*. To prove his assertion on this head, he goes directly to the Scriptures, and argues, as the advocates of parity do, from the interchangeable *titles* of bishop and presbyter; from the *directions* given to them, without the least intimation of difference in their authority; and from the *powers* of presbyters, undisputed in his day. 2. Jerome states it as an *historical fact*, that this government, by *presbyters alone*, continued until, for the avoiding of scandalous quarrels and divisions, it was thought expedient to alter it. 3. Jerome states it as a *historical* fact, that this change in the government of the church, this creation of a superior order of ministers, took place not at once, but *by degrees*—‘*paulatim*,’ says he, ‘little by little.’ 4. Jerome states as *historical facts*, that the elevation of one presbyter over the others was a *human contrivance;* was not imposed by authority, but crept in by custom; and that the presbyters of his day knew this very well. 5. Jerome states it as a *historical fact*, that the first bishops were made by the *presbyters themselves*, and consequently they could neither have nor communicate any authority above that of presbyters.” (See Dr Mason's *Works*, vol. iii.) The words of Jerome are very pointed when he urges the antithesis between the origin of the episcopate and those ordinances, the divine authority of which was not questioned; he opposes the “consuetudo ecclesiæ” to “dispositionis dominicæ veritas”—the custom of the church to a real enactment of our Lord. It is a weighty circumstance, moreover, not to be overlooked, that in his reasoning he does not found upon any individual opinion of his own, but upon facts of which he speaks as universally admitted and beyond denial.

To meet this remarkable corroboration of the Presbyterian theory respecting the origin of Episcopal jurisdiction, three arguments have been commonly advanced by the defenders of Episcopacy,—1. That the gradual process of which Jerome speaks was coincident with apostolic times, and the change, therefore, had apostolic sanction; 2. That Jerome elsewhere, in a letter to Evagrius, reserves for bishops in ancient times the right of ordination, and so concedes the essential distinction between their office and that of the presbyter; and 3. That, at the close of the latter passage, he seems to allude to some parallel between the threefold order in the Jewish hierarchy and the different offices of the ministry under the new dispensation. Presbyterians have felt no difficulty in obviating the force of all these pleas. The premiss of the first has been peremptorily denied. Jerome could not mean a process transpiring under the eye and authority of the apostles. To prove the original identity of bishops and presbyters, he quotes from three epistles of the New Testament. The fact of such identity must have existed in the age when the apostles wrote them; but the force of his reasoning would have been thoroughly neutralized if the change by which the bishop was advanced above the presbyter took place in the same age, and claimed as high a sanction as the previous condition of parity. One of the epistles cited bears a very late date in the history of Paul. As to the alleged reservation by Jerome of the Episcopal prerogative in respect to ordination, the clause upon which the allegation is founded occurs in his letter to Evagrius, where he argues the duty of the deacon to be subject to the presbyter on the high ground that, by express apostolical arrangement and commission, the presbyter originally had as much power as the bishop. Even as to the existing usage of the church in his own day, he affirms that there is no difference between the offices, except as to the prerogative of ordination. “Quid *facit*, excepta ordinatione, episcopus, quod non faciat presbyter?” To suppose that the affirmation implied in this query relates to the primitive church, and not exclusively to the church of his own day, is inconsistent with the mere grammar of the words, as well as with the basis of his whole argument—the complete identity of the two offices in primitive times. And, lastly, as to the clause in the same letter,—“Seeing we know that the apostolical traditions were taken from the Old Testament: what Aaron and his sons and the Levites were in the temple, that let bishops and presbyters and deacons claim to be in the church,”—it is clear that, since the whole drift of the letter is to prove that bishop and presbyter were the same originally, and that the distinction arose not as an *apostolical tradition*, but from the *custom of the church*,—the two offices of presbyter or bishop, and deacon, as a divine institute, are here represented as corresponding with the offices of the priesthood and the Levites under the old dispensation. In any other sense, the statements of the learned father would embrace an unaccountable contradiction.

The representation of the people in presbytery.

II. If, in the office of presbyter, the Head of the church has made provision for its due government, in the representative element, there is a sure guarantee for its liberty. As the church is not a democratic mob, so it is as remote from being a despotic autocracy. It is the remark of Bunsen, that in all congregational and ecclesiastical constitutions, Christian freedom, within limits conformable to Scripture, constitutes the first requisite for a vital restoration. How far the Presbyterian system embodies the needful securities for freedom as well as order, must be briefly indicated.

1. Presbyterians deny that all church power vests exclusively in the clergy. The clergy exist for the church;

the church does not exist for the clergy: "unto this catholic visible church Christ hath given the ministry." (West. *Conf. of Faith*, xxv. 3.) While they believe that the proper and primary subject of church power is the eldership, and that it comes to them in immediate donation from the Head of the church, still the power is to be exercised for the good of the church; government is a blessing conferred upon it as a whole; and in all that relates to the formation of symbols, liturgical service, the enactment of canons for the ends of order and harmony, and the administration of discipline the people are entitled to a share in the government, real and substantive, although indirect, and under the two formal limitations, that it be in consistency with Scripture, and exercised through regular office-bearers duly qualified and appointed.

2. Such a recognition of the people is sanctioned by the spirit of numerous references to them in Scripture, according to which they, not the clergy, are the church; the Spirit dwells in them, as in the clergy, for light and guidance; "the whole church," as well as the "apostles and elders," is represented as giving certain commissions, and transmitting certain decrees (Acts xv. 22, 23; 2 Cor. viii. 19); they are held responsible for the teaching to which they listen (Gal. i. 8), and for the character of the members admitted to the privileges of the church (1 Cor. v. 4).

3. Provision for the expression of this influence, and the fulfilment of this responsibility, is made,—*first*, in the terms on which the pastoral tie is formed; and, *secondly*, in the existence of a ruling, as distinguished from the teaching eldership. In regard to the former, the degree of popular control over the appointment of ministers varies. In all churches, where the state does not interfere, the privilege of choosing the minister is left with the people. Even when election by suffrage has not been the rule, the intrusion of an unacceptable minister has been condemned, as, for instance, in the Second Book of Discipline, prepared for the Scottish Church in 1581. Such a right in behalf of the people has been argued from the essential genius of presbytery, from the general tenor of Scripture in all the passages which narrate the appointment of ecclesiastical office-bearers (Acts i. 15–26; vi. 1–6; xiv. 23), as well as those in which the nature of the bond between the rulers and the ruled is described; and from the historical fact that, however rapidly corruption spread in the church, the right of the people to an effective share in the appointment of their ministers withstood for ages the swelling tide of clerical encroachment. On this last point the best authorities on ecclesiastical history are quite at one. "Cyprian," Neander tells us, "conceded to the community the right of choosing worthy bishops, or of rejecting unworthy ones. This conceded right of approving or rejecting was not a mere formality." *Secondly*, The existence of the ruling eldership serves also to elicit the mind of the people in the practical administration of ecclesiastical affairs. That a ruling is distinguished from a teaching eldership in Scripture, though the distinction involves nothing more than two functions in the same office, appears from the emphasis with which the duty of the ruler is particularized (Rom. xii. 6–8); from the separate place it holds in the inspired enumeration of gifts and offices in the church (1 Cor. xii. 28); from the express discrimination instituted in 1 Tim. v. 17; and from the plurality of elders admitted to have existed in the primitive churches. Neander states that, as the faculty of teaching and the talent for administration are distinct gifts, "the function of teaching, and that of church-government, were originally distinguished and held separate from each other." It is added, "in the first epistle to Timothy (v. 17), those of the presbyters who, to the talent for government could unite also that of teaching, are accounted worthy of double honour, and the prominence given here to each may be regarded as another proof that the two were not *necessarily* and *always* united." An historical argument for the ruling eldership is also urged from various statements in the fathers. Such a class of functionaries, chosen by the people, and identified with them in all the affairs of common life, are an absolute prevention against the rise of a clerical oligarchy, with supreme and unchecked power over the church.

Provision for the unity of the Church

III. There are certain rights, in the possession of which each congregation must not be disturbed. It has the power of discipline and the right of jurisdiction within itself; so that, in the case of a congregation standing alone, where circumstances do not admit of connection with other congregations in the form of subjection to a common and superior jurisdiction, it has the free use of all its powers for the purposes of edification and extension. When united, too, with other congregations, the authority to which it becomes amenable is not privative in the sense of curtailing its privileges, but cumulative in the way of increasing them. In virtue of the spiritual life animating the members of the church, and just in proportion to the intensity with which it operates, there will be the instinctive desire of association in common bonds and duties. It is believed that the general theory of the church to be gathered from all in Scripture relating to it, leads to the conclusion, that it is not to be a congeries of separate and detached communities, but one body, and that certain general principles are indicated through which the formal exhibition of this unity may be rendered obvious to the world. As the ethics of Scripture supply us only with leading principles for our guidance, and waive minute questions of casuistry; so, in the polity of the church, the arrangements for the manifestation of its external unity are indicated by some fundamental considerations which may require skill and caution in the proper evolution of them; but, in their generality, leave us some measure of freedom in the adjustment of ecclesiastical polity to local wants and temporary exigencies.

Among the arguments adduced in proof of the obligation to promote and secure this outward manifestation of unity, it is common to insist upon *the nature of the church*. It is not merely represented as one,—one in creed and privilege, and hope,—but the oneness attributed to it springs from the workings of the same Spirit into which all its members are baptized. As the vital principle seeks at once embodiment and development in an organism appropriate to its special ends and instincts; so the saints, as the instinctive dictate of their spiritual nature, entwine their affections around each other in a common brotherhood; and the same principle which induces them to coalesce in one locality for public acts of faith, binds them to seek union on the basis of a more extended confederacy. The principle is of importance, as tending both to check the pride of sectarian isolation and to discriminate the true church from the false. Wherever there is an indisposition to acknowledge true membership,—real connection with the body of Christ,—in a character rich in the best fruits of faith, because, in deference to the higher principles of unity, such a Christian repudiates some nominal badge of it, imposed merely by human authority, the first law of Christian order is violated which enjoins us to establish Christian fellowship upon one basis—"the unity of the Spirit in the bonds of peace." In other words, the denial of the reality of Christian character, however clearly attested, beyond our own pale, is schism and something worse. Surely, therefore, some constitutional provision must exist in the church by which an isolation, practically tantamount to so great an error, is avoided, and Christians in other congregations besides our own may be recognized as such. *Secondly*, The *duties enjoined* upon the members of the church imply reciprocal obligations and common action beyond the limits of a single congregation. In witnessing for the truth, in the endeavour to secure a well-qualified ministry, in the jealous vigilance that must be exercised to secure purity of communion, and in the diffusion of the gospel, especially among the heathen, the same law which obliges us, for the sake of combined action, to defer to the judgment of brethren in one congregation, binds us to the same exercise of self-control in regard to all the congregations which may be willing to associate with us. It is impossible to see how some of these ends can be promoted, except by subordination to a common jurisdiction, either permanent and authoritative, or special and by agreement; but to meet an abiding necessity, it holds to reason that the constitution of the church should embody a standing provision. *Thirdly*, All *the views given us of the primitive church* proceed upon the supposition of a unity pervading it, and linking its members, not to one congregation in Jerusalem, but to all congregations on the earth. The apostles exercised a common authority over them all, and so constituted them from the first that they were not separate and independent, but so united as to be capable of being denominated one church. This, in the judgment of Presbyterians, is obvious, from the single fact that, though in Jerusalem, Ephesus, and Corinth, there were several congregations, all believers in these cities are sometimes spoken of as one church (1 Cor. i. 2; xiv. 34). *Fourthly*, The precise form in which this unity was practically realized was *through courts of review* (Acts xv). The main features of the transaction there recorded are,—a reference from a particular church to a council assembled elsewhere, a decree passed as the result of consultation, and the obligation asserted of that decree upon all churches. The inquiry, as indicated by the narrative and the decision, related not to a matter of fact on which information was sought, but to a question of principle on which the council assumed its own authority to pronounce. Nor is the decree to be explained merely as the utterance of inspiration; for on this ground the dispute could have been settled at once by Paul at Antioch. The transaction is best understood as the warrant by which a new privilege was conferred on the church, and a new development of its organic power was sanctioned in accordance with the obvious necessities of its growth,—namely, unity, in the form of several congregations ranged under a common jurisdiction.

History of Presbyterianism.

In the belief of Presbyterians, it was only after the lapse of two centuries that diocesan Episcopacy became the prevailing form of government in the Christian church. The instances of the Presbyterian government in succeeding centuries belong rather to the department of the historical argument in its favour, and involve details, the full review of which is beyond our limits.

Middle ages.

On the authority of Philostorgius, it is alleged that the Gothic churches, till the time of Ulphilas, were under Presbyterian government. The case of Bavaria has sometimes been adduced as a decided instance in which this form of government obtained from the year 540 till the pontificate of Zachary in 740. In his letter, still extant, to Boniface Moyunt, Zachary seems to affirm that, before he had imposed Vivilo upon that province as its bishop, the presbyters in it had not received Episcopal ordination. The expressions of Zachary, however, may be interpreted as signifying little more than that it was uncertain by whom the Bavarian presbyters were ordained. Lechler[1] holds that the Presbyterian system was not borrowed by the Reformers from the Waldenses, inasmuch as no trace of the eldership can be proved to have existed amongst them in ancient times. This position is scarcely tenable; for the essential character of Presbyterianism is not absolutely dependent upon the existence of this class of functionaries, even on the supposition, which has been denied, that, as it exists amongst the Waldenses now, it is an innovation upon their ancient polity; while, on the testimony of their own historians, as well as according to the earliest Romish authorities, Reinerus, Seyssel, Æneas Sylvius, and Bellarmine, it is clear that they distinctly repudiated a hierarchy—any grade of office superior to the presbyter. Seyssel, the first archbishop of Turin, describes their system in a treatise which he published in 1520, after he had visited that part of his diocese, and his testimony clearly excludes all higher authority than the presbyter:—"Those whom they judge to be the best amongst them, they appoint to be their priests (that is, presbyters), to *whom* upon all occasions they have recourse, as to the vicars and successors of the apostles." "They deny," says Æneas Sylvius, "the hierarchy; maintaining that there is no difference among the priests by reason of dignity of office." The letter of Morel, a Waldensian minister, to Œcolampadius, in 1530, mentions a general council of these presbyters, by which the ecclesiastical affairs of the community were regulated.

Germany.

In the various countries to which the influence of the Reformation extended, the constitution of the Protestant churches was modified by the degree of freedom which they enjoyed. In proportion as they were left free from the control of the state in establishing their polity and order, the tendency in the first instance was to the Presbyterian model. The Lutheran churches mostly in the end adopted the consistorial system; the Reformed churches the Presbyterian system; but the statement must be qualified by the admission of some exceptions. At Zurich, the church, though one of the Reformed, was scarcely Presbyterian; while in Saxony the Reformers yielded only to the pressure of circumstances in accepting the consistorial system. There is accordingly a difference between the theoretic views of Luther, and their practical development. Proceeding upon the principle of the universal priesthood of believers, he held that ecclesiastical rights and functions pertained primarily to the church; in the exercise of discipline, he procured the co-operation of lay members as advisers; and in 1523 he counselled the Bohemians to elect their own pastors and bishops. Such, however, was the general ignorance of the times, that his chief object was to institute meanwhile a system for instruction in sound doctrine. He derived greater assistance from the princes and the magistrates in settling and governing the church than from the people, who as yet were scarcely so enlightened as to be entrusted with the responsibilities of government. Nothing can be more emphatic than Luther's condemnation of magistratical interference with spiritual affairs; but the arrangement to which he submitted, as all that was practicable at first, became the rule for the organization of the church. The civil authorities were slow to surrender the control they had thus acquired over it. The consistories, moreover, though originally church-courts for ecclesiastical affairs, gradually lost their strictly ecclesiastical character. At Leipsic, in 1547, it was decreed by an assembly of the estates that the consistories should administer secular as well as spiritual matters. The fundamental idea of the consistorial system is the transference from the Romish bishops to the civil ruler of all ecclesiastical jurisdiction, so far as consistent with liberty of conscience, and with the *jura ordinis* peculiar to the clerical office. On this principle, the members of consistories are appointed by the state. The consistorial system, therefore, has simply these two points of affinity with presbytery; it embodies indirectly a representation of the laity, and it is based upon Luther's rejection of any office superior to the presbyter; for, though to the present day, the Lutheran Church employs the services of superintendents, their office is based on mere expediency, not on the authority of Scripture or the precedents of antiquity; they confer only Presbyterian ordination; they do not necessarily continue in their position for life; and their reports as to the spiritual condition of their districts must be rendered to the consistories, from whom also they receive directions on all affairs of higher moment.

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[1] *Geschichte der Presbyterial, und Synodal verfassung seit der Reformation*, Leiden, 1854.

The consistorial system was modified according to provincial exigencies, but we need only glance at those cases in which a greater approximation was made to the cardinal principles of Presbytery. Brenz, in 1526, erected in the free imperial city of Halle in Suabia a form of church-government, in which an eldership of pious men was conjoined with the pastorate in the superintendence of the congregations, but the right of appointing them to their office was left with the magistracy, if evangelical, in the German sense of that term,—in other words, if belonging to the Protestant church. At the synod of Homberg, in the same year, Francis Lambert proposed a scheme of provincial synods, consisting of the pastors and a deputy from each congregation. The system was synodal rather than presbyterial in character, and was never established, as Luther, on being consulted respecting it, deemed the people as yet incapable of self-government. In 1539, however, the office of elder was introduced into the Hessian church, but the circumstance did not lead to any representation of the popular mind and will in the higher ecclesiastical courts. After a lengthened struggle with the civil authorities, John à Lasco, in 1544, succeeded in erecting Presbyterian church-government at Embden, and the flourishing Reformed church of East Friesland was the result of his labours. The substance of his system may be gathered from the form of government drawn up for the German congregation in London, with which he was afterwards connected. He recognised only two offices, the eldership and the deacons; but the former comprehended two classes, the teaching and the ruling elders. From a leet nominated by the congregation the consistory elected those whom they regarded as fittest for office. The advance which à Lasco made upon Calvin's system, as established at Geneva three years before the erection of Presbyterian government at Embden, consists in the identification of the clerical office with that of the eldership, in the recognition of the consistory as the organ of the whole congregation, and in the power secured for the people in elections. The same accomplished Pole was afterwards called to Frankfort, and under his influence Presbyterianism gained a footing in that city. In the palatinate the accession of the elector Frederick III. to the Reformed confession, led to the introduction of a new ecclesiastical polity about the close of the sixteenth century. It was a combination of the consistorial and Presbyterian systems; each congregation had over it a presbytery, consisting of the pastor, and under his presidency, of censors, elected by the ecclesiastical authorities for the maintenance of order and discipline; over the whole national church a council, appointed by the elector, presided, composed of three divines and three civil councillors, and holding its meetings at Heidelberg; subordinate to this council were superintendents in each of the dioceses, and the clergy, along with the superintendents, met in conventions. The persecution of Alva drove from the Netherlands several refugees, who carried with them into the regions of the Lower Rhine their attachment to Presbyterianism. In 1566 a conference held at Wesel issued in the affirmation of the divine right of the eldership —a principle which was more formally enunciated anew by a great synod at Embden in 1571. Arrangements were also made for quarterly meetings of the presbytery, provincial synods annually, and general synods biennially. The system thus established continues in a great measure to the present day. To some extent Presbyterianism was introduced into Westphalia in 1588; and ten years earlier, the province of Nassau enjoyed the full benefit of Presbyterian government and discipline. The subsequent history of Presbyterianism in the German churches is too complicated and various to admit of concise explanation and detail. It is marked by the growing predominance of the consistorial element rather than by any changes in its territorial influence, and the system thus developed has proportionally less claim to be noticed in any historical review of genuine Presbytery. Although in 1835 Presbytery was restored to the churches in Westphalia and the Rhenish provinces, the consistory was engrafted upon the ancient constitution. As monarchy consolidated and extended its influence in Prussia, supreme power became more and more vested in the crown, while pure ecclesiastical authority sank into abeyance. To the extent in which it loses its authority, a church ceases to be representative in government, and by consequence ceases to be Presbyterian. From time to time voices have been raised in vigorous advocacy of the rights and claims of Presbyterianism; and amongst these defenders of the system Lechler specifies Spener, Schleiermacher, and Neander. Excluded from all share in the government of the church, the laity manifest indifference to its external interests. Any desire for the revival of the Presbyterian elements in its constitution has been ascribed more to political motives than to the conviction which chiefly enlisted the early Reformers in its favour,—namely, that when it was properly wrought, no system so effectually secured the church against the admission of the irreligious and unworthy into her communion.

Eastern Europe. Traces of Presbyterianism are to be found in the history of the churches which arose in consequence of the Reformation beyond Germany. The Slavic race indicated generally a preference for the doctrine and government of the Reformed rather than of the Lutheran Church. The first Polish evangelical synod met at Pinkzow in October 1550. According to the annotations of Comenius on the Book of Order, adopted by the Bohemian brethren in 1616, presbyter is a word applied by the apostles "not only to pastors, but to their assistants in watching the flock, who do not labour in word and doctrine;" while the Book of Order itself affirms that, according to the apostles, "presbyter and bishop are one and the same thing." On the same model the Moravian churches were constituted, with a slight admixture of Episcopacy, to the extent of preferring ordination by bishops, though ordination in the Reformed Church was deemed equally valid; and the bishops, far from enjoying the supreme direction of ecclesiastical affairs, were subordinate to a court of elders. In Hungary every congregation originally had a pastor and lay inspector, chosen by the suffrages of the members. There was a gradation of courts, senorial meetings, provincial conventions, and a general assembly. Synodal action of this kind has been in operation since 1564. But recently, since the abortive effort at emancipation from Austrian despotism, the liberties of the Hungarian Church have been suppressed. Its affairs are administered consistorially; in other words, by men whom the government nominates to the office.

Switzerland. In Switzerland the system of government, devised by Zwingle for Zurich, according to which ecclesiastical affairs were entrusted to the care of the magistrate, provided he was a Christian, so that practically the Council of Two Hundred, in the name of the church, administered its affairs, was extended to Berne, St Gall, and Schaffhausen. Œcolampadius proposed a scheme for Basle, in which elders, some of whom were elected by the people, were conjoined with the ministers for the purposes of discipline. After certain essential modifications by the state, so as to restrict still further the independent action of the church, it passed into a law. But in connection with Switzerland, it is of chief importance that we attend to the Presbyterian model as instituted by Calvin at Geneva. And here, too, as in the case of Luther, the difference must be noted between his theory of church-government as he expounded it theoretically, and as it was actually carried into effect or developed in practice. Two leading principles gave shape to the system of polity instituted by this great Reformer. He founded it upon a scriptural basis; and he saw clearly how indispensable a sound species of government was to the maintenance of order and purity in the church. Presbytery commended itself to him as the best form of rule for the preservation of discipline. His system is sketched in two paragraphs of his Institutes. Nothing can be more lucid and concise than his statement (*Institut.*, lib. iv., cap. xi., sect. 11), in which he unfolds the *primary object* of ecclesiastical rule, "ut scandalis obviam eatur,"—in other words, the purity of the church; the *precise character* of it as wholly spiritual, "ut a jure gladii prorsus separetur hæc spiritualis potestas;" and the *scriptural mode* of it by Presbytery, "ne unius arbitrio sed per legitimum consessum administretur." In reference to the second principle, he states expressly, "severissima ecclesiæ vindicta et quasi ultimum fulmen est excommunicatio,"—weighty and pregnant words indeed, as not only claiming independence for the church, but establishing on a solid ground all that is precious in religious liberty! All he asks is the right which must be conceded to every association established for a religious or benevolent purpose, that it should be left free to prescribe its terms of admission, and to enforce compliance with them in the case of flagrant and persistent contumacy by expulsion. He prohibits the church from resort to "mulctis, vel carceribus, vel aliis civilibus poenis." Still further, to guard religious liberty, he vests the jurisdiction of the church not in the clergy alone, but in a presbytery ("senatus presbyterorum") composed of two classes, the teaching and the ruling elders: "Alii ad docendum erant ordinati, alii morum censores duntaxat erant." These quotations are enough to fix beyond question what Calvin's theory of church-government really was, while they show the spirit in which he viewed the whole subject,—as involving the only system on which the seal of divine authority is impressed for preserving, in consistency with freedom and the rights of conscience, the interests of true religion and pure morality.

It is of no consequence to affirm that Calvin made no provision for synodal action. He states the essence of his theory, which by no means excludes a grade of ecclesiastical courts superior to the presbyteries or sessions; and he admits that much in the development of his theory must be left to circumstances. The scheme which he drew up for the French Church includes courts of review. Geneva was too small to require more than a presbytery. Nor is there the least ground for the allegation, that because he used the language of friendly compliment to the church of England, he ever departed from his own principles as early recorded in the Institutes. In his commentary upon Acts xx., one of his latest works, written not long before his death, he states that, "according to Scripture, presbyters differed in no respect from bishops, but that it arose from corruption and a departure from primitive purity, that those who held the first seats in particular cities began to be called bishops."

Calvin was sorely thwarted and trammelled in the endeavour to establish his system in Geneva. The civil authorities were jealous of any rival sway, however carefully discriminated from their own; while the spawn of error and corruption, which the disorders of preceding times had produced, had given rise to the party of the Libertines, who were determined to oppose any system which had for its main object the establishment of better morals. It is difficult to say what might have been the result had Calvin's theory been fully carried out, and had his great principle—the spiritual nature of church power—enjoyed full honour and free scope. The community, under the influence of this truth, would have been trained to feel that civil penalties are not the weapons by which error is to be met; and Servetus, in spite of Calvin, if we assume his direct complicity in the sad transaction, might have been saved from the flames. As a condition of his return to Geneva, Calvin stipulated for the institution of the eldership. The "ecclesiastical ordinances" which ultimately, in 1541, received the sanction of the council, recognised the office of the elders, the nomination of whom lay with the little council and the pastors, while their appointment to the actual exercise of the office, if the persons nominated were found worthy, was vested in the Council of Two Hundred. In two respects the arrangement deviated from the theoretical convictions of Calvin. There was a confusion of the civil with spiritual power in the control which the council thus retained over the election of the presbyters; and another restriction, according to which the members of the council only were eligible to the sacred office, still further violated the autonomy with which Scripture has invested the church. No claim can be urged for Calvin as first broaching the theory of Presbyterian rule; but the twofold merit which Lechler ascribes to him cannot well be denied. He first unfolded the idea of it as a lucid theory, or rather a practical system; and secondly, at the cost of a severe struggle, established it in actual operation in Geneva. The sphere of its influence in that small community might not be great; but the reformation of manners, which, by the verdict of all candid history, it wrought, is the best tribute to its praise; while, as the model upon which the Reformed Church in France and other countries was formed, its nature should be clearly understood.

France. The Reformed Church spread rapidly in France, and from the first it was Presbyterian. So early as 1561 no fewer than 2150 congregations belonged to it; and according to L'Hopital, one-fourth of the nation had seceded from the communion of the Church of Rome. In the year 1555 a meeting of the Protestants in Paris took place; they agreed to elect a minister, elders, and deacons. The example was followed in other towns of importance. In spite of extreme danger, under the very shadow of the gibbets reared for their destruction, deputies belonging to eleven churches of the Reformed faith met in a general synod at Paris. They agreed on a Confession of Faith, and a form of government: the authorship of the latter is ascribed to Calvin. According to this constitution, each congregation had its consistory of elders, the members of which were in the first instance elected by the congregation. Vacancies, however, were filled up by the consistory itself, though the approval of the congregation was essential in every appointment. The election of the pastors was entrusted to the colloquy or provincial synod, subject to a similar check on the part of the people. "If any objection is made," says De Felice, "it must be laid before the bodies who are charged with the choice of the pastors. In no case can an appointment be made in opposition to the vote of the majority." Colloquies met twice a year, embracing one pastor and one elder from each church represented. Provincial synods, comprehending the churches of a wider district, but similarly constituted, assembled once a year. The national synod was composed of two pastors and two elders from each of the inferior synods. The first national synod was held at Paris in 1559; the twenty-ninth, or last, at Loudun in 1669. Permission to assemble has never been granted since. By the law of the 18th Germinal, 1802, five or six churches were placed in subordination to a consistory, nominated in the first instance by the five-and-twenty Protestants of the district who contributed most to the public taxes. No right of election or of veto was reserved for the people. Instead of provincial synods, synods "d'arrondissement" were established, consisting of deputies from five of these consistories. One only—at La Drome, in 1850

—has ever met. Considerable changes were made by the decree of March 10, 1852. Instead of the consistory presiding over five or six churches, there is appointed by the decree a *presbyteral council* for each parish, consisting of a pastor as president, and not less than four or more than seven elders, elected by the people. In the principal towns of a district, general consistories are held, composed of all the pastors and a certain number of delegates chosen by the parishes. Both in regard to the presbyteral councils and the general consistories, half the members comprising them are subject to re-election every three years. There is above all these courts a central Protestant council, composed of the two senior pastors in Paris, and fifteen members nominated by the state in the first instance. The property qualification previously required is abolished. In the year 1858 there were 617 pastors of the Reformed Church in France; the number adhering to the Confession of Augsburg was 273. The funds assigned for the support of the Protestant churches by government amounted to 1,375,936 francs. Besides the churches supported by the state, there are about 120 pastors of other congregations, 27 of whom are connected with "the Union of Evangelical Churches," which are Presbyterian in their forms of government and discipline.

Holland.

The first Dutch provincial synod was held in 1574 at Dort. It adopted the Embden Articles, which conjoined elders with pastors in the government of the church. The state, however, withheld its sanction, and for a long period there was a struggle between the two; the state seeking Erastian control, the church intent on acquiring freedom of action for spiritual ends. The result was, that in despair of establishing a comprehensive national system, each province erected an ecclesiastical constitution for itself, according to the influences that chiefly preponderated in it. Presbyterianism universally prevailed, but it was Presbyterianism in express subjection to civil magistracy. The co-ordinate jurisdiction of the Calvinistic theory was never realized. The synod of Dort in 1618, among the other questions which it had been convened to discuss and settle, took up the point of church government, and emitted a strong declaration in favour of Presbytery. Down to 1795 there were seven distinct ecclesiastical republics more or less under the power of the state, with no organic bond of connection but correspondence by deputations in the provincial synods. In 1816, under royal sanction, a constitution for the whole church was established, embracing provision for a national synod. Some changes ensued in 1852; but the general result has been, that the national church is now divided into forty-three *classes*, under ten provincial circuits, comprehending in all, according to the census of 1850, 1273 churches, 1508 ministers, and 1,661,661 souls.

England.

Presbyterian writers mention a considerable variety of facts in evidence that their ecclesiastical polity is coeval with the primitive Christianity of Britain, and they exhibit a succession of testimonies in its favour, among others that of Wickliffe, down to the times of the Reformation. No doubt can be entertained that many of the founders of the Anglican Church had leanings to it. Cranmer held the identity of bishop and presbyter, and proposed at one time the erection of courts corresponding to the kirk-sessions and provincial synods afterwards established in Scotland. The martyr Lambert, in 1538, testified for ministerial parity. *The Institution of a Christian Man*, a book published in 1536, and not only recommended but subscribed by two archbishops and nineteen bishops, declares that there are "but two orders of clergy, and no one bishop has authority over another, according to the Word of God." The testimony of à Lasco is occasionally cited, in which he affirms that it was the intention of Edward VI. to alter and remodel the English Church according to apostolical purity; while the context clearly shows that, in the judgment of à Lasco, apostolical purity was substantially Presbyterianism. Presbyterian ordination was freely acknowledged by the English divines of the period. Archbishop Grindal, in 1582, appointed Morison, ordained by the Church of Scotland, to pastoral duties within the diocese of Canterbury. When Bancroft, in 1588, first urged the plea of divine right for the superiority of bishops to presbyters, the learned Rainolds, in a letter to Sir F. Knolleys, declared that the contrary doctrine of their equality was "the common judgment of the Reformed churches," and after naming them, he adds, "and our own." The early Puritans of England for the most part held Presbyterian views, though their dispute with the Established Church turned more upon certain rites and ceremonies in its worship. On the accession of Elizabeth, so early as 1566, several excellent divines, disappointed in their hope of a more thorough reformation, agreed "to break off from the public churches, and to assemble as they had opportunity in private houses and elsewhere, to worship God in a manner that might not offend against the light of their consciences." In the preamble to this conclusion, they allude, in evident concurrence with its principles, to "the book and order of preaching, administration of the sacrament, and *discipline*, that the great Mr Calvin had approved of." At length, in 1572, resolved on a more complete organization of their party, fifteen divines, with several influential laymen, met at Wandsworth, a village on the Thames, about four miles from London. Eleven elders were chosen, and their offices described in a register which is commonly known as "the orders of Wandsworth." In spite of the secresy observed, the meeting of this presbytery came to be known. The members of it, however, could not be discovered. Associations on the same model were formed elsewhere. The clergy also, who were inclined to Presbyterian sentiments within the church, held voluntary meetings for mutual advice in associations perfectly akin to presbyteries and synods. The number pursuing this course amounted in 1586 to 500. There is less difficulty in determining the form of Presbyterian sentiment which at this time prevailed than its relative strength in the British community. A book, high in esteem among the Puritans, drawn up by Travers, printed at Geneva in 1574, and entitled *Disciplina Ecclesiæ sacra ex Dei verbo descripta*, affords a clear and full exposition of their views. It suggests the erection of sessions composed of ministers and elders chosen by the people, and upon this inferior court is based a provision for provincial and national synods. By a singular feature in such documents, it proposes an ecumenical council comprehending representatives from every national synod. In proof of the extent to which an inclination for the Presbyterian polity prevailed, appeal has been made to a dialogue published in the reign of Elizabeth, according to which 100,000 are said to have been favourable to it. Of the three parties, Roman Catholic, Church of England, and Puritan, Hallam reckons that the Church of England was "the least numerous of the three." On the other hand, Fuller, in his graphic description of the state of parties, would lead us to a conclusion in favour of the Church of England as stronger than the Puritans. "Now, if Rebecca found herself strangely affected when twins struggled in her womb, the condition of the English Church must be conceived sad which at the same time had two disciplines, both of them pleading Scripture and primitive practice, each striving to support itself and to suppress its rival,—the *hierarchy* commanded by authority, established by law, confirmed by general practice, and continued so long by custom in this land, that had one at this time lived to the age of Methuselah, he could not remember the beginning thereof in Britain; the *presbytery*, though wanting the stamp of authority, claiming to be the purer metal, founded by some clergymen, favoured by many of the gentry, and followed by more of the common sort, who, being prompted with that natural principle that the weakest side must be most watchful, what they wanted in strength they supplied in activity. But what won them most repute was their ministers' painful preaching in populous places; it being observed in England that those who hold the helm of the pulpit always steer people's hearts as they please."[1] It is admitted that the strength of the Presbyterian interest was greatly increased through the reaction excited by the policy of Laud. Arminianism, distasteful to the mass of the clergy, obtained favour under his administration. The Calvinistic clergy, feeling that they could put no reliance on the bishops or the state, in order to check its spread, were the more eager to secure the erection of a Presbyterian polity, according to which the general mind of the church might obtain free expression and due influence. At length Presbyterianism was in the ascendant. In 1642 Episcopacy was abolished. The Westminster Assembly, convened by the Parliament in 1643, declared in favour of Presbytery after long and patient discussions. A struggle was made to procure from Parliament the recognition of it as of divine origin and authority; the Parliament contented itself with the acknowledgment of it as "lawful and agreeable to the Word of God." By a parliamentary order of March 1646, ruling elders were to be chosen in all the English congregations, while ecclesiastical judicatories were also to be created. The system was next year carried into effect in London and Lancashire. In 1648, with the exception of chapels for the king and peers, "all parishes and places whatsoever" were declared to be under Presbyterian government. On the accession of Cromwell to supreme power, the strength of Presbyterianism declined. It had a brief revival in 1660, when it was established anew by Parliament. On the Restoration, it gave place to Episcopacy, and more than 2000 ministers, nearly all Presbyterians, refusing to comply with the Act of Uniformity, were in 1662 expelled from the Established Church. Ever since this date Presbyterianism has been a distinct communion in England.

In common with other Dissenters, Presbyterians sustained no small persecution till the Revolution, when the Toleration Act in 1689 secured them considerable freedom. Their cause sprang elastic from the previous depression, and in less than thirty years they had more than 800 congregations in England, Yorkshire alone containing no fewer than 59. They represented fully two-thirds of the Dissenting interest. Various causes have been assigned for the rapid declension which, in the course of the next century, took place in their numerical strength. Arianism, ripening fast into Socinianism, spread amongst them, partly because subscription to the standards of the church was not enforced, and partly because Presbyterian government was not brought into complete and efficient operation. Such are the reasons at least commonly assigned for this lapse into heterodox tenets, but it must have had connection with some wider causes then at work by which all evangelical churches in Europe were similarly and at the same time affected. In London, at a meeting in Salters Hall, out of 110 present, 53 only voted in favour of requiring from ministers subscription to the doctrine of the Trinity. A division ensued,—one party exacting adherence by subscription to the first article of the Church of England, together with the fifth and sixth questions in the Shorter Catechism; the other resisting the imposition of any such term of communion, although they would commit themselves to no denial of the divinity of Christ and the doctrine of the Trinity. In Northumberland alone, where Presbytery continued to be most efficiently wrought, Socinianism was completely excluded from its congregations. The influence of such men as Lardner and Priestley naturally led their brethren in the ministry to make an avowal of Arian or Socinian views with the same boldness which marked the opposition of these distinguished men to orthodox doctrine. In proportion as Socinianism came to be freely published and declared from the pulpit, and the forms of Presbytery sunk into desuetude, multitudes in the Presbyterian congregations found, in the evangelical preaching to which they listened elsewhere, an attraction before which any regard for another polity was felt to be of subordinate importance. The spiritual activity of other churches, Methodists and Independents, absorbing into its own channel the life and zeal which found no scope elsewhere, contributed still further to reduce the strength of the Presbyterians. The number of their congregations, both orthodox and Unitarian, was estimated in 1812 as amounting to 270. In 1850 there were 217 Unitarian congregations; but as they have neither sessions over particular congregations, nor courts uniting them under a common jurisdiction, they cannot properly be designated Presbyterian. In the national census, they rank under the title "Unitarians." Still there are many congregations, especially in Northumberland, who trace their origin up to 1662, when they were formed under the labours of ministers ejected by the Act of Uniformity. But the chief form under which Presbyterianism now appears in England is in connection with Scotch churches of the same doctrine and polity. About 15 are in connection with the Established Church of Scotland, and 60 with the United Presbyterian Church, to the extent of being represented in its annual synod. A still larger body, numbering about 90 congregations, though it maintains friendly relations with the Free Church, made a declaration in 1844 claiming to be a separate and independent church, with its own theological seminary and supreme court. Never ecclesiastically incorporated with any other church, and abiding by the Westminster Standards, it represents the old Presbyterianism of England, however much its membership may be sustained by immigration from the north. Proposals have been sometimes made for a union between the two last-mentioned bodies, but hitherto without success. In Wales, the large body of the Welsh Calvinistic Methodists, with upwards of 800 chapels and nearly 60,000 communicants, are substantially Presbyterian.

Scotland. The first General Assembly of the Church of Scotland was held in 1560. Of the 40 members, 6 only were ministers. The same ministers who drew up the Confession of Faith, which the Parliament had already ratified, were appointed to prepare a scheme of government and discipline for the church. It was presented to the Assembly, which met early in 1561, and cordially adopted; but on being submitted to the Privy Council, though several nobles and burgesses in Parliament subscribed it, it was never ratified by the authority of the state. The church, however, continued to be guided by it, and a simple review of its provisions will show that the subsequent Presbyterianism of Scotland has always in substance embodied the leading elements of the system described in it. The ordinary offices established by it are four in number,—pastor, doctor, elder, and deacon. The duties of the pastor only differed from those of the doctor in the difference of the sphere in which they were exercised; the former relating chiefly to the interests of a particular congregation, while the latter office was rather exercised in schools and universities. The elder was the assistant of the pastor in government and discipline. Upon the deacon devolved the care of the poor and of the revenues of the church. Two extraordinary offices were also appointed:

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[1] Fuller's *Church History*, xvi., cent. A.D. 1588.

readers, who, on the strength of a common education, could read the Scriptures to their ignorant neighbours, and who received the higher appellation of exhorters, if they were found qualified to follow up the reading of Scriptures with a plain and pious address. The other office was that of the superintendent, whose duty was to itinerate over a province, preaching the gospel, planting churches, and watching over the conduct of the pastors and readers. The election of the minister is distinctly entrusted to the people. Provision is made for the erection of four ecclesiastical courts: the kirk-session, consisting of pastor, elder, and deacon; a meeting called a prophesying, which afterwards merged into a presbytery, and which took under its charge several congregations of a district; provincial synods; and the General Assembly, in which ministers and elders, representing all the presbyteries throughout the kingdom, met for the administration of ecclesiastical affairs. It will be observed that, though so far as it was Presbyterian, there could be no essential difference in this system from what had been instituted twenty years before in Geneva, there is really ground for the assertion of Row, that the Scotch Reformers "took not their example from any kirk in the world,—no, not from Geneva!" It was national rather than municipal in its scope and design. The device of superintendents, too, as "expedient for the time," to use the words of the Book of Discipline, indicated that the founders of this polity were not so trammelled by implicit deference to Genevan arrangements as to overlook the necessity of special adaptation to the wants and circumstances of their own country. Nor is there any ground for regarding these superintendents as in any sense bishops. Elected by the people, ordained by presbyters, acting only in concert with provincial synods, responsible for all their proceedings to the General Assembly, and ceasing when presbyterial organization throughout the land was sufficiently complete to supersede the necessity for such temporary office-bearers, they really bore no character and exercised no functions analogous to Episcopal authority. It is only due to the sagacity of the early founders of the Scottish Church to mention another distinctive feature of their system. They saw that the people might be the worst enemies to their own privileges if they were not trained to the proper use of them; and hence, besides a scheme for the administration of the church, it embraced, as essential to its proper working, an elaborate plan of national education. With the exception of the superintendents and the readers, the Presbyterian churches of Scotland to the present day exhibit substantial conformity to the scheme of Knox, so far as relates to the different offices and to the courts of review. The single question, however, raised by the appointment of ministers has given rise, with but one exception, to all the Presbyterian churches existing in a state of separation from the Establishment. In the latter the people have only the right of stating objections to a presentee, whereas in the former the full liberty of election is conceded to them.

This accordance of Scottish Presbytery with the original scheme devised by Knox and his associates renders it necessary only to mention the steps by which its establishment was secured. The various branches into which it came to be subdivided belong to another department of this article. Meanwhile, attention is called to the history of the system, rather than of the churches adopting it. The First Book of Discipline did not receive formal ratification from the state. The true motive on account of which this was refused transpired in the endeavour on the part of the nobles to secure the property of the church. The courts of presbytery proved so strong an exposition of public feeling as to hold in check aristocratic rapacity. A natural leaning to Episcopacy was thus produced in the higher circles of society, under an impression that bishops, owing their titular dignity to civil patronage, would evince readier subserviency to the designs of the court. A convention of superintendents and ministers, under the influence of Regent Morton, met at Leith in 1572, and passed a decision by which Episcopal titles were retained in the church. So soon as this point was gained, the titles were bestowed on such as consented to receive benefices on the condition of restoring to the patron the best portion of their annual revenues. This simoniacal arrangement was stigmatized in popular wit as *tulchan* Episcopacy, from the practice in the country of placing before a cow, that it might yield its milk freely, an image with the skin and in the shape of a calf. Even according to the scheme sanctioned at Leith, these nominal dignitaries were declared to be subordinate to the Assembly, a feature of vital difference from common Episcopacy. In 1580 the Assembly declared the office of bishop to be without scriptural authority, and charged such persons as held it to demit it immediately. In the light of these facts, the Second Book of Discipline will be properly understood; which, adopted by the Assembly in 1581, and, partially at least, recognised by the state in 1592, best illustrates the type of Scottish Presbyterianism in this age. Ecclesiastical jurisdiction is formally based on dogmatic grounds, the headship of Christ; so that, blending with the highest articles of the Christian faith, it could not cease to be an obligation on the conscience so long as Christianity itself was embraced. In proportion to the weight and sacredness of such a claim, it needed the more careful discrimination from civil authority at once to prevent abuse and to appease the jealousies of the state; and hence the Second Book of Discipline insists upon the distinction between civil and ecclesiastical power. Warned by the recent struggle of the church against a pseudo-Episcopacy, the framers of this book omitted all reference to the extraordinary offices, the superintendents and exhorters, mentioned in the system of discipline adopted in 1560. Not content with this, they inserted a special protest against the notion of any superiority on the part of a bishop as above the presbyter. They desire the abolition of patronage, as it "cannot stand with the order which God's word craves." The spirit of the whole book may be described as evincing the utmost anxiety to establish, in the first place, an efficient discipline in each congregation for the purity of the church; secondly, a firm bond of unity in courts rising in succession to one that sustained a relation to the whole church, and of last resort in all cases of discipline and points of controversy; and lastly, harmonious co-operation with the civil authorities, under no compromise of the rights or interference with the functions respectively belonging to church and state. Hence, in the language of the German historian Lechler, the Church of Scotland, "by its earnest and persevering struggle for the complete independence of the church in contradistinction to the state, and by the prominence assigned to the most important and practical truth, that Christ is the only Head of the church, shows itself beyond question in advance of all the Reformed national churches."

Although the Second Book of Discipline was not formally and in express terms ratified by the act of Parliament in 1592, there can be no doubt that it was the system of government observed at the time by the Scottish Church; and the act incidentally recognises, and so far by recognition sanctions, "the jurisdiction and discipline of the church as the same is used and exercised within this realm." The state, however, speedily resolved upon another policy than that to which it seemed committed by the provisions of this enactment. It strove to re-establish Prelacy; and the plan taken to accomplish this object was the control, with a view to the ultimate suppression, of the church's prerogative of meeting in free assemblies. Gradually the power of the crown made way in spite of the heroic resistance of the clergy, and the moment seemed close at hand when, by a single stroke, the state might venture to consummate a long course of policy, and abolish the last vestige of Presbyterianism. It is only the more educated class that can be expected to appreciate the value of a sound theory of government in a church. Worship appeals directly to the individual conscience. The zeal of Laud, more impetuous than discreet, insisted on the introduction of the Liturgy. It was the spark on the dry grass of the prairie. The nation was at once inflamed with indignation. The issue of the various struggles and conflicts which ensued was Presbyterianism—not merely restored to Scotland, but established in England; not by an act of Parliament only, but by the oath of the three kingdoms,—the Solemn League and Covenant.

From 1638 to 1649 the Church of Scotland enjoyed perfect exemption from the control of the state. Not only so, but the Scottish Parliament ratified willingly all the Westminster standards of faith, the Confession, and the form of church government,—in this respect outstripping the English Parliament, which, while it ratified and approved of the doctrinal part of the Confession of Faith, "recommitted" the chapters described as "the particulars in discipline." In 1653 the Assembly was interrupted and dissolved at the instance of Cromwell; nor had it ever liberty to meet again during his life. The type of Presbyterianism which the Scottish Church thus received from the English divines contained no point of essential difference from that exhibited in the Second Book of Discipline. There are the same three essential offices—minister, elder, and deacon; for though, as in the Scottish scheme, we read of pastors and doctors, the account given of them indicates a division of labour, and not a distinction of office. There is the same gradation of courts. The only point of difference is the apparently lower degree of privilege conceded to the people in the settlement of ministers. The presbytery is to proceed to ordain, if there be no just exceptions against the presentee. Still there is no absolute denial to the people of the right of election; for, at the outset of the regulations on this head, it is supposed that he may be "nominated by the people." In Scotland, by the act of 1649, he was to be nominated by the session. At the Restoration the system of government thus established was overthrown, and Episcopacy for twenty-eight years again enjoyed the favour and support of the state. Finally, when the Revolution occurred, all legislation in favour of Presbyterianism was found to be buried under rescissory acts. The government of William did not cancel the acts rescissory, but simply, in the Act of Settlement, made a statutory recognition of the Confession of Faith, "voted and approven by them as the public and avowed confession of this church;" they further revived and confirmed the act of 1592, and having reserved the question of the appointment of ministers for further consideration, they gave the privilege to the heritors, but latterly, in 1711, it was given to the ancient patrons. It is this question which has since produced the greatest changes in the external aspect and position of Scottish Presbytery. No essential divergence in respect either of doctrine, government, worship, or discipline, has taken place from the Westminster deeds to the extent of a formal and avowed renunciation of them, except that in one denomination adherence to the articles on the power of the civil magistrate has been somewhat qualified. For three hundred years the avowed faith of the Scottish people, both in regard to the doctrine and the polity of the church, has been, amid all the countless vicissitudes of speculation, unchanged. The key-note struck by Knox has never ceased to find an echo in the ear and heart of his nation.

reland.

Escaping from Scotland and England, many Presbyterians sought in Ireland some relief from the persecution which they experienced in the former countries. The ministers amongst them were permitted to exercise their office and share emolument in the Established Church, till they were ejected and silenced in 1634, when Laud insisted on the Book of Canons, and substituted for the Irish articles of 1615 the Thirty-Nine Articles of the Church of England. Direct persecution was put in force against them; but the freedom they enjoyed after the rebellion enabled them to establish the Presbyterian system, not in Ulster only, but in other parts of Ireland. In 1642 the first regular meeting of presbytery was constituted at Carrickfergus. At the Restoration, 61 ministers were not only expelled from their benefices, but deposed from the ministry. Heavy penalties were threatened if they dared to preach or baptize; harsh and angry proceedings, in which Jeremy Taylor tarnished the lustre of a brilliant name, and all the more ungenerous that the Presbyterians of Ulster had stood so fast by the royal cause at the lowest ebb of its fortunes, that afterwards, in 1672, the crown, in recognition of their services against Cromwell, was constrained to honour them with an annual grant of money. However discountenanced, Presbyterianism held its own in Ulster. The Revolution found it with nearly a hundred congregations, under the care of five presbyteries and a general synod. It partook in Ireland of the same changes which mark its history in England. A large proportion of its ministers became imbued with Arian and Socinian views. In 1727 the presbytery of Antrim seceded on this ground from the general body; and more recently, in 1829, a similar rupture took place, in consequence of which the Remonstrant Presbytery was formed. Together with the presbytery of Munster, which dates from 1660, these two bodies form "the General Nonsubscribing Presbyterian Association of Ireland." From the times of the persecution some Presbyterians had protested against the acceptance of any indulgence. Their principles were transmitted from generation to generation, till they appear embodied in "the Reformed Presbyterian Church of Ireland." The Secession in Scotland had also its representatives in Ulster, who latterly, in 1840, effected a junction with the synod of Ulster, and both parties became merged under the common name of "the Presbyterian Church of Ireland." The present condition of the Presbyterian interest may be gathered from the statistics of the various bodies composing it. The Presbyterian Church of Ireland has 559 ministers and 514 congregations. In connection with the Reformed Presbyterian Synods there are about 30 ministers and 40 congregations. The Secession is represented by 15 ministers, and as many congregations.

America.

American Presbyterianism has a manifold but honourable origin. The main stream of immigration by which it has been fed from the beginning of last century has been from Ireland and Scotland. Before the close of the seventeenth century the greater number was from the latter country. The Presbyterians of Ireland, however, long after the Revolution, continued to labour under disabilities, from the operation of the Sacramental Test Act, and from the peculiar tenure of land, which induced emigration to a greater extent from Ireland than from Scotland. Before the middle of last century 12,000 annually left Ireland for the New World. New Jersey, Pennsylvania, Virginia, North and South Carolina, were the parts of America to which Presbyterian emigrants directed their course. Four other sources may be specified whence important accessions have been derived to the general body of American Presbyterianism,—The Puritans of England, the Reformed Church of Holland, the Protestants of Germany, and the Huguenots of France. Philadelphia was the seat of the first presbytery, which was organized in 1705, and consisted of seven ministers. In 1716 a synod was formed; and at length, as the church increased, the body was divided in 1787 into four synods, under a general assembly. In 1729, by a formal act, the Confession of Faith and Catechisms of the Westminster Assembly were adopted. For more than a hundred years the harmony of the church was not disturbed by any controversy on the subject of doctrine. Three causes have been assigned for the disruption of 1838, through which it divided into Old School and New School Presbyterians,—*first*, an admixture of Congregationalists from the New England States, who naturally leant to their old ecclesiastical usages; *secondly*, the spread of erroneous sentiments on such points as original sin, election, and efficacious grace, or at least attempts to obviate the objections to them philosophically on principles that seemed to concede the doctrines themselves; and *lastly*, a preference by some for voluntary societies, rather than ecclesiastical action, as the proper method for the advancement of religious objects. The Old School were attached to the previous views and system of the church on all these points. The New School has experienced since 1857 a similar division,—the southern portion espousing a position of entire neutrality on the question of slavery, and practically abetting it; while the northern congregations are disposed to countenance an opposite line of policy. According to an official statement in 1858, at the end of May the Old School had 33 synods, 159 presbyteries, 2468 ministers, 3357 churches, and 259,335 communicants; while its contributions of various kinds for the year had amounted to 2,632,717 dols. The New School, on the other hand, has 26 synods, 120 presbyteries, 1613 ministers, 1686 churches, 143,410 communicants; its contributions for religious purposes last year amounted to 273,952 dols. The body seceding from the New School in 1857 have taken the name of "The United Synod of the Presbyterian Church," and numbers 113 ministers. There is also a Free Presbyterian Church, which refuses communion with slaveholders, and has 43 ministers.

There are other bodies which from the first have held a separate standing in America. The *Dutch Reformed*, almost from the middle of the seventeenth century, had a footing in the States. They were under the government, however, of the classis of Amsterdam till 1772, when they obtained regular and independent organization under five classes, subordinate to a general synod. In doctrine this church is purely Calvinistic. It has about 330 ministers.

The *German Reformed*, moreover, has enjoyed an independent constitution since 1792, and has 350 ministers.

Since 1752 the *Reformed Presbyterians* had assumed organization as a distinct body in the States; but their first presbytery was constituted in 1774. In 1833 they divided upon the question of their relations to the civil government of the United States,—one party holding that, in consequence of the constitution supporting slavery and not recognising Christianity, it could not receive their conscientious support; the other contending that it was not formally opposed, but rather favourable on the whole to true religion, and that slavery was an unconstitutional abuse, which they did not despair of seeing rectified. There are now synods belonging respectively to each of these parties,—the former, styling itself the Synod of the Reformed Presbyterian Church, has 53 ministers; the latter, called the General Synod of the Reformed Presbyterian Church, has the same number.

About the year 1754 the *Associate Synod* of North America had its commencement, representing the Secession Churches of Scotland; and on a junction between some of its members and some members of the Reformed Presbyterian Synod, the Associate Reformed Church was in 1782 originated—the attempt to unite two churches having issued in the formation of three. In the course of 1858, however, the Associate Synod and the Associate Reformed effected a union, under the designation of *The United Presbyterian Church*, which is distinguished from the main body of American Presbyterians by three points,—opposition to slavery, attachment to an inspired psalmody, and dislike of secret societies, connection with which excludes from their communion. Its ministers are 429 in number.

A large body, the *Cumberland Presbyterians*, dates its existence from 1803. It arose from a proposal to license and ordain laymen who had the gift of public utterance, in order to meet a want of regularly-trained ministers. It professes a modified Calvinism, embracing the doctrine of universal atonement, but rejecting that of eternal reprobation, and qualifying that of election. It engrafts upon its extreme Presbyterianism the itinerating system of the Methodists. It is represented by 588 ministers.

The *Lutheran* Church, now containing upwards of 400 ministers, had for its first minister Jacob Fabricius, who reached America in 1669. It received more effective organization about the middle of last century. It is essentially Presbyterian, but differs from Lutheranism in Europe by no longer insisting on the bodily presence of the Saviour in the eucharist.

Canada. In Canada, under three different synods, respectively connected with the Established, the Free, and the United Presbyterian Churches in Scotland, there are 290 ministers. In Nova Scotia and New Brunswick there are fully 120 more, under different synods; while in other British dependencies in America, such as Jamaica and Guiana, about 50 more fall to be reckoned.

Australia Presbyterianism has obtained an extensive footing in Australia, and is represented by nearly 100 ministers in connection with the three largest denominations in Scotland. In New Zealand there are about 20.

Presbyterian Churches in Scotland.

ESTABLISHED CHURCH. I. *Established Church.*—The legal position of this church, as fixed at the period of the Revolution, depends upon three acts,—a statute, 1689, c. 2, by which Episcopacy was abolished, and the Presbyterian church restored to its privileges and emoluments; another, 1690, c. 1, by which the act in favour of the royal supremacy was repealed; and a third, the most important of all, 1690, c. 5, ratifying the Confession of Faith, and establishing Presbyterian church government in Scotland. By a separate act, the right of patronage was cancelled, a pecuniary compensation awarded to the patrons, and the presentation to vacant churches assigned to the Protestant heritors and to the elders of the parish, subject to the approval or rejection of the whole congregation. The Act of Security, passed and adopted in 1707, as the basis of the treaty of union, declared the Presbyterian church government "unalterable," and "the only government of the church within the kingdom of Scotland." In 1712 the Patronage Act became law, by which the rights of lay patrons were restored. The application of this enactment in a way which, in the judgment of the Seceders, wholly neutralized the rights of the people in the appointment of ministers, gave rise to the Secession. The enforcement of it, to the extent not merely of interfering with the rights of the people, but with the spiritual jurisdiction of the church, was the reason assigned for the Disruption of 1843, by those who constituted themselves as a separate communion into the Free Church.

Two parties gradually arose after the Revolution within the pale of the church,—the one distinguished by their attachment to popular interests and liberties, and by a predilection for those doctrines which stand opposed to the theory of Arminianism; the other avowing, as the essence of their policy, "the steady and uniform support of lay patronage," and suspicious of the doctrinal views of their opponents, as tending, in their judgment, to Antinomian excess. The Marrow controversy, which turned upon the merits of a book, evangelical in the opinion of the former, Antinomian in the opinion of the latter, elicited a discordance of view amounting to an open rupture. The party intent upon enforcing the law of patronage acquired the mastery. When Mr Stark had been settled at Kinross against the wishes of the parishioners, several ministers made a representation against this course of policy. The Assembly refused to hear the petition, and dismissed the complaint against the settlement at Kinross. Feeling specially aggrieved because he had not been allowed to enter his dissent, the Rev. Ebenezer Erskine, in a sermon before the Synod of Fife, denounced the corruption of the church. His brethren sentenced him to a rebuke for his conduct; and on appeal to the Assembly, that supreme court confirmed the sentence. Mr Erskine accordingly, along with three other brethren, protested, and left the church. In spite of an attempt at conciliation by the Assembly of the following year (1734), the four brethren adhered to their position, and exerted themselves in the formation of the *Secession* church. In 1752 the Rev. Thomas Gillespie was deposed for contumacy, in refusing to assist at the ordination of an unacceptable presentee at Inverkeithing. The *Relief* church arose in consequence. Minuter details of these proceedings will be given under the account of the United Presbyterian Church. Principal Robertson, by whose resolute leadership the Assembly had been guided in them, retired from the management of the church about 1780; but the party he represented was so powerful that for a long period after his retirement they had the chief sway in the councils of the church.

The next event of importance in the history of the Established Church was a movement in favour of its extension by the erection of chapels of ease in 1795. It gave occasion to a controversy, in which the popular party conceived it sufficient to leave with the presbytery the power of deciding whether such erections should be sanctioned; while their opponents insisted on retaining for the General Assembly the final decision in every case. Another discussion arose which in successive Assemblies elicited singular powers of eloquent debate on the part of their members, till it was terminated in 1824 by an enactment against plurality of offices, inhibiting any minister from combining with a parochial charge the duties of a professorship in a university. The same year is memorable in the annals of the Assembly by the proposal of Dr Inglis to institute a mission to the heathen. The result was the important and successful mission to India, conducted ever since by the Established Church. After a brief controversy in reference to a heresy which took its name from the parish of its origin (Row), and which embraced as its chief tenet the doctrine of universal pardon, the church was agitated in 1832 by the renewal of the old struggle against patronage, through means of an overture introduced into the Assembly craving the restoration of the call, or the right of the people to a share in the appointment of their pastors, by a real and effective instead of a formal and nugatory expression of their concurrence in their settlement over them. The overture, however, was rejected. In 1833, at the instance of Dr Cook, certain churches, built and partially endowed by Parliament, were elevated to the full standing of parishes so far as ecclesiastical privileges were concerned, and their ministers admitted to the complete exercise of their official rights in the courts of the church.

In the Assembly of 1834 Dr Chalmers became convener of the committee for the extension of the church. He devoted to the scheme all the energy and resources of his character; so that, by the next Assembly he could report new places of worship, completed or in course of erection, to the number of sixty-four, while the liberality of the church had responded to his appeals by a sum of L.66,000. Within a period of seven years about 205 churches were erected. In 1836 a scheme for providing ministers and churches to the colonies was instituted. Two years later, a mission to the Jews was undertaken. The circumstances under which the Free Church arose fall to be detailed in connection with the notice of that body which follows. The church, after a prolonged and severe controversy with those who separated from it at the Disruption in 1843, justified its adherence to the position which it had assumed principally on three grounds,—the constitution of the church as regulated by the law of patronage, the decisions of the civil courts as confirming the interpretation which it put on the bearings of that enactment, and the act of the legislature, denominated Lord Aberdeen's Act, according to which, it was supposed, sufficient scope was given to the ecclesiastical courts to reject a presentee if the reasons urged against him were in their judgment valid. Within the last two years some dissatisfaction has sprung up at the working of this act, and changes have been proposed,—by one party on the act itself, by others upon the ecclesiastical regulations for carrying it into effect.

Standards. It is singular that all the Scotch Presbyterian churches owe their *symbolic books* to a convention mainly composed of English divines—the Westminster Assembly. The doctrinal standards of the Church of Scotland, as recognised by act of Parliament (1690), are simply the Westminster Confession of Faith. In some acts of Assembly the Catechisms, Larger and Shorter, receive ecclesiastical sanction, and so far as the church connects itself with the church of the first and second Reformation, it can make use of the Form of government and Directory for worship, together with the First and Second Books of Discipline, though the exact amount of authority due to these latter documents has been sometimes matter of dispute. In 1707 the Form of Process for the regulation of discipline became the law of the church.

Constitution. The *constitution* of the Established Church embraces a fourfold gradation of courts. The *kirk-session*, under the superintendence of the minister, takes charge of the spiritual interests of the parish, nominating new elders to supply vacancies in its number; but these nominees are ordained only after opportunity has been afforded to the congregation to intimate any objections to them. The *presbyteries*, 82 in number, consist equally of ministers and elders. Theological professors, when resident within the bounds, have a seat in these courts. The duties of the presbytery are, to watch over the conduct of the ministers, to examine students, to ordain to vacant parishes, and to try the qualifications of schoolmasters. In regard to secular interests—questions regarding church property,—the presbytery, according to law, is viewed as a different court, and acting in a civil capacity. The *synods*, sixteen in number, include several presbyteries. They are chiefly occupied in the duty of reviewing, in the case of appeals, any decisions of the inferior court. The *General Assembly* is the supreme court, possessed of the highest executive authority, and the source of legislation. It is representative in its constitution, consisting not of all the ministers of the church, with a corresponding elder, but of persons nominated chiefly by the various presbyteries. The presbyteries elect to serve in it 200 ministers and 89 elders, the royal burghs 67 elders, the universities 5 ministers or elders, and the churches in India 1 minister and 1 elder. There are thus in every Assembly 363 members. In every Assembly, too, a Lord High Commissioner appears as the representative of the sovereign. By an act of Assembly in 1697, an important restriction is laid upon its powers, known as the Barrier Act, by which every measure seriously affecting the forms of government and discipline must descend as an overture to the presbyteries, and can only become law when it has been approved of by a majority of them. The object of the act is to secure the church against the dangers of precipitate legislation.

Extent. The Established Church embraces 963 parish churches, including collegiate churches as one parish, 42 parlia-

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mentary churches, and 147 chapels of ease and *quoad sacra* churches. According to Sir James Graham's Act, when the concurrence of a majority of heritors has been obtained, and a competent endowment has been secured, any *quoad sacra* church may be raised to all the privileges of a regular parish. Under the operation of this act, parochial churches have been increased from 963 to 1006. Since 1843 the work of extending the church has been prosecuted with great zeal and energy, and several new churches have been erected. The large sum of L.326,406 has been raised for the purpose of endowing them, the subscriptions in order to accomplish this object amounting, in 1857 alone, to L.61,188.

Endowments.

The provision for the support of the ministry in the Established Church embraces a manse, a glebe, and stipend. Ministers in rural parishes and royal burghs have generally manses, but in cities it is otherwise. The glebe consists of arable land, generally exceeding four acres. The stipend is raised on the basis of the old system of teinds or tithes, which, when seized by the crown at the Reformation, were burdened, and continue burdened to this day, with the support of the parochial minister. The court of teinds determines the amount of land-produce to be allotted for the purpose; and under a subsequent process, or *decreet of modification*, landholders are proportionally assessed, in order to raise the whole amount thus declared to be due to the minister. Every twenty years, by an application to the Court of Session, if he can prove that the resources of the parish have increased, he may secure an augmentation of his stipend. Since 1810, by an act of Parliament, all stipends are made up out of the Exchequer to L.150. In parishes recently constituted the stipend depends upon an endowment through a fund raised by voluntary contributions.

Theological education.

The last regulations on the subject of the education required for the privilege of license and admission to the ministry are contained in an act of Assembly (1856). All the classes necessary for the degree of Master of Arts must be attended in four successive sessions,—Greek and Latin in the first session, logic and moral and natural philosophy, separately, in the three following sessions. Mathematics must be studied in a university at least for one session before the student enters the class of natural philosophy. The theological course is completed in four sessions; attendance is required for two sessions in the classes of church history, Hebrew, and biblical criticism, if such classes exist in the university to which the student belongs; while, in regard to systematic theology, he may attend three regular sessions and a partial one, or two regular, with three partial sessions.

Schools.

The care of the parochial schools has been entrusted to the Church of Scotland, as from the first the church devised and promoted the system of national education pursued in them. The right of electing the schoolmaster is vested in the minister of the parish, and all heritors in possession of land to the amount of one hundred pounds Scots. The schoolmaster is responsible for his moral conduct and professional diligence to the presbytery. According to a report submitted by the inspector to the Privy Council in 1854, the five classes of schools which follow, with the numbers of each respectively, are in connection with, and more or less under the care of the Established Church:—Parish schools, 1049; sessional, 119; General Assembly, 179; Christian Knowledge Society, 232; and Gaelic School Society, 52.

Missions.

The Church of Scotland has a mission in India, with separate stations in Calcutta, Madras, and Bombay. The missionaries, foreign and native, are about 10 in number. It maintains also missionary operations, through means of 12 labourers, among the Jews in Karlsruhe, Salonica, Cassandra, Smyrna, Voorla, Constantinople, and Alexandria.

Colonial churches.

In connection with this church there are synods in England, Canada, Nova Scotia, New Brunswick, New South Wales, and Victoria, together with presbyteries in Tasmania and Guiana, and separate congregations in different parts of the world.

Free Church.

II. *Free Church.*—This denomination—the next in size among the Presbyterian churches of Scotland—assumed distinct organization in May 1843, though it claims to represent the Church of Scotland as recognised by the state in the acts of 1592 and 1690. The causes which led to the disruption of the Established Church in 1843 are somewhat various. The movement of which it was the consummation was characterized by two stages,—the former being simply a struggle for popular rights, and the latter an assertion of the intrinsic spiritual jurisdiction of the church against what was deemed an invasion by the civil courts of its independence. It is not difficult to trace the origin of the movement. The theory of Presbyterianism implies a certain amount of deference to the popular mind: historically, the policy of the great leaders of the church, Knox, Melville, and Henderson, had been to base it upon the affections of the people, as the best safeguard against royal encroachment or aristocratic domination; and the traditional conviction of its members for generations, confirmed by the explicit doctrine of the First Book of Discipline, had been, that it was the privilege of the people to elect their ministers. Conspiring with the influence of these facts to awaken a demand for the restoration of the privilege, were the revival of evangelical feeling within the pale of the church and the rapid growth of dissent beyond it. So soon as the former spread so far as to influence the majority of the church, concession to popular right could not but follow if the evangelical party were true to their own principles, while the danger arising from the latter became more obvious when the question was distinctly raised and keenly debated as to the lawfulness of any alliance between church and state. In the controversy which arose on this point it was pleaded by the advocates of Established churches that alliance with the state was a cumulative, not a privative arrangement,—one which, without the least abatement of its liberties, simply added to all the privileges enjoyed by the church the express and formal sanction of the state; so that an Established church possessed a security for its freedom beyond any Dissenting community. It was in vain to urge this theory, however, when the yoke of patronage all too plainly indicated the thraldom under which the church was labouring. The zeal of its champions was naturally in these circumstances led to devise, as indispensable for the safety of the church, some scheme of relief from the yoke. The practical measure to accomplish this end bore the name of the Veto, and was first proposed in the Assembly of 1833 by Dr Chalmers. Since the *call*, or invitation from the people to the presentee that he should accept and fulfil the office of pastor over them, had all along been recognised as among the established forms and usages of the church even under the law of patronage, it was believed that it was still more within the power of the church to ascertain how far the people concurred in the proposed settlement, not by a positive call, but by a simple dissent. It was only, however, in the ensuing Assembly of 1834 that the motion in favour of the Veto was carried. The principle embodied in the motion is thus expressed:—"If, in moderating in a call to a vacant pastoral charge, the major part of the male heads of families, members of the vacant congregation and in full communion with the church, shall disapprove of the person in whose favour the call is proposed to be moderated in, such disapproval shall be deemed sufficient ground for the presbytery rejecting such person, and he shall be rejected accordingly." The competency of the Assembly to pass such an enactment was speedily tried before the civil courts. When a presentation to Auchterarder was issued, the call to the presentee was signed only by 3, while a protest against his settlement was signed by 287 out of 330 persons on the roll of communion. In obedience to the regulations of the Assembly, he was rejected by the presbytery. The patron ultimately took the case into the Court of Session. The discussion turned on the points, whether it was competent for the Assembly to pass such an enactment as the Veto; and if this point fell to be decided in the negative, whether any other result could follow than the forfeiture by the church, during the lifetime of the presentee, of all the civil emoluments of the benefice. By a majority of seven against five judges, it was ruled, on March 8, 1838, that the Veto Act was illegal.

The struggle at this stage took a new form; it now became resistance to civil encroachment on the spiritual jurisdiction of the church, as well as the maintenance of popular rights. Resolutions in support of the independence of the church were passed in the Assembly of 1838, and it was agreed to prosecute the appeal against the decision of the Court of Session to the House of Lords. The supreme court confirmed the decision of the inferior. The course taken by the Assembly, when it met in the following May of 1839, was to enjoin "implicit obedience to the decisions of the civil courts in regard to *civil* rights and emoluments," while it adhered to the principle of non-intrusion as "an integral part of the constitution of the church." Several cases—Lethendy, Marnoch, and others—speedily occurred in which the collision between the civil and ecclesiastical courts was renewed. In the judgment of those who formed the majority of the Assembly at this time, and who afterwards organized themselves into the Free Church, according to their protest at the disruption, the effect of the decisions in the courts of law was—1. That the courts of the church, in their spiritual functions, were coerced by the civil courts to the extent of being compelled to intrude ministers on reclaiming congregations; 2. That civil interdicts could arrest the preaching of the gospel and the administration of ordinances by the church; 3. That spiritual censures could be suspended by civil courts; 4. That deposed ministers and probationers deprived of their license could be restored to their status by a civil mandate; 5. That the right of membership in ecclesiastical courts could be determined by the civil courts; 6. That a minority of the former, in defiance of a majority, could be authorized by the civil courts to exercise spiritual functions; 7. That processes of discipline could be arrested by the civil courts; and lastly, That without the sanction of the civil courts no provision could be made for the spiritual cure of a parish, although such provision left all civil rights and patrimonial interests untouched. Smarting under such grievances, the church composed a claim of rights, which, when presented to both houses of legislature, was rejected. Various ineffectual attempts to adjust the difference had been made, and bills proposed by Lord Aberdeen and the Duke of Argyle. Prolonged and intricate negotiations to secure relief had also failed. The Assembly of 1843 arrived; and, since the government still declined to interfere, Dr Welsh, as moderator of last Assembly, proceeded, immediately after prayer, to read the protest to which we have just alluded, signed by 203 members of the court, against the lawfulness of a court met under liabilities to civil coercion in its spiritual procedure, and announcing their intention to withdraw from the Establishment. Having read the protest, he bowed to the commissioner and retired, followed by all who adhered to it, amid the deep emotion of the spectators, who could not but reverence, whatever view they took of the questions at issue, the magnanimity of men thus laying on the altar of principle the costly sacrifice of their endowments.

Extent. The number of ministers who signed the deed of demission by which they renounced all claim to their stipends, was 474. A few more were subsequently added to the list. The increase of the church has been such, that it now has upwards of 800 ministers, under 71 presbyteries and 16 synods. The congregations amount to 867.

Support. The support procured for these ministers, and for the other objects of the Free Church, is one of the marvels of Christian liberality in modern times. Before the Disruption, the members of the church had undergone but a partial training for the maintenance of Christian schemes. All at once they took rank as among the foremost of Christian churches in contributions for the support and extension of the gospel. The ministry is supported from two sources,—a common sustentation fund, from which each minister draws an equal dividend, varying according to the amount of the fund annually; and the supplementary contributions which a congregation may feel it needful to give its pastor. By the former, provision is made against the caprice of a congregation, if disposed to interfere unduly with the faithfulness of a pastor in the exercise of his office; by the latter, a stipend may be adjusted to local necessities and peculiar claims. At the close of the financial year in March 1858, the former rose to L.110,254, yielding a dividend of L.138 to each minister on the fund; the congregational fund, from which the supplements are drawn, but which at the same time covers other expenses, amounted to L.52,556. The building fund, for the erection of new churches and manses, was L.46,896; and the fund for missions and education L.56,776; besides a fund for miscellaneous objects, amounting to L.25,386. Besides their stipends, a large proportion of the ministers—about 570—occupy manses provided for them by the church.

Standards. The *standards* of the Free Church are "the several formularies as ratified, with certain explanations, by divers acts of Assembly in the years 1645, 1646, and particularly in 1647." These formularies are,—the Confession of Faith, to which subscription is exacted from every office-bearer; the Catechisms, Larger and Shorter, which are enjoined as useful for catechising; the Directory for Public Worship; the Form of Church-government and the Directory for Family Worship; which are to be used as regulations rather than tests. The Sum of Saving Knowledge is also recognised. All office-bearers, on admission to office, must subscribe a formula binding them to the Claim of Right and the Protest.

Constitution. The *constitution* of the Free Church is not materially different from that of the Establishment. There is the same gradation of courts, the ministers are chosen by the members of the church, and the General Assembly is composed exclusively of representatives in a certain proportion from each presbytery,—240 ministers and 240 elders, with two professors from each of the three theological faculties.

Schools. There are now 614 schools under the care of the Free Church, along with two normal schools. The sum raised in support of them last year was L.16,673.

Theological education. The Free Church, in regard to the education of candidates for the ministry, adopts the same course in science, literature, and philosophy with the Established Church. It has, however, three theological halls,—one in Edinburgh, another in Glasgow, and a third in Aberdeen. In session 1857–8, 127 students attended the hall in Edinburgh, 36 in Glasgow, and 24 in Aberdeen. The general course of education in theology embraces the various departments of apologetic, systematic, and exegetical theology, together with Hebrew and church history. Four sessions of attendance at the hall are required. In regard to two of them, liberty of partial attendance is granted, though seldom, only on special application, and on the understanding that two years of enrolment are given in compensation.

Missions. There are in connection with the foreign missions of the Free Church 35 ordained missionaries: 20 at various stations in India—Calcutta, Chinsurah, Bombay, Madras, Puna, Sattara, and Nagpore, assisted by 10 ordained native missionaries; and 5 at four different stations in Africa. There are 9 missionaries labouring among the Jews in Constantinople, Amsterdam, Breslau, Pesth, Frankfort, and Galatz. Besides these schemes, the Free Church has instituted evangelical operations for the benefit of the large towns, the Highlands, and various localities in the rural districts of Scotland.

Affiliated churches. There are several synods,—in Canada, Nova Scotia, New Brunswick, Eastern Australia, Victoria, and New Zealand, together with presbyteries in South Australia and Tasmania, and separate congregations in Africa, the East and West Indies, and some important cities in Europe,—all of which are in close and direct connection with the Free Church of Scotland.

UNITED PRESBYTERIAN CHURCH. III. *The United Presbyterian Church.*—The causes which led to the first secession from the Church of Scotland had existed from the memorable era of the Revolution. The first Parliament which met after that event abolished Episcopacy, and the royal supremacy in ecclesiastical affairs, ratified the Westminster Confession of Faith, together with the Presbyterian form of church government and discipline, abolished patronage, and vested the election of ministers in the heritors and elders, with the consent of the congregation. But this ecclesiastical settlement was in various respects incomplete, and disappointed the hopes of the most zealous Presbyterians. King William, who had no strong predilection in favour of any one form of church government, was anxious to conciliate both Episcopalians and Presbyterians: while, therefore, he approved of the law which restored to their parishes the ministers who had been ejected at the Restoration, he was at the same time desirous that as many as possible of the present incumbents should be allowed to retain their position in connection with the new ecclesiastical establishment. The leaders of the Presbyterian party were easily induced to acquiesce in this policy; and accordingly the General Assembly, in 1694, opened to the Episcopal ministers a wide door of admission into the national church. Great multitudes of the "curates," as they were termed, were induced, for the sake of their benefice, to transfer their respect and obedience from the bishop to the presbytery, and were received "into ministerial communion" on merely acknowledging that "the church government, as now settled by law, is the only government of this church." The better class of the Episcopalian clergy refused thus to barter their principles for a mess of pottage; and the greater part of those who conformed, amounting to several hundreds, belonged to the class described by Bishop Burnet "as generally very mean and despicable in all respects, and the worst preachers he had ever heard." The admission of these time-servers into the new establishment exercised a very injurious influence both on its preaching and its polity, and laid the foundation of those measures which ultimately led to the Secession.

At the union of Scotland and England in 1707 the Protestant religion, as by law established, was ratified, together with the Presbyterian form of church government and discipline, and the unalterable continuance of both was declared to be an essential condition of the union of the two kingdoms in all time coming. In spite of this solemn pledge, that the constitution of the national church should not be tampered with by the British legislature, the right of the people to choose their pastors was wrested from them in 1712 by the Tory government, in resentment, it has been said, of the warm attachment which the Church of Scotland had shown to the Hanoverian dynasty. It is probable, however, that the real ground of the measure was a desire to secure a more complete control over the proceedings of the ecclesiastical courts, and to render the church subservient to the designs of the government. The oath of abjuration, which was imposed about the same time, proved a fertile source of discord both among ministers and people. This oath was regarded with great jealousy, and was peculiarly obnoxious to the Presbyterian clergy, both because its avowed design was the security of the Church of England, and because it seemed to imply an approbation of diocesan Episcopacy with the ceremonies of that church, and a recognition of the Queen's supremacy in matters of religion. About a third part of the clergy, including the founders of the Secession, positively refused to swear this offensive oath, though they were enjoined to do so on pain of ejection from their churches, and of paying an exorbitant fine.

For some time after the revival of patronage in 1712, the severity of the law was greatly mitigated by the general disinclination, on the part both of ministers and patrons, to avail themselves of its provisions in opposition to the feelings of the people. But after the lapse of a few years, patrons no longer hesitated to take advantage of their legal rights, and ministers were no longer disinclined to accept of presentations although given contrary to the wishes of the congregation. On the part of the people acts of resistance to the nominees of the patrons became more frequent and more obstinate, though they were almost uniformly unsuccessful; for the ruling party among the clergy were firm in their resolution that the law of patronage should be carried into effect. They found themselves, however, placed in circumstances of peculiar difficulty; for not only were the people loud in their remonstrances against violent settlements, but a considerable party of the ministers themselves strenuously opposed the intrusion of presentees upon congregations, and obstinately refused to carry into effect the decisions of the church-courts. To obviate this difficulty, in 1729 the Assembly appointed a committee of its own number to meet and ordain the obnoxious presentee; and for a period of twenty years this expedient was resorted to in cases where the presbytery proved refractory. The excitement of the people, and their resistance to the yoke of patronage, continued to increase; violent settlements prevailed in every part of the country; and in some cases the popular feeling was so strong that it was deemed necessary to employ an armed force to carry into effect the decisions of the church-courts. At the meeting of the Assembly in 1730, there were no fewer than twelve cases of appeals on the part of congregations against the intrusion of obnoxious ministers; but the dominant party were so determined to crush all opposition to their enactments, that they not only dismissed these appeals, but solemnly enacted, at this meeting of the Assembly, that henceforward no reasons of dissent "against the determination of church judicatures" should be entered on the record; thus in the most unconstitutional manner taking away the power even of complaint. The Assembly of 1731 followed closely in the footsteps of its predecessor. By the law of patronage it was provided, that if the patron suffered six months to elapse without exercising his right of presentation, the presbytery to which the vacant parish belonged was empowered to take steps for its settlement. The presbyteries in these cases frequently gave the people the right of choosing their ministers; and with the view of destroying this last remnant of popular election, an overture was laid before the Assembly of 1731, proposing that when the right of appointment devolved upon presbyteries, the power of election in vacant parishes should belong only to the elders and Protestant heritors, and, in royal burghs to the elders, magistrates, and town-council. This overture was transmitted to the different presbyteries, that, according to the regulations of the Barrier Act, their opinion respecting it might be given at next meeting of the Assembly; and though a great majority of those presbyteries from whom reports were received expressed disapprobation of the mea-

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sure, the supporters of the overture obtained a majority of the Assembly of 1732 in its favour.[1]

Mr Ebenezer Erskine and some other ministers protested against this decision as being unconstitutional, but the Assembly refused either to receive or record their protest. Forty-two ministers then addressed a memorial to the Assembly respecting these arbitrary enactments; but the document was not even allowed to be read; and a similar remonstrance, signed by seventeen hundred elders and laymen, was treated with equal contempt.

These violent and unconstitutional proceedings excited great indignation and alarm throughout the community; and a series of events which occurred at the same time showed that the dominant party in the church were not only ready to sacrifice the rights and liberties of the people at the shrine of authority, but were indifferent, if not hostile to the fundamental doctrines of evangelical religion. The conduct of the Assembly towards the Presbytery of Auchterarder in the year 1717, with regard to what has since been denominated the Auchterarder Creed,—the vindictive proceedings against the twelve ministers, known by the name of "Marrow men," who endeavoured to check the progress of error by reprinting and circulating a celebrated treatise of the sixteenth century entitled the *Marrow of Modern Divinity*,[2]—and the unqualified condemnation of the doctrines of that work by the Assembly in 1720, presented a chilling and melancholy contrast to the leniency shown to Professor Simpson of Glasgow, who, though found guilty of teaching from the chair of theology a system of combined Arianism and Pelagianism, was merely suspended from his ecclesiastical functions, and that with undisguised reluctance, while he was continued in the fellowship of the church, and in the enjoyment of all his official endowments.

The great body of the people, together with a section of the clergy, were indignant at this rapid declension of the national church both in doctrine and discipline. In the language of the times, "the carved work thereof was broken down, and the heritage was desolate." The breach between the dominant party and their opponents daily widened, and a crisis speedily came.

Among the opponents of the arbitrary measures of the Assembly in 1732, Ebenezer Erskine, minister of Stirling, held a prominent place. Though the son of an ejected clergyman in the days of the persecution, he was descended from the Erskines of Shielhill, a branch of the ancient and noble house of Mar. He thus, as Mr Burton remarks, united those two idols of the Scottish common people, which they regretted to see so seldom in conjunction, antiquity of blood and orthodoxy of creed. He was a scholar and a gentleman, as well as a popular preacher; and his talents and learning, his faithfulness in the discharge of his ministerial duties, and his intrepidity and zeal in the cause of truth and liberty, had secured him the respect and esteem of his brethren, as well as extensive influence among the people. In the various important questions which had been agitated after his entrance into the ministry,—the abjuration oath, the controversy respecting the *Marrow of Divinity*, and the process carried on against Professor Simpson,—he had shown himself an active and fearless opponent of the measures pursued by the ruling party in the church. He was not only one of those who signed the representation of grievances laid before the Assembly in 1732, but being a member of Assembly that year, he spoke and protested against its rejection. Being at that time moderator of the synod of Perth and Stirling, he opened the meeting at Perth, on the 10th of October following, with a sermon from Psalm cxviii. 22, in the course of which he remonstrated against the act of the preceding Assembly with regard to the settlement of ministers, alleging that it was contrary to the word of God and the established constitution of the church. These statements gave great offence to several members of synod, and after the court was constituted, and a new moderator chosen, a formal complaint was lodged against him, for uttering several offensive expressions in this sermon.[3] This was done accordingly, and Mr Erskine having been heard in reply, after a hot and keen debate of three days, the synod, by a majority of six votes, found Mr Erskine censurable for some expressions in his sermon, "tending to disquiet the peace of the church, and impugning several acts of Assembly, and proceedings of church judicatories." Against this sentence Mr Erskine protested, and appealed to the General Assembly. That venerable court, which met in May 1733, affirmed the sentence of the synod. Mr Erskine, however, declared that he could not submit in silence to the rebuke and admonition, and presented a written protest, to the effect, that as the Assembly had found him censurable, and had rebuked him for doing what he conceived to be agreeable to the word of God and the standards of the church, he should be at liberty to teach the same truths, and to testify against the same or similar evils, on every proper occasion. To this protest Messrs William Wilson, minister at Perth, Alexander Moncrieff, minister at Abernethy, and James Fisher, minister at Kinclaven, gave in a written adherence. The Assembly, in accordance with the arbitrary rule which had given so much offence, refused to permit the protest to be read, and the four protesters left the paper on the table and withdrew. Here the matter would in all probability have terminated, as at that period none of the four entertained any intention of separating from the national church. But an overruling Providence had ordered it otherwise. The court had proceeded to a different business, when the protest, which had fallen from the table, was accidentally picked up by a certain Mr James Nasmyth, minister of Dalmeny, designated by a contemporary "a fiery man in the corrupt measures of that time." Upon perusing the document, he rose with great indignation, and called the attention of the Assembly to the insult which he alleged had been offered to their authority. The protest being read, a great uproar ensued, and the Assembly ordered their officer to summon the four brethren to appear at the bar of the court next day. They obeyed the citation, and a committee was appointed to retire with them in order to persuade them to withdraw their paper. The committee having reported that their persuasions had produced no effect on the minds of the brethren, the Assembly ordered them to appear before the Commission in August following, and retract their protest; and if they should not comply, and testify their sorrow for their conduct, the Commission was empowered to suspend them from the exercise of their ministry, and even to proceed to a higher censure in case of their acting contrary to the sentence of suspension.

The Commission met in August accordingly, and the four ministers still adhering to their protest, were suspended from the exercise of their office. At the meeting of the Commission in November, they were severed from their respective charges, their churches declared vacant, and all ministers of the Church of Scotland were prohibited from employing them in any ministerial function. When this sentence was intimated to the four brethren, they protested that their ministerial office and pastoral relation should be held firm and valid, that they still adhered to the principles of the true Presbyterian Covenanting Church of Scotland, though they were now obliged to "MAKE A SECESSION from the prevailing party in the ecclesiastical courts, and that it should be lawful for them to preach the gospel and discharge all the duties of the pastoral office according to the word of God, the Confession of Faith, and the constitution of the Church;" and they concluded their dignified protest by an appeal to "the first free, faithful, and reforming General Assembly of the Church of Scotland."

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[1] Reports were received from forty-nine presbyteries; six approved of the overture without alteration, twelve on condition that certain important amendments were introduced, while thirty-one gave it their unqualified condemnation. Eighteen presbyteries gave in no report.

[2] The author of this famous treatise was Edward Fisher of Brazenose College, Oxford.

[3] The persons who took the lead in moving for investigation were, Messrs Adam Ferguson, minister at Logierait; James Mercer, minister at Aberdalgie; James Mackie, minister at Forteviot, afterwards at St Ninians; and the Laird of Glendoig, ruling elder.

The Secession properly commenced at this date. A few weeks after their expulsion from the national church, the four brethren met at Gairney Bridge, a small hamlet in the neighbourhood of Kinross (5th December 1732), and formally constituted themselves into a presbytery. In the new and trying circumstances in which they were placed they conducted themselves with great caution and prudence. Anxious to avoid everything like rashness or precipitancy, they resolved to hold their meetings chiefly for prayer and religious conference, and to defer proceeding to any judicial acts till they should see whether the ecclesiastical courts would retrace their steps.

Meanwhile the harsh and unjust treatment of the four brethren had excited great agitation throughout the country. The mass of the people regarded Mr Erskine and his associates as sufferers for the cause of truth and religious freedom. Many of the clergy themselves sympathized with the Seceders, and the sentence against them had been carried only by the casting-vote of the moderator or chairman of the Commission. The ruling party felt that in their eagerness to crush opposition, they had gone too fast and too far, and they now saw the necessity of making some concessions in order to allay the public agitation, and prevent the spread of disaffection and schism. When therefore the Assembly met in 1734, it was seen that a considerable re-action had taken place in that body. When the Commission-book was examined, there was some marked reservations made in the approval of its proceedings. The act of 1730 forbidding church-courts to record dissents and protests, and the act of 1732 respecting the settlement of vacant parishes, were repealed. The Commission was directed to petition his Majesty and the Parliament for the repeal of the Patronage Act; and the Assembly authorized the Synod of Perth and Stirling to restore the ejected ministers to their respective charges and ministerial position.

It was supposed that the dispute between the Seceders and the Assembly was now amicably settled, and to show that the reconciliation was sincere, the Presbytery of Stirling elected Mr Erskine their moderator, and sent a deputation to request him to accept the office. The four brethren, however, were not satisfied that it was their duty to return to the bosom of the church from which they had been ejected. Their strong attachment to the church of their fathers had kept them within its pale, although feeling deeply day by day that it was rapidly degenerating both in doctrine and discipline. But now that they had been expelled from its communion for their fidelity to the cause of truth and justice, they at once took their stand upon the original constitution of the Scottish Establishment, and thus put an impassable gulf between them and the men who swayed the counsels of its degenerate successor. They were of opinion that the reforms which had been made by the Assembly of 1734 were dictated merely by policy and by no real regard for the cause of truth. The sentence against them had indeed been rescinded, not, however, because it was unjust, but simply because it was inexpedient, for the synod was expressly forbidden to "judge of its legality or formality." They were therefore treated merely as pardoned offenders, not as the vindicators of the principles and constitution of the church; and they had no security against a repetition of the unconstitutional and sinful acts against which they had testified. After long and careful deliberation, therefore, they were unanimously of opinion that it was their duty to remain in a state of separation till they should see unequivocal and decided evidence that the course of defection was in reality abandoned. "Some brethren call upon us to come in and help them against the current of defection," said Ebenezer Erskine, "but now that the hand of Providence has taken us out of the current against which we were swimming, and set us upon the reformation ground, by a solemn testimony and constitution, it would be vain for us to endanger ourselves by running into the current again, unless our reverend brethren who call for our help can persuade us that our doing so will turn the current and save both them and ourselves, and so preserve the Lord's work and testimony."[1] On forming themselves into a presbytery in 1733, they drew up what was termed an extrajudicial Testimony to the doctrine, worship, and government of the Church of Scotland, together with a statement of the grounds of their secession. But now assuming a loftier tone, they prepared a document setting forth the reasons of their refusal to abandon their separate position, and stating the terms on which they were willing to return to the bosom of the Establishment.

The proceedings of the Assemblies of 1735 and 1736 seemed to the seceding ministers fully to justify the opinions which they had formed respecting the measures adopted by the Assembly of 1734, and to dispel, for the time at least, all hopes of a reunion with the Established Church. They therefore proceeded to exercise "judicial powers" as a church court, published "A Judicial Testimony," and organized churches in various parts of the country. In 1737 the celebrated Ralph Erskine of Dunfermline, brother of Ebenezer Erskine, and three other ministers, abandoned the Establishment, and joined the "Associate Presbytery," which now consisted of eight clerical members. Numerous and urgent applications for supply of sermon having been received from nearly all the lowland districts of Scotland; and the Seceders having now renounced all hopes of a reunion with the national Church, resolved to adopt measures for extending and perpetuating the benefits of the Secession. Accordingly, Mr Wilson of Perth, a person of great ability and learning, was chosen professor of divinity, and entrusted with the education of candidates for the ministry. These measures necessarily produced a complete separation between the Seceding ministers and the Establishment. They were cited to answer for their conduct at the bar of the Assembly in 1739, and obeyed the summons, appearing before the court as a constituted presbytery, and formally declined the Assembly's authority. The court was startled at this "unparalleled boldness;" and though it declared the refractory ministers worthy of deposition, did not venture to pronounce sentence against them till next year, when they were all deposed, and ordered to be ejected from their churches. But though deprived of the position and emoluments connected with the Establishment, they all continued to discharge the duties of their office in their respective congregations, who zealously adhered to their ministry, erected places of worship for them, and provided for their support. Meanwhile, cases of violent settlements of ministers increased throughout the country; and the opposition of the parishioners was frequently so formidable and popular, and the excitement so great, as to render the attendance of a guard of soldiers necessary at ordinations. These contests had of course a powerful influence in swelling the ranks of the Seceders. Had they been men "after this world," skilful in devising and carrying out schemes for the organization of masses of men, there can be little doubt that, notwithstanding the hostility of the nobles and gentry, they might, by dexterous management, have induced the great majority of the middle and lower classes to abandon the Establishment and join the cause of the Secession. Even as it was, without any plan or organized system for the extension of their cause, it rapidly "grew and multiplied." New accessions were made to them from all quarters. Upwards of seventy applications for sermon were made to the Associate Presbytery during the years 1737–38. Young men were licensed to preach the gospel in connection with the Secession. Some even of the probationers of the Established Church joined the new body; and their theological hall was in such a flourishing condition, that in the year 1741 it was attended by a greater number of candidates for the ministry than any of the Scottish universities except Edinburgh. The presbytery speedily expanded into a synod, consisting of thirty settled congregations and sixteen vacancies, and held its first meeting at Stirling in 1745–46, the memorable year of the Rebellion.

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[1] Letter from the Rev. Ebenezer Erskine to the Presbytery of Stirling.

The progress of the Secession, however, was greatly impeded by an unhappy controversy which arose at this time respecting the religious clause of the oath taken by burgesses in Edinburgh, Glasgow, and Perth. One party insisted that no Seceder should be allowed to swear this oath, as it was utterly inconsistent with the Secession Testimony; while the other urged that it should be made a matter of forbearance. "So sharp was the contention between them," that at the meeting of synod in April 1747, after several long and stormy discussions, an entire separation took place between the contending parties. Seldom has the truth of Father Paul's remark been more strikingly verified,—"In verbal contentions, the smallness of the difference often nourishes the obstinacy of the parties." Those who condemned the swearing of the burgess oath as sinful were called "Antiburghers," and the other party who contended that it should be declared not to be a term of communion were designated "Burghers." The latter made various attempts to bring about a reconciliation with the opposing party, but without success. The "Antiburghers" not only refused to agree to a proposal that they should hold a general meeting for prayer and friendly conference, but ultimately went the length of passing sentence of deposition and excommunication, with all due formality, on Messrs Ebenezer and Ralph Erskine, James Fisher, and the other ministers who had adopted the opposite views respecting the swearing of the burgess oath. A furious controversy raged between them for a number of years, both from the pulpit and the press. In the course of time, however, this hostility subsided; a feeling of cordiality gained ground; and after a separation of upwards of seventy years, the two bodies were again united into one.

These divisions among the Seceders afforded an excellent opportunity to the dominant party in the national church to have regained their lost influence with the people; but instead of availing themselves of it to check the progress of the Secession, they only became more hostile to the doctrines of evangelical religion, and more resolute in enforcing the law of patronage. "The language of the majority in Assemblies at this time," says the late Sir Henry Moncrieff, "universally was, that the secession from the church, instead of increasing, was on the decline, and that the superior character and talents of the Established clergy were gradually weakening its resources, and would ultimately exhaust them. Experience has not verified these sanguine expectations. At the distance of a few years after Dr Robertson retired, the people, disgusted with unsuccessful processes before the Assembly, relinquished the plan of their predecessors, and came seldom to the Assembly with appeals from the sentences of the inferior courts appointing the settlement of presentees whom they resisted. But they began to do more quietly, or with less observation than formerly, what was not less unfriendly to the Establishment. In ordinary cases they now leave the church courts to execute their sentences without opposition, and set themselves immediately to rear a meeting-house, which very frequently carries off a large portion of the inhabitants of the parish."[1] This state of comparative quiescence, however, was not produced without long and severe struggles for many years: the disputes in the church courts respecting the settlements of ministers were incessant. In the year 1751, an unpopular minister having been presented to the church and parish of Inverkeithing, the great body of the parishioners protested against his settlement amongst them, the presbytery of Dunfermline refused to induct him, and the synod of Fife proved equally refractory. The case was brought before the Assembly of 1752, and, mainly through the influence of Dr Robertson, it peremptorily enjoined the Presbytery of Dunfermline to proceed with the settlement of the presentee, and ordered all the members of presbytery to attend on that occasion. Six ministers who absented themselves, from conscientious scruples, were brought to the bar of the Assembly; and one of them, Mr Thomas Gillespie, minister of Carnock, near Dunfermline, was immediately deposed; three others were deprived of the power of sitting in all church courts except their own sessions. This tyrannical and most disgraceful proceeding led to another secession from the Established Church. Mr Gillespie, notwithstanding his deposition, continued his ministrations in the neighbouring town of Dunfermline; and a few years after, he and a son of the celebrated Thomas Boston of Etterick, and a Mr Collier, formed themselves into a presbytery, and became the founders of that numerous and respectable body of Dissenters entitled the *Synod of Relief* (now merged in the United Presbyterian Church), formed for the purpose of giving RELIEF to oppressed Christians from the yoke of patronage and the tyranny of the church courts.

The downward progress of the Established Church, both in doctrine and in discipline, still continued. The fundamental doctrines laid down in its standards were denied by many of its ministers, and Pelagian and Socinian errors were openly taught by them, both in the pulpit and through the press. At length Principal Robertson himself became alarmed at the proceedings of his followers, and retired from the leadership of the Assembly in 1781, partly at least, if not mainly, because a section of the "moderate party" insisted on getting rid of the Confession of Faith altogether. In these circumstances it is not to be wondered at that the spirit of disaffection continued to spread among the members of the Establishment, and that the Seceders rapidly increased in numbers, in spite of the strife that prevailed among themselves at this period. Not only did the Associate Synods steadily extend their influence in Scotland by the accessions which they were constantly making to the ranks of their adherents, but they sent preachers to England, to Ireland, and even to America, and erected a considerable number of Secession congregations in these countries.

Towards the close of the eighteenth century the tranquillity of the Associate synods was again disturbed by a controversy respecting the power of the civil magistrate in matters of religion, and the perpetual obligation of the national covenant. A great majority in both synods abandoned the old ground held by the early Covenanters; denied the right of the civil magistrate to interfere with the church, and of the church to accept the support of the state; declared that the power of the church is wholly spiritual, while the end of civil government is the public and temporal good of civil society; that neither of these kingdoms has power over the other; that the church has no civil authority, and the magistrate no spiritual jurisdiction. These principles, thirty years later, led to what is called the "voluntary controversy," which raged fiercely for several years, and has exercised a most momentous influence upon the religious condition of Scotland. In consequence of these "New Light" views, as they were termed, a small party who held the opinions stated in the Confession of Faith respecting the right and duty of the civil magistrate, seceded from both synods. Dr M'Crie, the able and learned biographer of Knox and Melville, and several other ministers, quitted the Antiburgher Synod on this ground in 1804, and formed themselves into a distinct presbytery. A few years earlier the Burgher Synod agreed not to require from their ministers an approbation of those "parts of their standard-books which have been interpreted as favouring compulsory measures in religion," or of "the obligation of the national covenants upon posterity." Three ministers protested against this decision, constituted themselves into a distinct presbytery, and became the founders of the "Original Burgher Synod," which in 1839 returned into the bosom of the national church. An attempt was made by these separatists to obtain possession of the property of the synod, on the alleged ground, that the latter had abandoned the principles which their predecessors in the Secession had always maintained. An appeal to the courts of law was made on this point by one of the ministers and a portion of the Associate congregation of Perth, who had joined the "Old Light" party, and claimed the exclusive possession of the manse and place of worship. After a long and expensive litigation, in the course of which the process was carried from the inferior courts to the House of Lords, and thence remitted back to the Court of Session, it was ultimately decided that the pursuers had separated from the congregation to which they belonged without any sufficient cause, and that they had consequently no right to disturb the defenders in the possession of their property. The question was one of great importance, and the principle laid down in this instance by Lord Chancellor Eldon as the ground of judgment has ever since been regarded as the settled law of the country in all similar cases.

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[1] Appendix to *Life of Dr Erskine*, by Sir H. Wellwood Moncrieff, Bart., p. 464.

No other event of much importance occurred in the history of the Secession Church till the period when the two great branches of which it was composed were again happily united into one on the 8th of September 1820, in Bristo Street church, Edinburgh,—the spot where, seventy-three years before, the separation had taken place. Ten ministers of the General Associate, or Antiburgher Synod, refused to concur in the union, and soon after formed a junction with Dr M'Crie, Professor Bruce, and the other ministers who withdrew from the same synod in 1806. This highly respectable body assumed the name of "the Associate Synod of Original Seceders," and ultimately consisted of four presbyteries and thirty-six congregations.

The only other incident that remains to be noticed is the union between the Secession and Relief Churches. Negotiations for this purpose were commenced in 1835. A scheme of union was agreed on in 1840; but it was not consummated till the 13th of May 1847 in Tanfield Hall, Edinburgh,—the scene, four years previously, of the first Assembly of the Free Church of Scotland. The designation of the combined bodies is the United Presbyterian Church. The United Presbyterian Church has the same standards, the same Confession of Faith and Catechisms, the same form of government and ritual, as the Established Church. It has also lay elders, sessions, and presbyteries; but instead of a General Assembly, its supreme court is a general synod, composed of all the ministers having charges, with an elder from each session. The conditions of membership are a credible and intelligent profession of the faith of Christ, accompanied by a corresponding character and deportment. All the members of the church, without distinction of office or rank or sex, have a right to vote in the election of ministers and other office-bearers, and in the management of congregational affairs. Only members in full communion are permitted to observe the Lord's Supper, which is celebrated at least four times a year in nearly all the congregations. Baptism is administered in the church, unless in special cases, and only to the children of members in the full possession of their privileges. A formula, closely resembling that of the Established and Free churches, is employed at the licensing of the preachers, and the ordination of the ministers, of the United Presbyterian Church; but they "are not required to approve of anything in the standards of the church which teaches, or is supposed to teach, compulsory or persecuting and intolerant principles in religion."

Theological Education.

The education of candidates for the ministry has always been reckoned a matter of the greatest importance by the United Presbyterian Church. The course of preliminary training is very nearly the same as that adopted by the Establishment. Students must attend at least four sessions at one of the national universities, and the course of preparatory study includes Latin, Greek, logic, moral philosophy, mathematics, natural philosophy, and Hebrew. The divinity hall meets annually in August, and continues for eight weeks. There are five chairs of theology,—viz., sacred languages and Biblical criticism, hermeneutics and evidences, exegesis, systematic and practical theology, and ecclesiastical history, comprehending the history of doctrine, ritual, and government. The term of study is five years. During the vacation, the students are under the superintendence of their respective presbyteries, who examine them as to their progress in their studies, and hear and criticise their trial discourses. The number of students attending the hall is nearly 200. The United Presbyterian Church consists at present (1859) of 32 presbyteries and 528 congregations; the membership amounts to 152,622, the attendance in the churches to 181,279, the annual baptisms to 8603. Including children, about a fifth part of the population of Scotland is connected with this church.

The annual congregational expenditure is L.122,890, and the expenditure for missionary and benevolent purposes is L.39,310; making together L.162,200.

Finance.

There are 1350 Sabbath-schools and Bible-classes, attended by 76,942 scholars.

The sum of L.15,541 was raised last year, and L.170,000 during the last twenty years, for the liquidation of debt, while nearly L.120,000 has been contributed during the same period for the erection of new churches and manses. The stipends of the ministers vary from L.100 to L.550 a year. In nearly all the country congregations a manse is also provided.

Affiliated Churches.

There is a large and prosperous branch of the United Presbyterian Church in Canada, consisting of 7 presbyteries and upwards of 60 congregations, with a theological seminary of its own. In connection with the United Presbyterian Church there are also a considerable number of missionary congregations in Jamaica, Trinidad, Old Calabar, and Caffraria. Upwards of a dozen congregations have recently been established in Southern Australia; and four missionaries are about to be sent to India. The Irish branch of the Secession Church, consisting of 9 presbyteries and 134 congregations, was merged some years ago in the Presbyterian Church of Ireland.

EFORMED PRESBYTERIAN HURCH.

IV. *Reformed Presbyterian Church.*—This church has sometimes been known by the designation "Cameronians," from Richard Cameron, which, however, it rejects, as he was in no sense the founder of the body. On the contrary, in virtue of its adherence to the principles of the covenants, it claims connection with the earliest Presbyterianism of Scotland. By an act of Parliament in 1649, and by a corresponding act of the General Assembly in the same year, allegiance to the king was conditioned on his faithful adherence to the principles on which he should receive the crown, and according to which he should engage to rule. It is declared in the latter deed that he could not be admitted to the exercise of his government until he had given satisfaction in regard to the religion and liberties of the kingdom. He agreed accordingly to take the covenant, and to establish Presbytery. Afterwards, when he established Episcopacy, and put the covenants under the ban of the acts rescissory, a large body of the Presbyterians conceived that, having broken compact with the nation, he could no longer be regarded as a constitutional sovereign, and had forfeited all claim to their obedience. To this effect they issued a declaration at Sanquhar in 1680. It was with them, accordingly, a struggle for constitutional government, as clearly appears from a similar document subsequently issued at Lanark, in which, after declaring, "although we ought to take in good part whatever God in his infinite wisdom hath, for the punishment of our sins, carved out to us, and although we always ought to acknowledge government and governors as ordained by him, in so far as they govern according to the rules set down by him in his Word and *the constitutive laws of the nation*, and ought to cast the mantle of love on the lesser errors of governors, and give the best countenance to their administration, that the nature of their actions will bear; yet when all these laws, both of God and the kingdom, conditional and constitutive of the government, are cassed and annulled," they proceed, having enumerated their grievances, to affirm that, to yield "implicit submission" to the royal will, as "an absolute and sovereign rule," would be "to destroy themselves and betray posterity." In 1681 they were organized into various societies, maintaining close correspondence. When the ministers to whose preaching they listened were cut off by the sword of unrelenting oppression, James Renwick was sent to receive ordination from the Dutch clergy. On his return, he wielded considerable influence over the societies. Endowed with no common gifts of winning eloquence, together with fervent piety and amiable dispositions, he secured the attachment of his followers, and revived the enthusiasm of the nation in behalf of the principles of the Reformation. The only document of authority issued by the societies—the Informatory Vindication—was prepared chiefly by Renwick; and it is but fair that their opinions should be judged of from it, rather than from the hasty and unauthorized expressions of individuals,—the more especially as in this very document they complain that prejudices had been created against them in this way, by the "extravagances" into which some of their number had fallen through "overmuch rigidity and strictness." As to their relations to the government, they intimate their intention to take up arms only in self-defence; and as to the abettors of the prevailing tyranny, they affirm, "not that we would martially oppose and rise up against all such, but by our profession, practice, and testimony, we would contradict and oppose them; we positively disown, as horrid murder, the killing of any because of a different persuasion and opinion from us." They have been blamed, moreover, for narrow views and extreme bitterness of feeling towards brethren from whom they separated, and towards the members of other churches. On the contrary, they speak of men who had complied so far with the demands of the government as brethren "whom they love in the Lord, and acknowledge to be ministers of his church," and "with whom they would not refuse accidental or occasional communion, as brethren and Christians;" and on the subject of communion they express sentiments which would be accounted generous and catholic, even when tested by the light of modern opinion. Discriminating ecclesiastical from catholic union, they enunciate the broadest views in regard to the latter, expressing a willingness to associate in common religious enterprises, "with some as *Christians*, holding the same fundamentals;" "with others, on stricter conditions, as *Protestants;*" "and with others, on yet stricter conditions, as *covenanted* brethren." The statement applies to "saints, whether they be natives or foreigners." So far were these men from holding, as has been alleged, that Calvinistic and Lutheran churches abroad were little better than synagogues of Jesuits.

It was from the ranks of this body that, at the Revolution, the armed companies were derived to which the Convention of Estates owed its safety and undisturbed freedom in the prosecution of its deliberations. They held in check the violence and plots of Claverhouse, and when disbanded, they received for their intrepid services the public thanks of the convention. "As these people," says the historian Crookshanks, "however reproached by their enemies as the cold, antimonarchical, enthusiastic, lunatic Cameronians, were among the first in Scotland who took up arms for the Prince of Orange, so they were the first men in Scotland that petitioned the Convention of Estates to place the crown of Scotland on the head of their deliverer King William." At a later period, in a single day, "without beat of drum or expense of levy-money," they raised a regiment of 800 men, who, marching under Cleland to Dunkeld, defeated General Cannon at the head of 5000 soldiers, and by their gallant defence of that village, retrieved the disgrace of Killiecrankie. On mature consideration, however, the societies did not feel themselves at liberty to accede to the church, as established by law at the Revolution. They went so far as to petition the General Assembly to take into consideration the difficulties under which they conscientiously laboured. The Assembly refused to allow their petition to be read. On several grounds, such as the continuance on the statute-book of the acts rescinding the second Reformation, the undue control exercised by the state in the settlement of the church, and the restrictions which, in their belief, were laid upon the liberties and the independence of the latter; they held aloof from the Established Church, while the re-establishment of Prelacy in England and Ireland, as an essential part of the civil constitution, together with the absence of such a formal guarantee as the covenants for the rights and liberties of Presbyterian Church, kept them from entertaining such confidence in the government that they could take oaths to it of unqualified approbation and support. To the present day, their descendants labour under similar difficulties. The Reformed Presbyterian Church, it will be seen, is not founded merely in antagonism to other churches on account of evils in their constitution or administration, because in date it precedes them. Its position is determined by a question of doctrine. Its adherents, while repudiating, even in documents so early as the Informatory Vindication, the error that dominion is founded in grace, attach importance to the headship of Christ over the nations, and believe that whatever civil constitution is not adjusted in harmony with this scriptural principle is to that extent without a claim upon their allegiance. They find that the British constitution, since the statute of Henry VIII., invests the monarch with perfect control in the government and discipline of the Anglican Church, and involves, in the language of the German historian Gervinus, the anomaly of "a royal Pope," with the single reservation of sacerdotal powers and functions. As it is upon the footing of adherence to the coronation oath, in which the monarch engages to uphold this system, that the oath of allegiance is sworn, Reformed Presbyterians can neither, as consistent Presbyterians, take it themselves, nor employ others as their representatives in taking it. Hence their distinctive and peculiar standing among the churches of the land.

The Rev. John M'Millan, minister of the parish of Balmaghie, was deposed in 1707, with summary rigour, for holding principles akin to those of the societies. Repudiating the validity of his sentence, he joined them, and, after a long interval, a presbytery was formed in 1743. The church increased, till, in 1811, a synod was constituted, under which there are 6 presbyteries, with 36 ministers and 45 congregations. The membership may be estimated at 6000. The annual contributions for religious purposes reported at last synod, and exclusive of congregational funds not reported, amounted to L.6000. The standards of the church are the Westminster Confession of Faith, the Catechisms, Larger and Shorter, and a Testimony authorized and issued by the synod in 1839. It has three missionaries to the heathen in the New Hebrides, and one to the Jews in London. In Ireland there are two synods, holding identical views with the Scotch synod; while in America there are two synods, and in Northern India a presbytery, bearing the same designation, and professing the same views. All these synods have separate theological halls. In Scotland, the general curriculum for the students is the same as in the other Presbyterian churches. In theology, systematic and exegetic, they must attend five complete sessions, of two months each, in successive years, under two professors.

V. *Original Secession.*—In consequence of the rupture in the Secession Church of 1747, on the subject of the burgess oath, one division had assumed the name of "The General Associate or Antiburger Synod," as opposed to "The Associate or Burgher Synod." In 1806 four ministers, among whom is the honoured name of the historian M'Crie, left the former body, on the ground that, in a Narrative and Testimony recently emitted, they had somewhat compromised the duty of the magistrate in support of religion. On effecting a union with some brethren who could not accede to the union of the two main bodies of the secession in 1820, they assumed the name of "The Associate Synod of Original Seceders." By a narrow majority, this synod resolved to merge in the Free Church, and in the course of 1852 was received into its fellowship. The minority continues a distinct body, under the name of "The Synod of United Original Seceders." They adhere to the original principles of the Secession, and attach such importance to the covenants, as to decline all ecclesiastical fellowship with churches which do not recognise their descending obligation on posterity. The synod comprehends 4 presbyteries, with 22 ministers and 29 congregations. They hold by the Westminster standards, and the Testimony originally adopted by the synod in 1827. Their divinity hall is in Glasgow. Although circumstances have prevented them from instituting a mission to the heathen, it is from no lack of zeal in such a cause, and they are committed to resolutions in its favour, on which they are ready to act as soon as an opportunity for carrying them into effect transpires.

(W. H. G.)

PRESCOT, a market-town of England, in Lancashire, 8 miles E. of Liverpool, and 198 N.E. of London. It stands on an eminence, and is a straggling place, consisting of one long street on the road between Liverpool and Manchester. The parish church, an ancient building with a lofty modern spire, is a very conspicuous object, not only in the town, but in the whole of the adjacent country. The Primitive Methodists, Wesleyans, Independents, and Unitarians have also churches in the town. A grammar school (founded in 1792, and having in 1852, 90 pupils), a girls' school, and an infant school, are the principal educational establishments here. Prescot has also a town-hall, a prison, several alms-houses, and a mechanics' institute. The principal manufactures of the town are those of watch-making tools, and the more delicate parts of watch machinery, for which Prescot has long been famous; files of excellent quality and engravers' tools, as well as coarse pottery, are also made; and there are here rope-works and cotton-spinneries. Coal mines are worked in all parts of the surrounding country. The chief supply of coal for Liverpool is obtained from these collieries. Markets are held here twice a week, and there are also several fairs. Pop. (1851) 7393.

PRESCOTT, William Hickling, a famous American historian, born at Salem, Massachusetts, on the 4th of May 1796. The first of the family of whom any record remains was John Prescott, an English blacksmith and millwright, who settled at Lancaster, New England, in 1640, and who used to take the field against Indian marauders in a helmet and breast-plate which he had brought with him from home. His grandson Benjamin was a man of influence and consideration in the colony of Massachusetts, and long represented Groton in the colonial legislature. William, the second son of Benjamin, after serving in his youth for a few months in the French war, spent the greater part of his life in farming his paternal estate at Pepperell. On the breaking out of the war of independence, at the age of forty-five, he quitted the plough for the sword, and fought in the republican ranks, where he attained the rank of colonel. He had the honour of leading his countrymen at the battle of Bunker's Hill, and of being called by Washington "Prescott the Brave." His only son William followed the legal profession, and both as an advocate and as a judge was esteemed one of the most eminent lawyers of his day. By his wife Catherine, daughter of Thomas Hickling, long United States consul at the Azores, Judge Prescott became the father of the historian. In 1808, when the boy was in his twelfth year, the family removed from Salem to Boston. In the latter city young William Prescott was placed in the academy of Dr Gardiner, a pupil of the famous Dr Parr. In 1811 he entered Harvard College, and graduated there in 1814. The classical attainments acquired through his university career gave promise of future excellence. His studies were, however, interrupted by what, to many men, would have proved a severe calamity. In the college dining-hall, a playful classmate threw at him a crust of bread, which struck one of his eyes. With that eye he never could afterwards do more than distinguish light from darkness. By the injury, the other eye was also sympathetically affected, and for many months he was shut up at home, suffering great pain, in a dark room. "In all that trying season," said his mother in after years, "I never groped my way across the apartment to take my place by his side, that he did not greet me with some hearty expression of good cheer, as if we were the patients, and it were his place to comfort us." Although the injury to the destroyed organ became in time hardly perceptible, the remaining eye was permanently weakened; and Prescott, finding himself unfit for any pursuit in which strong eyesight was indispensable, relinquished his intention of adopting the law as his profession. His father having inherited a sufficient fortune, which his practice at the bar had greatly increased, he was happily in a position of social independence. Soon after leaving college he was recommended to travel for advice, and for the benefit of his health. Crossing the Atlantic, he visited London and Paris, and consulted the best oculists there; but found that his case was one which their art had little power of relieving. From the pleasures and advantages of travel the weak state of his eyes in a great degree debarred him; but he went over a considerable portion of England, France, and Italy; and he resided for several months at Rome and Naples, where he chiefly employed himself in examining the remains of antiquity, and in reviewing the classical reading of his youth. Excepting Belgium, he never beheld with his bodily eye any of the countries, either in Europe or America, which his pen has painted so well, and with which his name will be inseparably connected. After an absence of two years, he returned to Boston in improved general health, but with eyesight, as was now obvious, permanently impaired. He soon after married Susan, daughter of Thomas C. Amory, one of the most eminent merchants of Boston, and settled down in his father's family. From 1817 Judge Prescott inhabited till 1844, when he died, an old-fashioned house in Bedford Street. It was a square edifice of brick, and painted yellow, standing alone amongst some fine elms and chestnut trees. Here the future historian commenced a life of literary labour which was rarely interrupted. "I had early conceived," he said, in a letter to a friend in after years, "a strong passion for historical writing, to which perhaps the reading of Gibbon's autobiography contributed not a little. I proposed to make myself an historian in the best sense of the term, and hoped to produce something which posterity would not willingly let die. In a memorandum-book dated so far back as the year 1819, I find the desire intimated; and I proposed to devote ten years of my life to the study of ancient and modern literature, chiefly the latter; and to give ten years more to some historical work. I have had the good fortune to accomplish this design pretty nearly within the limits assigned." In the pursuance of this plan, he was very methodical in the apportionment of hours as well as years, and rarely allowed his arrangement to be interfered with. He rose early, walked for half an hour before breakfast, and dined at half-past two. Five hours a day he passed at work in his study; three hours, broken by half an hour's walk before dinner, and two in the evening, from six to eight. He took a good deal of exercise on foot and on horseback, generally walking and riding alone; a peculiarity which he shared with his father. Although social in their habits and tenderly attached to each other, it was observed that the judge and his son, in setting out at the same moment for a walk or a ride, generally went different ways.

For some years after his return home Mr Prescott employed himself in the study of French and Italian literature. Of Italian literature he became exceedingly fond, and for some time he contemplated undertaking its history; a scheme which, however, he eventually abandoned on account of the great amount of reading which it involved. The valuable papers which he contributed to the *North American Review*, and which have several times been printed in a collected form, in some degree mark the amount of his studies. The first of these was an essay on "Italian Narrative Poetry," published in October 1824; the last, a review of Mr Ticknor's *History of Spanish Literature*. He also wrote in 1834, for Sparks' *American Biography*, a pleasing Life of Charles Brockden Brown, which likewise appears amongst his *Critical and Historical Essays*.

To the serious study of the language, literature, and history of Spain he did not devote himself until 1825, when he began to lay the foundation of that fine series of historical writings upon which his fame rests. After much reading and deliberation, he fixed upon the reign of the Catholic sovereigns Ferdinand and Isabella as the subject of his first work. These great rulers, under whose wedded sceptres Castile and Aragon became one monarchy, the remarkable group of personages who surrounded their thrones, including Cardinal Ximenes, the great captain, and Columbus, and the spirit-stirring events which made their reign so glorious for Spain and so important in the annals of the world, might at that time have been said almost to have escaped the notice of English writers. The story of Columbus had indeed been told by Robertson with a grace which compensates the defects of a narrative, of which the meagreness and inaccuracy are to be ascribed to the want not of diligence but materials. But the rest of the field was ground almost untrodden by English, French, or German writers. What little had been written on the subject in these languages had been taken almost exclusively from Italian authorities. To the rich materials afforded by the neglected Spanish chronicles of the fifteenth and sixteenth centuries there had been lately added many new and valuable stores, the fruits of the patient toil of several modern Spaniards, who were rather makers of historical collections than writers of history. Mr Prescott's choice was therefore eminently happy, both as regards the interest and the freshness of his subject, and the abundance of choice materials. He commenced his work in 1827. The remarkable difficulties which lay in his way, and the patient resolution with which they were overcome, renders this work memorable in literary history. Its progress may therefore be traced with some minuteness in the language, as far as possible, of a letter written by Mr Prescott himself in later years, when that slow and painful progress had become a portion of his triumph. For some years his eyesight had been sufficiently strong to admit of his using it for several hours a day in reading. He had already accumulated a considerable number of books and manuscripts relating to the period of which he was about to treat. A still larger number purchased for him in Europe were on their way to Boston. "But just before these materials arrived," he wrote, "my eye had experienced so severe a strain that I enjoyed no use of it again for reading for several years. It has indeed never since fully recovered its strength, nor have I ever ventured to use it again by candle-light. I well remember the blank despair which I felt when my literary treasures arrived from Spain, and I saw the mine of wealth lying around me which I was forbidden to explore. I determined to see what could be done with the eyes of another. I remembered that Johnson had said, in reference to Milton, that the great poet had abandoned his projected History of England, finding it scarcely possible for a man without eyes to pursue a historical work requiring reference to various authorities. The remark piqued me to make an attempt.

"I obtained the services of a reader who knew no language but his own. I taught him to pronounce the Castilian in a manner suited, I suspect, much more to my ear than to that of a Spaniard; and we began our wearisome journey through Mariana's noble *History*. I cannot even now call to mind without a smile the tedious hours in which, seated under some old trees in my country residence, we pursued our slow and melancholy way over pages which afforded no glimmering of light to him, and from which the light came dimly struggling to me through a half-intelligible vocabulary. But in a few weeks the light became stronger, and I was cheered by the consciousness of my own improvement; and when we had toiled our way through seven quartos, I found I could understand the book when read about two-thirds as fast as ordinary English. My reader's office required the more patience; he had not even this result to cheer him in his labour.

"I now felt that the great difficulty could be overcome, and I obtained the services of a reader whose acquaintance with modern and ancient tongues supplied, so far as it could be supplied, the deficiency of eyesight on my part. But though in this way I could examine various authorities, it was not easy to arrange in my mind the results of my reading, drawn from different and often contradictory accounts. To do this, I dictated copious notes as I went along; and when I had read enough for a chapter,—from thirty to forty, and sometimes fifty pages in length,—I had a mass of memoranda in my own language which would easily bring before me at one view the fruits of my researches. Those notes were carefully read to me; and while my recent studies were fresh in my recollection, I ran over the whole of my intended chapter in my mind. This process I repeated at least half-a-dozen times; so that when I finally put my pen to paper it ran off pretty glibly, for it was an effort of memory rather than creation. This method had the advantage of saving me from the perplexity of frequently referring to the scattered passages in the originals, and it enabled me to make the corrections in my own mind which are usually made in the manuscript, and which with my mode of writing, as I shall explain, would have much embarrassed me. Yet I must admit that this method of composition, when the chapter was very long, was somewhat too heavy a strain on the memory to be altogether recommended.

"Writing presented me a difficulty even greater than reading. Thierry, the famous blind historian of the Norman Conquest, advised me to cultivate dictation; but I have usually preferred a substitute that I found in a writing-case made for the blind, which I procured in London forty years since. It is a simple apparatus, often described by me for the benefit of persons whose vision is imperfect. It consists of a frame of the size of a piece of paper, traversed by brass wires as many as lines are wanted on the page, and with a sheet of carbonated paper, such as is used for getting duplicates, pasted on the reverse side. With an ivory or agate stylus the writer traces his characters between the wires on the carbonated sheet, making indelible marks, which he cannot see, on the white page below. This treadmill operation has its defects; and I have repeatedly supposed I had accomplished a good page, and was proceeding in all the glow of composition to go ahead, when I found I had forgotten to insert a sheet of my writing-paper below, that my labour had been all thrown away, and that the leaf looked as blank as myself. Notwithstanding these and other whimsical distresses of the kind, I have found my writing-case my best friend in my lonely hours, and with it have written nearly all that I have sent into the world the last forty years.

"The manuscript thus written and deciphered—for it was in the nature of hieroglyphics—by my secretary was then read to me for correction, and copied off in a fair hand for the printer. All this, it may be thought, was rather a slow process, requiring the virtue of patience in all the parties concerned. But in time my eyes improved again. Before I had finished *Ferdinand and Isabella* I could use them some hours every day; and thus they have continued till within a few years, though subject to occasional interruptions, sometimes of weeks and sometimes of months, when I could not look at a book. And this circumstance, as well as habit (second nature), has led me to adhere still to my early method of composition. Of late years I have suffered not so much from inability of the eye as dimness of the vision; and the warning comes that the time is not far distant when I must rely exclusively on the eyes of another for the prosecution of my studies. Perhaps it should be received as a warning that it is time to close them altogether."

Thus ten busy years rolled away. During that time appeared the *Life of Columbus* and the *Chronicles of the Conquest of Granada*, the brilliant works of Washington Irving; and it is probable that Mr Prescott felt a natural pang at thus finding himself forestalled by a formidable and already popular rival in two of the most attractive passages of his *History*. After ten years of toil, however, the *History* was completed. Of the work, as it proceeded, four copies were printed in a large type, to enable the author to refer to it with ease, and with ample margins for annotation. It was submitted to the judgment of his father, Mr Ticknor, Mr Sparks, and other friends, and received their cordial approbation. For some time, however, Mr Prescott hesitated to publish it; and it was eventually given to the world in consequence of the urgency of his literary advisers. It appeared (in 3 vols. 8vo) towards the end of 1837, both in Boston and in London. On both sides of the Atlantic its success was great. An article in the *Edinburgh Review* (No. cccxxxviii., 1839), written by Don Pascual de Gayangos, than whom no man was better qualified to judge of its merits, and whose English is no less elegant than his Castilian, pronounced it "one of the most successful historical productions of our time." In the *Quarterly Review* (No. cxxvii., 1839), Mr Ford also expressed his high admiration of a work on which no Englishman was better fitted to pass a judgment than himself, and bade Mr Prescott welcome to the high place which he had at once achieved in English letters. He characterized the book as "by much the first historical work which America has yet produced, and one that need not fear comparison with any that has issued from the European press since this century began." Germany, France, and Spain acknowledged the merits of the new historian by transplanting his work into their respective languages; and the Spanish Royal Academy of History did him and itself honour by enrolling him amongst its members.

Six years later, in 1843, *The Conquest of Mexico* (in 3 vols. 8vo), and in four years more, in 1847, *The Conquest of Peru* (in 2 vols. 8vo), proved that the industry of Mr Prescott was stimulated by success, and that his skill was considerably heightened by practice and experience. In these histories Mr Prescott had not been forestalled by any popular writer; and he led not only his English readers, but the readers of the various European countries into whose languages the works were almost immediately translated, into what were to most of them fresh fields and pastures new. Both *Mexico* and *Peru* were received with immense applause. Like *Ferdinand and Isabella*, they have been frequently reprinted; and they bid fair to remain, for many an age to come, the standard histories of some of the most interesting and eventful periods of human action and enterprise. Their merit obtained for the author unsolicited election into many of the chief literary societies in Europe and America. Amongst other learned bodies, the Institute of France placed his name in 1845 on the list of its corresponding members. The sale of his writings became a source of income, of which the author's share has been estimated at from L.4000 to L.5000 a year.

Peru accomplished, Mr Prescott turned to collect materials, or rather to complete the large stock of materials already collected, for the *History of Philip II.*, the work which he intended to be the great achievement of his later life, and the crown of his historical labours. While preparing for this extensive work, embracing the world's history during the last forty-five years of the sixteenth century, Mr Prescott indulged himself with a short visit to England. He arrived here in the summer of 1850. Many years before, he had passed through England as a young and comparatively unknown traveller; he now returned to it the American whom, of all others perhaps, intelligent Englishmen were most desirous to see and converse with. During his sojourn in London Mr Prescott was one of the most observed and popular personages in a society ever "to famous wits native or hospitable." In truth, he did not need his fame to aid his social success. His fine presence and countenance, his pleasing conversation, and his perfect manners, would have ensured him a welcome even as a nameless stranger. He had the happy gift of at once adapting himself to his company, and catching its best tone; and his varied stores of knowledge, his wide acquaintance with men, quick observation of character, and his even and genial flow of spirits, enabled him, without pause or effort, to find some common ground of thought and sympathy with every one with whom he was brought into brief and casual contact. In the course of a few weeks he became the friend of all the most distinguished members of London society. The university of Oxford conferred upon him the honorary degree of LL.D. In the early autumn he also visited some of his friends at their country houses, and made a brief tour in Scotland. He also crossed the Channel, for the purpose of consulting some of the libraries in Belgium, and of examining some of the more remarkable historical monuments and sites of that interesting country.

Four years afterwards, in 1854, two volumes of *Philip II.* were ready for the press. Mr Prescott had made an arrangement with an English publisher, by which he was to receive L.1000 for each volume of the work, which it was supposed would extend to six volumes. This bargain was, however, subject to the decision of the House of Lords in a case then pending, which involved the question of international protection to literary enterprise. That decision, affirming a previous judgment of the Barons of Exchequer, declared that no American, not domiciled in England at the time of the publication of his book, could claim the benefit of our copyright law, and therefore put an end to the transaction. The letter containing this unpleasant news reached Mr Prescott while he and an English guest, Mr C. R. Weld (who has recorded the circumstance in his *Vacation Tour*, 8vo, London, 1855), were deep in argument on the copyright question. The historian mentioned the new illustration of the hardships to which the state of our international law exposed authors—the annulment of a bargain by which he lost L.6000—with perfect equanimity. If Mr Prescott had thought proper to have resided in England during, and for a certain time before and after, the publication of the book, he might have reaped the full benefit of its great success on both sides of the Atlantic. But he would not take this course. At a great pecuniary sacrifice, he preferred to present the world with one signal example more of the injustice to which the writers of England and America are exposed by the want of a reasonable system of international copyright,—a want for which the American legislature appears to be wholly responsible.

Two volumes of *Philip II.* appeared in 1855. The year following, Mr Prescott supplied to an edition of Robertson's *Charles V.* a sequel, in which he related, in his usual agreeable style, the true history of the emperor's retirement and death; events upon which recently-discovered documents have thrown so much light. In the same year, 1856, he contributed to an American periodical called the *National Portrait Gallery*, a graceful biographical sketch of his old friend Abbott Lawrence, one of the most successful merchants, ablest statesmen, and worthiest citizens of the United States; a sketch which was afterwards published in a separate quarto form.

Mr Prescott's literary labours were carried on during six winter months at Boston, in summer at his marine villa at Nahant, and in autumn at his country house at Pepperell. Soon after the death of his father, which took place in 1844, he removed his town residence from Bedford Street, where the old mansion was soon afterwards pulled down, to 55 Beacon Street, a spacious house overlooking the common, and commanding a fine view of land and water. To the back of this abode he added a noble room to contain his library. Over its western bay window hung two crossed swords: one of these had been worn at Bunker's Hill by his grandfather, Colonel Prescott; the other had been also drawn in that battle by the grandfather of Mrs Prescott, Captain Linzee, who commanded the British sloop Falcon, one of the naval squadron which severely galled the lines of the republicans. The collection of books was extensive and valuable, and related chiefly to the subjects of Mr Prescott's own writings. His own study was a smaller room above, and communicating with this library. The abode at Nahant, in which, during twenty years, he passed the hotter months, was a cottage of two storeys, with a broad verandah, perched on a cliff overlooking the ocean, and washed by its stormy spray. "It is," he said, "the coolest spot in New England; it is called the Fitful Head; and Norna's was not wilder." During the last six years of his life his summers were spent at another house in the same neighbourhood, but less romantically situated, at Lynn Beach. His autumnal retreat at Pepperell was 42 miles from Boston, on the border-line of Massachusetts and New Hampshire. The estate, consisting of some 250 acres, and called the Highlands, lies in a fine undulating country bordered on the N.W. by a wild mountain range. It has been in the family about a hundred and fifty years; and is wooded with fine avenues and groves of oak, chestnut, walnut, and maple. The mansion, an old-fashioned, rambling, roomy farmhouse, with white walls and green blinds, is seated on a gentle eminence overlooking the clear windings and rich pastures of the beautiful Nissitisset. A garden, an orchard, fish-ponds, and green lawns shaded by some noble butternuts, surround the house; and near it a grove of stately oaks leads into a venerable fragment of the primeval forest. Within the porch, the low ceiling and spacious fireplaces, the old furniture, and a closet full of old books, are relics of the simple, homely habits of the past century.

On the 4th of February 1858 Mr Prescott's labours at Boston were interrupted by a slight paralytic shock; but he soon rallied from the effects of it, and his family and friends were under no apprehension of further consequences. From that time he lived wholly on a vegetable diet, and used wine even more sparingly than before. He took less pleasure also in general society, and spent his leisure hours more constantly at home and with his grandchildren, of whose innocent company he was never weary. His sight was for some time a good deal weakened, but it gradually returned to its usual condition, and he was able to resume his literary pursuits for two or three hours a day. Towards the end of the year the third volume of *Philip II.* appeared, and was received both in England and America with the applause to which the author had now been long accustomed.

On the 26th of January 1859 he was at home at Boston. On the evening of that day a friend from New York, the Rev. William Milburn, called upon him. They had not met since Mr Prescott's illness. The guest observed that his host entered the library to receive him with a slower and heavier step than had been his wont in former years, and that in speaking his utterance was occasionally somewhat thick and imperfect. His manner, however, had lost nothing of its accustomed warmth; and he spoke of old friends, living and dead, with his usual feeling and cordiality. Of his own stroke of paralysis he likewise talked with perfect calmness, said it had weakened him and affected his sight, but that he was now able again to take exercise and pursue his work for two or three hours a day. Mr Agassiz, and the interruption of his scientific labours by injured eyesight, were mentioned, and led Mr Prescott to express his sympathy, and to speak of an infirmity which was common both to himself and his guest, Mr Milburn being also partially blind. "These men with eyes," said he, "have us at a serious disadvantage. While they run, we can only limp. But I have nothing to complain of, nor have you. Providence has singularly taken care of both, and by compensation keeps the balance even." He spoke also with warm affection of England, which Mr Milburn had lately visited, and of their friends there. On being asked when he was coming to New York, he replied, "I suppose the days of my long journeys are over, and that, like Horace, I must content myself with my three houses. You know I go at the commencement of summer to my cottage by the sea-side at Lynn Beach; and at autumn to my patrimonial acres at Pepperell, to sit under the trees I sat under when a boy; and then with winter come to hibernate in this house. This is the only travelling, I suppose, I shall do until I go to my long home." These words were spoken almost on the threshold of that final abode. On Friday, 28th January, he was so well that, although the morning was wet, he proposed to take a walk at his usual hour, between seven and eight, to inquire after a sick relative. With some difficulty Mrs Prescott prevailed on him to remain within doors. After breakfast she read to him, as was her habit, the morning papers. She then left him with his secretary in his study. Some time afterwards, about half-past twelve, he rose and went into an adjoining apartment. In a few minutes the secretary, hearing a groan, followed, and found him dead to all consciousness, smitten with a second stroke of paralysis. Medical aid proved unavailing; he never spoke again; and about two in the afternoon he expired.

According to his wish, his body was laid for a while in his library, near the hearth of his affections, amongst his well-beloved books, and beneath the portraits of those to whom his pen had given new life. From thence, on the 31st of January, it was borne to the vault of the Prescott family in St Paul's Episcopal church. It was followed to the tomb by a company such as the death of no man of letters had ever before assembled in America, paying to his great name and noble nature a tribute of tears and mourning "which," as one of themselves remarked, "would have been dearer to his heart than all the intellectual triumphs of his life."

Mr Prescott left behind him a widow, two sons, and a daughter. He never, at any period of his life, took any active part in public business or in politics. Born and educated in the Unitarian persuasion, he adhered to it through life; although for may years he attended the services of an Episcopal congregation of which his old tutor and friend Dr Gardiner was the minister. Of his face and person several excellent memorials remain in the portraits executed in America by Mr Ames and Mr Whipple, and in England, in 1850, by Mr H. W. Phillipps and Mr Geo. Richmond. These, as well as several photographs, have been engraved. Tall and slender in figure, he had a countenance singularly comely, expressive, and engaging. His fresh complexion and his waving brown hair, scarcely tinged with grey, gave him until the last a very youthful appearance. His eminence as a writer was not more cordially recognised than the remarkable worth and beauty of his character as a man. In the management of his affairs, as in the disposal of his time and the arrangement of his study, book-shelves, and writing-table, he displayed a strong love of method and order. Prudent and considerate in small things as well as great, he was liberal in all his dealings, and open-handed in his unostentatious benevolence. Adored by his family and familiar friends, he was hardly less esteemed by the whole society of his native city. In his successes, literary and social, almost every American with whom his friends in Europe conversed appeared to take a personal interest and to feel an honest pride. Amongst the organs of the press, and at the meetings of various literary societies, his death elicited the most touching expressions of regard and respect from many of the most distinguished of his countrymen. "All who knew him," said Mr Bancroft, "will say that he was greater and better than his writings. Standing as it were by his grave, we cannot recall anything in his manner, his character, his endowments, or his conduct, we could wish changed." Mr Ticknor remarked, "that he was loved of all who knew him for the transparent sincerity of his nature, his open and warm sympathies, and for the faithful affections to which years and the changes of life only added freshness and strength." "Of all men whom I have known," said his classmate, Dr Walker, president of Harvard university, "I have never known one so little changed by the hard trial of success and prosperity. At college and on the morning of the day he died he was the same in his disposition, the same in his outward manners, the same in his habit of thought and feeling, the same, to a remarkable degree, in his attitudes and looks. He was one of that happy few whom all love to hear praised."

As a writer, Mr Prescott occupies a distinguished place in the first rank of English historians. His fidelity and industry—qualities which form the foundation of historical merit—are universally acknowledged. It has been doubted, and it is doubtful, whether his powers of philosophical analysis were equal to his skill in synthetical arrangement; whether he could penetrate to vital principles as happily as he could marshal facts and picture events. It is certain that the latter portions of the duty of an historian were those to which he specially applied himself. His practice may be justified on the ground of the subdivision of literary labour which at present obtains, greatly to the advantage of the accuracy of our knowledge. To describe clearly what was done in a particular age, and how it was done, is in itself an important and difficult task; to show why it was done, by discovering the hidden causes which shaped and coloured events, belongs perhaps more properly to writers who take a more comprehensive view of the chart of the world's history. In the art of narrative Mr Prescott has few rivals—very few equals—in our language. So pure and idiomatic is his English that it is rarely indeed that the most critical ear detects, in the use of a word or the construction of a phrase, the transatlantic origin of the writer. The Introduction to the *History of Ferdinand and Isabella*—a review of the early annals and political constitution of Castile and Aragon—is one of the most comprehensive surveys of a great subject ever presented to the historical student. The condition and relations of the crown, the nobles, the clergy, the cities, and the commons, are painted with a masterly hand, and are presented in a picture at once clear, concise, and complete. The wily, able Ferdinand and the good Isabella, the model of womanly heroism, are portrayed with consummate skill and delicacy; and neither Robertson nor Irving has excelled in easy grace the narratives of the siege of Malaga and the crowning conquest of Granada. In the *Conquest of Mexico* and the *Conquest of Peru*, and especially in the chapters on the civilization of the Aztecs and the Incas, Mr Prescott displays great sagacity in assorting the scattered fragments of social edifices, which were destroyed before they could be intelligently delineated, and in recalling to their living forms the dry bones of the extinct races which inhabited them. He also appears to have shaken off the diffidence of a stranger in the historical field. His style betokens more self-confidence, and is bolder and more animated. His descriptions of scenery, in which he is always happy and never redundant, are more full and vivid, and are elaborated with the greater care which was required by the strangeness of unfamiliar lands. Mexico spreads her matchless valley, her lake, and her imperial city before our eyes; we wander through the royal gardens, beneath the giant cedars of Tezcuco; the golden halls of the Inca and the blazing temples of the sun unfold themselves before us; we follow the silver-shod cavalry of Pizarro through the flowery dales of the Cordilleras; or we ascend through the pastures of the llama or the stern regions where the condor hovers in the tropical sun around the peaks of the Andes. The account of the *triste noche*, the rueful night, in which, after the death of Montezuma, Cortes and his band retreated across the lake and along the broken causeway, cutting their way through a nation in arms, is one of the finest pieces of modern historical painting. In the *Reign of Philip II.* unflagging strength and unabated fire are displayed in the treatment of the troubles in the Low Countries, the siege of Malta, the rebellion of the Mexicos, and the battle of Lepanto.

Mr Prescott's chapters on manners and literature are not less lively and picturesque than his record of contemporary events which these chapters illustrate. Of modern historians he was one of the first to acknowledge and to exhibit the importance of this kind of illustration, which his immediate predecessors had been too much in the habit of neglecting. In another respect also his works set an example well worthy of general adoption. Not content with embodying the result of his own researches, he constructed a road to the fountains from whence he had drawn and the mines in which he had toiled, in order, to use his own words, "to put the reader in a position for judging for himself, and thus for revising and, if need be, of reversing, the judgments of the historian." Of all his chief authorities he has left us elaborate biographical notices, showing their means of obtaining a true knowledge of facts, the circumstances and influences to which they were exposed, the complexion of their minds, and the value of their evidence. Were this method of writing history general, we should lose some ingenious books, but we should also escape the noxious influence of many dishonest ones. On those who read critically Mr Prescott's plan must have already had a wholesome effect. From him many such readers must have learned to distrust even the most brilliant of the writing craft who withhold the grounds of their faith and facts, who cite sparingly and loosely, and impudently tell the world that they have drawn materials, perhaps for caricatures of the past and slanders on the dead, from sources so numerous as to defy specification.

As a critic and essayist, Mr Prescott would have attained great eminence had he pursued that path of letters. His essays on Cervantes, Molière, Scott, and Italian narrative poetry are written with much taste and with a just appreciation of their subjects. His reviews are none of them examples of the slashing style of criticism. When he turned aside from his own chosen course, it was for the purpose of throwing some fresh light upon the old masterpieces, or of bidding an unknown fellow-labourer welcome to the temple of Fame. If a blockhead was to be lashed or a knave exposed, he left them to critics who loved to perform such operations. It was very characteristic of his gentle and genial nature that he prefaced his volume of essays, which most readers will be disposed to regard as eminently calm and candid in tone, with the wish "that some of his critical judgments had been expressed in a more qualified and temperate manner." When those who knew and loved Mr Prescott shall have passed away, his memory will still be cherished by his countrymen, not only for the sake of works which will always rank amongst the chief monuments of American literature, but also for the sake of his pure and graceful life, which did honour to the literary calling. (W. S.)

PRESCRIPTION, in *Medicine*, signifies much the same with what in common language is called a *receipt*, being a form of direction for the preparation and administration of some compound medicine. These medical receipts are commonly called *formulæ* by physicians; and the term *prescription* is applied to what is written by a physician on seeing his patient, instructing the apothecary what medicines are to be prepared, how they are to be composed, and how administered to the patient. In this sense, a prescription may contain two or more *formulæ*. These prescriptions are almost always written in Latin, and are expressed in a peculiar style, which, though well known to physicians and apothecaries, may require the illustration of an example. The following is a specimen of a modern prescription as it would be written by a physician, according to the nomenclature of the pharmacopœia:—

For Mr Middleton.
℞. Pulv. Rad. Rhei palmati gr. xxv.
Tartratis Rotassæ ʒij.
Tincturæ Sennæ compositæ,
Syrupi Rosæ centifoliæ āā ʒij.
Aquæ Menthæ piperitæ ℥iss.
M.f *Potio summo mane sumenda.*
Jan. 31, 1859.

From the above example, it will be seen that a prescription, properly so called, contains several circumstances beside the *formulæ* or receipts, as the name of the patient for whom the prescription is written; the signature of the physician, as J. B. for John Balfour; and the *date of prescribing;* none of which should be omitted, as the prescriptions are carefully preserved by the apothecary for future reference.

It may be proper to explain some circumstances respecting the *formula* given in the above prescription. The ℞ with which it commences signifies *recipe* or *take;* and is prefixed to all medical receipts. Then follow the several ingredients of which the medicine is to be composed, with the quantities of each. These quantities are usually marked by peculiar characters or symbols, and the numbers employed are usually the Roman numerals. After the ingredients have been enumerated, and their quantities specified, there follows the title of the medicine, as *Potio* in the present instance, signifying *potion* or *purging draught*, with M.f. prefixed to it, which stand for *misce fiat*, or *misce ut fiat*, mix to make; and lastly, the direction how the medicine is to be taken or administered, *summo mane sumenda*, to be taken early in the morning. The ingredients of which a formula is composed have been, by writers on medical prescriptions, arranged under four heads: 1. The *basis* of the formula, which in the present instance is the rhubarb, constituting the principal ingredient, on whose action, modified where necessary, the chief success of the medicine, in fulfilling the required indication, is to depend. 2. The *adjuvant* or auxiliary, added to the basis, for the purpose of increasing its power, expediting its action, or rendering it more easily soluble in the juices of the stomach; in the above formula the *tartrate of potash* is the principal adjuvant. 3. The *corrector*, added to the basis when we wish to moderate or delay its action, to correct some unpleasant or injurious property of it, such as its odour, taste, acrimony, &c., or to prevent it from acting on the body in a different manner from that which the indication requires: thus, in the present formula, the warm *tincture of senna* is added, rather to correct the griping quality of the rhubarb, than to increase its action, and the *syrup of roses* to correct the unpleasant taste of the medicine; and the *essential oil* in the pepperment-water contributes to both these purposes: these, therefore, are to be considered as the correctors. 4. The *constituent*, or that ingredient which serves to reduce the rest into the form which is considered as most convenient for the exhibition of the medicine; in the present case the *peppermint-water* is the constituent, serving to reduce the medicine to the form of a potion or draught.

Medical *formulæ* are either *officinal* or *extemporaneous;* the former being such as are directed by authority of some public medical college to be kept in the shops of apothecaries, and the preparation of which is described in their *pharmacopœias* or dispensatories; the latter such as are prescribed by the physician or surgeon, as occasion may require.

PRESCRIPTION, in English law, "is when a man claimeth any thing for that he, his ancestors or predecessors, or they whose estate he hath, have had or used anything all the time whereof no memory is to the contrary." (*T. de la Ley.*) This definition appears to be sufficiently definite and comprehensive. There have been various attempts at defining prescription, and few of them have ended in entire success. According to a passage in Littelton, prescription is made essential to custom. He says, "No custome is to bee allowed, but such custome as hath been used by title of prescription; that is to say, from time out of mind. But divers opinions have been of time out of mind, &c., and of title of prescription, which is all one in the law." There is another claim, however, to which the term prescription is very frequently applied, and which resembles custom, in being endowed with the inseparable incidents of time and of usage, which is another essential to custom. Yet this claim differs from custom in the mode of pleading adopted in it, which serves to distinguish the difference of the right. The word prescription is given to this claim, because the plaintiff or defendant making it "prescribeth that," &c., going on to state the nature of his claim. The following example of such a prescription is taken from Coke upon Littelton:—"I. S. seised of the manor of D. in fee *prescribeth* thus: That I. S. his ancestors, and all whose estate he hath in the sayd manor, had and used to have common of pasture time out of mind in such a place, &c., being the land of some other, &c., as pertaining to the same manor." It accordingly follows that the claim by prescription is properly a claim of a determinate person; that by custom, as opposed to prescription, belongs and applies to a particular place, belongs and applies to many, nay, to an indefinite number of persons, such as to the inhabitants of an entire parish. From the first definition, it appears that prescription may belong to a man as the heir of his ancestors, or to a corporation as the representatives of their predecessors, or it may be the claim of one who holds a situation in which there is perpetual succession, or by a person in virtue of an estate which he holds.

It seems to form an essential element in prescription, that the use of the thing claimed should have been time out of mind continuous and peaceable. As to the signification of the expression "time out of mind," it means that there must be no evidence of the non-usage of the claim subsequent to the first year of legal memory; that is, after the beginning of the reign of the first Richard. In order to substantiate the prescription, there must also be evidence of repeated usage; but where the evidence fails to show the beginning of the enjoyment, twenty years has been considered sufficient proof. Prescription is said to be founded on the assumption of an original grant that has been long lost. Thus Blackstone, in speaking of the erection of corporations, has the following passage:—"Another method of implication, whereby the queen's consent is presumed, is, as to all corporations, by prescription; such as the city of London, and many others, which have existed as corporations time whereof the memory of man runneth not to the contrary, and therefore are looked upon in law to be well created. For though the members thereof can show no legal charter of incorporation, yet, in cases of such high antiquity, the law presumes that there once was one; and that, by the variety of accidents which a length of time may produce, the charter is lost or destroyed."

Some alterations as to prescription have been made by recent acts, limiting the time within which actions can be brought, or suits instituted, relating to real property. Such are the 3 and 4 Will. IV., c. 27; also 2 and 3 Will. IV., c. 100. The 2 and 3 Will. IV., c. 71, is entitled "An Act for Shortening the time of Prescription in certain Cases," and applies (§ 1) to "claims which may be lawfully made at the common law by custom, prescription, or grant, to any right of common, or other profit or benefit, to be taken from or upon any land, &c., except such matters and things as are therein specially provided for, and except tithes, rents, and services." Section 2 applies "to any way or other easement, or to any watercourse, or the use of any water;" and sect. 3 to the use of light. It is further enacted, that no claim to the things comprised within this statute, "shall, when such right, profit, or benefit (as is mentioned in sect. 1), shall have been actually taken and enjoyed by any person claiming right thereto, without interruption, for the full period of thirty years, be defeated or destroyed, by showing only that such right, profit, or benefit was first taken or enjoyed at any time prior to such period of thirty years; but nevertheless such claim may be defeated in any other way by which the same is now liable to be defeated; and where such right, profit, or benefit shall have been so taken and enjoyed, as aforesaid, for the full period of sixty years, the right thereto shall be deemed absolute and indefeasible, unless it shall appear that the same was taken and enjoyed by some consent or agreement, expressly made or given for that purpose by deed or writing." The terms of twenty and forty years are fixed respectively, instead of thirty and sixty, as mentioned in the first section. The eighth section enacts, "that when any land or water upon, over, or from which any such way, or other convenient watercourse, or use of water, shall have been enjoyed or derived, hath been or shall be held under any term of life, or any term of years exceeding three years from the granting therof, the time of the enjoyment of any such way, or other matter as therein last mentioned, during the continuance of such term, shall be excluded in the computation of the said period of forty years, in case the claim shall, within three years next after the end, or sooner determination of such term, be resisted by any person entitled to any reversion expectant on the determination thereof."

Prescription, in Scotch law, has a much wider operation than in either the civil law or the law of England, supplying the place, as it does, of the statute of limitations in the latter system. In Scots law, and according to the long prescription, titles may be had to heritable property through a series of consecutive titles, extending over a period of forty years. But this positive prescription must be accompanied by negative prescription, to afford it free operation. By negative prescription is meant the absence of any effort on the part of one who may have a competing title to put his claim in force. This negative prescription will of itself destroy a claim by one party in cases where it cannot be directly said there is relative possession on the part of the other, independently of the existence of any positive prescription. The act creating this prescription says generally regarding obligations, "the party to whom the obligation is made that has interest therein, shall follow the said obligation within the space of forty years, and take document thereupon. And if he does not, it shall be prescribed, and be of no avail, the said forty years being run, and unpursued by the party." Prescription is counted from the day when fulfilment of the obligation became exigible, and it is effectual in all cases of debt, bonds, provisions in marriage-contracts, &c. Prescription can only be interrupted by the act of the person against whose claim it is running. Suspension of prescription takes place during minority; and so if the person having a claim have been twenty years a minor, he cannot lose his claim by negative prescription in less than sixty years. A similar suspension takes place in all cases where the creditor is physically disabled from acting. The short prescription, or, more properly speaking, limitation, is an exclusion on the ordinary means of proving the obligation. The triennial prescription, or the limitation of the existence of an obligation to three years, runs on most debts contracted in ordinary business without a written obligation. A prescription of five years takes place in all bargains concerning moveables or sums of money which may be proved by witnesses, such as contracts of sale, letting and hiring, &c. Holograph writings, or those of which the whole is written by the granter, if not attested by witnesses, prescribe in twenty years. Actions on the ground of the transactions between tutor and curator, on either side, prescribe in ten years after the expiration of the guardianship; and the operation of certain cautionary obligations is limited to seven years; while bills of exchange and promissory-notes prescribe as items of debt in six years. (Hill Burton's *Manual of Scots Law.*)

PRESENT TENSE, in grammar, the first tense of a verb, expressing present time, or that something is now performing; as *I write*, or *I am writing*.

PRESENTATION to a living in the English Church may be performed by any patron to whom the advowson of the church belongs, by offering his clerk to the bishop of the diocese to be instituted. The bishop, however, has the power of refusing the said clerk: this on many accounts, as,—1. If the patron be excommunicated, and remain in contempt forty days; or 2. If the clerk be unfit, which unfitness is of several kinds: first, with regard to his person, for he may be an outlaw, an excommunicate, an alien, under age, or the like; next, with respect to his faith or morals,—as for any particular heresy, or vice that is *malum in se;* or, finally, the clerk may be unfit to discharge the duties of the pastoral office by reason of his want of learning. If the bishop, however, have no objections, then the care of the souls of the parish is committed to the charge of the clerk, who enters on the parsonage-house and glebe, and takes the tithes.

PRESIDENT, Præses, is an officer created or elected to preside over a company or assembly, and is so called in contradistinction to the other members, who are termed *residents.*

Lord President of the Council is a great officer of the crown, who has precedence next after the lord chancellor and lord treasurer. The lord president is as ancient as the time of King John, when he was styled *consiliarius capitalis.* His office is to attend on the king, to propose business at the council-table, and to report to the king the several matters transacted there.

PRESS. See Printing, and Liberty of the Press.

PRESSBURG (Hung. *Posony*), a town of Hungary, at one time the capital of that kingdom, as it is still of the county of Pressburg, stands in a beautiful country, amidst vine-covered hills, near the foot of the Little Carpathians, on the left bank of the Danube, here crossed by a bridge of boats, 34 miles below Vienna. It is built on sloping ground, and has much the appearance of a quiet German country town, with few Hungarian characteristics. The most conspicuous object is a large brick castle, of which only the walls now remain, as it was destroyed by fire in 1811. The ruins, which stand on a hill, command a fine view of the broad plains of Hungary and the windings of the Danube. The cathedral, in which the kings of Hungary were crowned, is an ancient Gothic building of the eleventh century. It contains many trophies gained from the Turks, and an equestrian statue in lead of St Martin, which is a masterpiece of Donner. The Landhaus, in which the meetings of the Diet were held, is a very plain building; and the chambers are simple rooms with green baize tables, round which the members sat in their splendid Hungarian costume. Pressburg contains also an ancient town-hall; numerous churches, chapels, and convents; an archiepiscopal palace; archbishop's summer residence; and several palaces of the nobility. Near the end of the bridge there is an artificial hill, 12 or 14 feet high, surrounded by a railing. It is called the Königsberg; because here each king of Hungary after his coronation used to proceed on horseback, and from the top of the mound waved the sword of St Stephen towards the four points of the compass, as a sign that he would defend the country from all enemies. The educational establishments of Pressburg comprise a royal academy, with faculties of law and medicine; a Roman Catholic theological seminary and upper school; an evangelical college for philosophy and theology; and several elementary schools. The town has also a public library and several hospitals. Silk and cotton goods, tobacco, nitre, and leather, are among the chief manufactures of Pressburg; and an active trade is carried on, chiefly in rural produce. The town is of great antiquity, and is said to have existed even before the conquest of the country by the Romans. From 1547, when Buda was taken by the Turks, till 1784, it was the capital of Hungary; but in the latter year Joseph II. again made Buda the capital. In 1619 Pressburg was taken by Bethlen Gabor, but retaken in 1621 by the imperialists under Boucquoi. In 1805, after the battle of Austerlitz, a treaty was concluded here between France and Austria. Pop. (1851), exclusive of the military, 42,178.

PRESTEIGNE, a parliamentary borough and market-town of Wales, in the county of Radnor, on the borders of Hereford, in a fertile valley watered by the Lug, 6 miles E. by N. of Radnor, and 151 W.N.W. of London. The parish church is a large ancient building containing several curious monuments, and an altar-piece of tapestry. There are here also Wesleyan, Primitive Methodist, and Baptist churches, a free grammar school, a county-hall, and a jail. Large quantities of malt are made here; and there is some trade in timber. Pop. (1851) 1617.

PRESTER or PRESBYTER JOHN, was the name given by the Europeans of the middle ages to a dynasty of supposed eastern potentates. The following account is the history of this legend:—About the beginning of the eleventh century, it began to be reported in Christendom that a certain king beyond Persia and Armenia had been met by the spirit of a departed saint in a forest; that he had been overawed into becoming a true believer; and that he had ordered all his subjects, to the number of 200,000, to adopt the same faith. As time passed by, the report seemed to receive corroboration. Envoys pretending to come from the land in question arrived at Rome. Additional rumours, by what means nobody knew, found their way to the West. The manners and customs of this newly-Christianized people were said to retain many traces of the old patriarchal times. The chief was both priest and king, and was known on that account by the name of Prester or Presbyter John. His tribe lived a peaceful pastoral life, following their flocks through the desert, feeding upon flesh and milk, and being so destitute of corn and wine that they were unable in the prescribed manner to observe the fast-days, or to partake of the eucharist. Nor was the exquisite primitive simplicity of his kingdom unadorned by substantial wealth and majesty. Unbounded treasures were at his command; many neighbouring nations were his tributaries; and he swayed supremely with a sceptre of emerald.

Such pleasing reports as these continued to be greedily swallowed by the superstitious in Europe, until investigations commenced to be made. It then began to appear doubtful whether this happy land were not a mere Utopia, and whether this admirable Prester John were not a mere creature of the popular fancy. Carpini, a Franciscan friar who was sent by Pope Innocent IV. in 1246 on an embassy to the Mongols, failed to discover the celebrated nation of Christians. Not long afterwards another Franciscan, William de Rubruquis, who penetrated into Asia as far as Karakorum, could find none but a few Nestorians, who had even heard of the great priest-king. Equally unsuccessful were the Portuguese explorers who reached India by the way of the Cape of Good Hope about the end of the fifteenth century. After fruitlessly seeking for the Prester in Asia, they were fain to suppose, on few or no grounds, that they had found him in Africa in the person of an Abyssinian prince. The result of all these explorations was, that investigators ceased to inquire into the truth of the story of Prester John, and turned their attention to an explanation of its origin. The most plausible solution is that given by Mosheim in his *Church History*. He supposes that a certain Nestorian priest named John gained possession of a throne in Asiatic Tartary; that he still retained the name of Presbyter after his accession; and that the title of Prester John was inherited by his descendants, along with the throne, until his dynasty was extirpated by the mighty Tartar emperor Genghiskan.

PRESTO, in the Italian music, intimates to perform quickly; and hence *prestissimo* denotes extreme quickness.

PRESTON, a parliamentary and municipal borough, seaport, and market-town of England, in the county of Lancaster, on the N. bank of the Ribble, here crossed by three fine bridges, 19 miles S. of Lancaster, and 217 N.W. by N. of London. It is well built, for the most part of brick, on a rising ground about 120 feet above the river; and the principal streets, one of which, called Fishergate, is about a mile long, are broad and well paved. In the neighbourhood there are many villas, and some beautiful public walks. One of the latter, called Avenham Walk, on the top of the hill on which Preston is built, is much frequented, and has been well laid out by the corporation. There are in the town a spacious market-place, and many elegant terraces and squares. Among the public buildings are the guild-hall, a brick edifice with a turret and cupola, in the centre of the town; the court-house, built in 1826, in the Grecian style of architecture; the market-house, corn exchange, cloth-hall, custom-house, theatre, and assembly-rooms. Of the places of worship in Preston, ten belong to the Established Church. The parish church, rebuilt in 1770, has a lofty spire. Those of St Peter and St Paul, erected in 1824 and 1825, are both in the modern Gothic style; and Christ church is a fine specimen of pure Norman architecture. The Roman Catholics have four churches here, one of which is a building of great elegance. There are also places of worship belonging to Wesleyan Primitive, Episcopalian Primitive, and Associated Methodists; Baptists, Independents, Unitarians, Quakers, Swedenborgians, and Mormonites, to the number of twenty in all. One of the finest buildings in the town is a Grecian structure belonging to the Society for Diffusing Useful Knowledge, containing a library of 5000 volumes, and a valuable museum. The educational institutions comprise a free grammar school, founded in 1663, occupying a large stone edifice, and attended by 130 scholars in 1852; a blue-coat school, several national and infant schools, and a deaf-and-dumb institution. Preston has also a literary and philosophical society, with an elegant building of the Tudor style, a mechanics' institute, agricultural society, and three public libraries. There are, besides, nine alms-houses, a dispensary, infirmary, workhouse, and savings-bank. Public baths and wash-houses have been erected here by the corporation, and were opened in 1851. The town contains a borough prison and county penitentiary; while at Fulwood, 2 miles to the N.W., there are large barracks. Preston is chiefly important as a manufacturing and commercial town. Its staple manufacture at present is cotton, of which it is one of the principal seats in England. This branch of trade was introduced here in 1777, before which time the principal industry of the place was directed to the manufacture of linen, which is still carried on to a considerable extent. There are upwards of fifty mills for spinning and weaving cotton, worsted and flax mills, iron and brass foundries, tanneries, rope-works, malt-houses, and breweries. Fishery has been carried on for a long time in the Ribble, where salmon, eels, &c., are caught. The river has been, by dredging and other improvements, rendered navigable at spring tides for vessels of 300 tons burden up to the quays of the town, where extensive warehouses have been erected. Besides those derived from the navigation of the Ribble, Preston enjoys many advantages for commercial purposes in being connected, both by canals and railways, with the central and other parts of the country. The commerce of the town is considerable; corn, timber, and iron being the principal imports. On the 31st December 1857 there were registered at the port 114 sailing-vessels, tonnage 6253; and 3 steamers, tonnage 440. During that year there entered 295 sailing-vessels, tonnage 16,485; and 2 steamers, tonnage 298: and there cleared 517 sailing-vessels, tonnage 25,382,—all of these, except 11 sailing-vessels that entered from foreign ports, tonnage 1414, being engaged in the coasting trade. Besides weekly markets, several annual fairs are held at Preston; and there are races, which take place on the other side of the river. A celebration called the "Guilds" is held at Preston once every twenty years, generally in the end of August. It consists of a procession of the corporation and the various trades of the town, and is an occasion of great festivity. The borough is governed by a mayor, twelve aldermen, and thirty-six councillors. It returns two members to the House of Commons. The origin of Preston seems to date from the decay of Ribchester, which is now a mere village, 11 miles farther up the river; and the name *Priests-town* was probably given to it on account of its ecclesiastical edifices, some remains of which still exist. In 1323 it was taken and partly burned by the Scotch under Robert the Bruce. In the civil war Preston adhered to the royal cause, but was besieged and taken by the parliamentary forces. In 1715 the Jacobites took possession of the town, and erected barricades for its defence, but after a brave resistance were obliged to surrender. In January 1854 a strike of the workmen at Preston occurred, which lasted twenty-nine weeks, causing a great excitement and much distress among the work-people. Sir Richard Arkwright, the inventor of the spinning-jenny, was born at Preston in 1732. Pop. (1851) 69,542.

PRESTONPANS, a burgh of barony and seaport-town of Scotland, in the county of Haddington, on the S. shore of the Firth of Forth, 8 miles E. of Edinburgh. It is meanly and irregularly built, and contains a plain parish church, a Free church, a parish school, and an hospital. The manufacture of salt is carried on here; and there are potteries, a distillery, and a brewery. The people are also largely employed in the oyster fishery. Near the town was fought the battle of Prestonpans, in which the Pretender entirely defeated the forces of Sir John Cope, September 21, 1745. Pop. (1851) 1640.

PRESTWICK, or Priestwick, a burgh of barony of Scotland, in the county and 4 miles N.N.E. of Ayr. It is an old and decayed place, with a deserted church that serves as a sea-mark to ships in the Firth of Clyde, a cross, council-house, and prison. Pop. (1851) 1200.

PRETERITE. See Grammar.

PREVESA, a fortified town of European Turkey, in Albania, on the N. shore of the Gulf of Arta, 18 miles S.W.

of Arta, and 58 S.S.W. of Yanina. It has all the appearance of an oriental town, with its fantastically-carved mosque having a tall slender minaret. The streets are narrow and crooked, and the houses built chiefly of wood. There is a harbour, where some trade is carried on. Timber, tobacco, oil, wool, cotton, &c., are exported; and coffee, sugar, hardware, &c., are imported. Prevesa belonged to the Venetians from 1684 until the fall of that republic in 1797. It was then held by the French for a time, but was afterwards taken by the Turks. About 3 miles from the town are the ruins of the ancient Nicopolis. Pop. about 4000.

PRIAM, King of Troy, was the son of Laomedon and Strymo or Placia. His original name, *Podaras*, "the swift-footed," is said to have been changed into *Priamus* "the ransomed," from his having been ransomed by his sister Hesione, when he had fallen into the hands of Hercules. He is said to have been first married to Aisbe, by whom he became the father of Æsacus; but giving her up to Hyrtacus, he married Hecuba, by whom he had nineteen sons. He took no active part in the Trojan war, from his advanced age. Priam is said to have been killed by Pyrrhus, the son of Achilles, at the sacking of Troy by the Greeks (about 1184 B.C.)

PRIAPUS, according to some, the son of Dionysus and Aphrodite; according to others, the son of Dionysus and a Naiad, the son of Adonis and Aphrodite, the son of Hermes, and the son of Pan or a satyr. He is reported to have been born at Lampsacus on the Hellespont (whence the name *Hellespontiacus*), of extreme ugliness, and with unusually large genitals. He was worshipped as the promoter of fertility, both vegetable and animal. First-fruits were offered to him; milk, honey, and cakes; rams, asses, and fishes. He was represented in carved images, mostly in the form of *hermæ*, or of a head placed on a quadrangular pillar, painted red (whence *ruber* or *rubicundus* is applied to him by Ovid, *Fasti*, i. 415, vi. 319, 333), carrying fruit in his garment, and either a sickle or cornucopia in his hand.

PRICE, RICHARD, Fellow of the Royal Society of London and of the Academy of Sciences, New England, was born at Tynton in Glamorganshire on the 22d of February 1723. His father was a dissenting minister at Bridgend in that county, and died in 1739. At eight years of age he was placed under a Mr Simmons of Neath; and four years afterwards he was removed to Pentwyn, in Caermarthenshire, where he was placed under the Rev. Samuel Jones, whom he represented as a man of a very enlarged mind, and who first inspired him with liberal sentiments of religion. Having lived as long with him as with Mr Simmons, he was sent to Mr Griffith's academy at Talgarth in Breconshire. In 1740 he lost his mother, upon which he quitted the academy and proceeded to London. Here he was settled at the academy of which Mr Eames acted as the principal tutor, under the patronage of his uncle, the Rev. S. Price, who was for upwards of forty years co-pastor with Dr Watts. At the end of four years he left this academy, and resided with Mr Streatfield, of Stoke Newington, in the quality of domestic chaplain; whilst at the same time he regularly assisted Dr Chandler at the Old Jewry, and occasionally assisted others. Having lived with Mr Streatfield nearly thirteen years, he was induced to change his situation, and in the year 1757 married Miss Blundell of Leicestershire. He then settled at Hackney; but being shortly afterwards chosen minister at Newington Green, he lived there until the death of his wife, which took place in 1786, when he returned to Hackney. He was next chosen afternoon preacher at the meeting-house in Poor Jewry Street; but this he resigned on being elected pastor of the Gravel-pit Meeting, Hackney, and afternoon preacher at Newington Green. These he resigned with a farewell sermon in February 1791. Shortly afterwards he was attacked with a nervous fever, which reduced him to such a degree, that, worn out with agony and disease, he died on the 19th of April 1791. He bequeathed his property to a sister and two nephews.

In morals, Dr Price's principles were those of Cudworth and Clarke; and by many persons who have themselves adopted a very different theory, he is allowed to have defended these principles with greater ability than any other writer in the English language. In metaphysics he was a very great admirer of Plato, from whom he borrowed his doctrine concerning ideas. He was a firm believer in the immateriality of the soul; but with Dr Law, the learned bishop of Carlisle, he thought that from death to the resurrection of the body it remains in a dormant and quiescent state. He contended for its indivisibility, but maintained, at the same time, its extension; which, in the celebrated controversy with Dr Priestley, furnished the latter with some advantages which his own acuteness would never have obtained. In propagating his political principles, which were republican, he sometimes expressed himself with undue vehemence; and he was a zealous enemy to all religious establishments, which in his opinion encroach upon that liberty with which Christ has made us free. His faith respecting the Son of God was what has sometimes been called Low Arianism, and sometimes Semi-Arianism. From a very early age he claimed the privilege of thinking for himself on every subject. His father was a rigid Calvinist, and spared no pains to instil his own theological dogmas into the tender mind of his son; but young Richard would often start his doubts and difficulties, and sometimes incur the old man's displeasure by arguing against his favourite system with a perplexing ingenuity, and a solidity that could not easily be overturned. He had once the misfortune to be caught reading a volume of Clarke's sermons, which his father, in great wrath, snatched from him and threw into the fire. Perhaps he could not have taken a more effectual method to make the book a favourite, or to excite the young man's curiosity in regard to the other works of the same author; and it is by no means improbable but that this orthodox bigotry contributed more than any other circumstance to lay the foundation of his son's Arianism. An elegant notice of Price's moral system will be found in the SECOND PRELIMINARY DISSERTATION.

In 1763 or 1764 he was chosen a fellow of the Royal Society, and contributed largely to the transactions of that learned body; in 1769 he received from Aberdeen a diploma creating him Doctor of Divinity; and in 1783 the degree of Doctor of Laws was conferred upon him by the college of Yale in Connecticut. As in the year 1770 he refused an American degree which had been conveyed to him by Dr Franklin, his acceptance of one, thirteen years afterwards, can be attributed only to his extravagant attachment to a republican form of government.

To posterity his works will be his monument. They are,—*A Review of the Principal Questions and Difficulties in Morals*, 1758, 8vo; *Dissertations on Providence*, 1767, 8vo; *Observations on Reversionary Payments*, 1771, 8vo; *Appeal on the National Debt*, 1773, 8vo; *Observations on the Nature of Civil Liberty*, 1776; *On Materialism and Necessity, in a Correspondence between Dr Price and Dr Priestley*, 1779; *On Annuities, Assurances, and Population*, 1779, 8vo; *On the Population of England*, 1780; *On the Public Debts, Finances, and Loans*, 1783, 8vo; *On Reversionary Payments*, 1783, 2 vols.; *On the Importance of the American Revolution*, 1784; besides Sermons, and a variety of papers in the *Philosophical Transactions* on Astronomy and other philosophical subjects. (The *Memoirs of the Life of Richard Price, D.D.*, by Wm. Morgan, F.R.S., London, 1815, 8vo.)

PRICE, *Thomas*, an eminent Welshman, was born near Builth in Brecknockshire in 1788, and was educated for the church at the college of Brecknock. After settling down as vicar of Cwmdu in 1825, he appeared before the public as a man of great and many-sided activity. There was scarcely a gentlemanly accomplishment which he did not practise. He was an excellent swimmer, and an adept in archery and other athletic games. He carved in wood, modelled in wax and cork, etched with success, and played upon the Welsh harp. Nor did these elegant pastimes detain him from more elevated pursuits. His exertions for the honour of his nation were untiring. The Welsh *Eisteddfods*, or literary gatherings, received his thorough-going support. No less than fifteen Welsh periodicals were enriched by his contributions. Several essays on the Welsh literature proceeded from his pen. A Welsh history, *Hanes Cymru*, was published by him between 1836 and 1842. He continued, in fact, to be the great champion of his countrymen till his death in 1848. The most important of this author's works are contained in the *Literary Remains of the Rev. Thomas Price, with a Memoir of his Life*, by Jane Williams, Ysgafell, in 2 vols. 8vo, Llandovery, 1854–55.

PRICHARD, James Cowles, a great ethnologist, was born at Ross in Herefordshire on the 11th of February 1786, and was educated at London and Edinburgh for the medical profession. He was early led to devote his attention to ethnology by hearing objections brought against the Mosaic account of the origin of our race. His first thoughts on the subject were given in the thesis which he delivered on the occasion of taking his M.D. at Edinburgh. On his settlement at Bristol in 1810 as a physician, his inquiries assumed a more definite form. He addressed himself to the study in the most able and systematic manner. The most unwearied research, the most varied erudition, and the most sagacious deliberation, were brought to bear upon the subject. All the evidences in favour of a plurality of races were first either directly refuted or at least removed. The different kindreds, as described by many different authors, were next passed in review; their varieties of form, colour, language, and habits, were contrasted and compared; and the differences and resemblances were carefully ascertained. The differences were concluded to be chiefly the result of civilization; and the resemblances were adduced as a proof of the unity of the human race. The result of these investigations was a book published in 1813 under the title of *Researches into the Physical History of Man*. Nor did the enthusiastic ethnologist halt on the way of research upon which he had so successfully entered. It is true that during the next thirteen years his large and ever-open mind was occupied with an astonishing multiplicity of engagements. He maintained a large practice in Bristol and its neighbourhood, delivered lectures on physiology and medicine, and wrote treatises on fever, epilepsy, nervous diseases, and insanity. He also made himself an adept in German, Greek, and Hebrew, studied Egyptian mythology and history, and contributed various articles to periodicals. Yet in 1826, when the second edition of his *Researches* was published, it was found that his attention had been chiefly occupied in maturing and illustrating his ethnological opinions, and that much of his miscellaneous acquisitions had been employed for that purpose. Many improvements on the former edition were observable. A wider, and at the same time a more minute view had been taken of the families of mankind. Greater prominence had been given to language as a mark of affinity. Especially had the discovery been made that the Celtic tongues and the Sanscrit were sprung from the same stock. In fact, the book, by developing to its full extent the philological element in ethnology, had introduced a new era in the history of the science. Still the author with unwearied endeavour continued to correct and expand his views. An *Analysis of the Egyptian Mythology*, which he published in 1838, assisted him considerably in carrying out this purpose. His removal also to London in 1841 as inspector of the lunatic asylums was probably not without its effect. He did not cease his laborious investigations until he had completed the third edition of his work in five closely-printed volumes. The great task of Dr Prichard's life was now accomplished. He died in London in December 1848. At the time of his death Prichard was president of the Ethnological Society of London and a fellow of several learned societies both at home and abroad. The latest edition of his *Researches* is that in 5 vols. 8vo, London, 1851. An abstract of this work, which he published in 1843 under the title of *The Natural History of Man*, has gone through several editions. (See "A Biographical Sketch of Dr Prichard," by Thomas Hodgkin, M.D., in *The Edinburgh New Philosophical Journal*, vol. xlvii.)

PRIDEAUX, Humphry, a very learned clergyman of the Church of England, was born at Padstow in Cornwall in 1648. He studied three years at Westminster under Dr Busby, and was then removed to Christ Church, Oxford. Here, in 1676, he published his *Marmora Oxoniensia*. This introduced him to the Lord Chancellor Finch, afterwards Earl of Nottingham, who in 1679 presented him to the rectory of St Clement's, near Oxford, and in 1681 bestowed on him a prebend of Norwich. Some years afterwards he was engaged in a controversy with the Catholics at Norwich concerning the validity of the orders of the Church of England, which produced his book upon that subject. In 1688 he was installed in the archdeaconry of Suffolk, to which he was collated by Dr Lloyd, then bishop of Norwich. In 1691, upon the death of Dr Edward Pococke, the Hebrew professorship at Oxford, being vacant, was offered to Dr Prideaux; but he refused it. In 1697 he published his *Life of Mohammed*; and in 1702 he was installed dean of Norwich. Some time after his return to London he proceeded with his *Connection of the History of the Old and New Testament*, which he had commenced when he laid aside the design of writing the *History of Appropriations*. He died in 1724.

Prideaux, *John*, an eminent dignitary of the English Church, was born in 1578 at Stowford, an obscure hamlet near Ivy-Bridge in Devonshire. His rise in life began amid great embarrassments. While a poor village lad, he aspired to be clerk of the neighbouring parish of Ugborow, and was unsuccessful. The failure depressed his spirits very much, until a kind country lady sent him at her own expense to a school in the vicinity. There he unweariedly plodded on for some time, acquiring with great difficulty a small smattering of classical learning. A rustic-looking youth of eighteen, clad in breeches which were no better than leather, and had very little in their pockets, he then set out to travel on foot to the distant university of Oxford. On his arrival it was accepted by him as a great boon that he was allowed to become a student of Exeter College, on condition that he should also become a menial of Exeter kitchen. In spite of all these difficulties, however, Prideaux soon rose to eminence. His attainments recommended him to a probationer fellowship in 1602. The repute of his theological learning placed him in the rectorship in 1612. Nor in this important position did he fail to advance his reputation. His gentle and fatherly government won every heart. The students under his charge increased till they outnumbered those under any of the other rectors of the university. Some even came from abroad for the purpose of sitting at his feet. His fame was established; and no ecclesiastical preferment was beyond his reach. Several benefices, the office of regius professor of divinity, and the vice-chancellorship were conferred upon him. At length, in 1641, he was promoted by Charles I. to the see of Worcester. Bishop Prideaux, in the discharge of his high office, showed himself to be a fine specimen of the English clergyman of that period. Among his flock he was simple and gentle, a child in the affairs of this world, and a saint in the affairs of the next. In his study he was a good linguist, a profound theologian, and a very hammer of the heretics. And when the troubles of the civil war came, his spirit was not unequal to the trials of a martyr. In vain did the Puritans harass him, and sequestrate his estate for his adherence to the cause of the king. He continued true to the principles of his church, living upon the proceeds of his library for the rest of his life, and leaving at his death in 1650 no other legacy to his children but "pious poverty, God's blessing, and a father's prayers." The chief works of Bishop Prideaux are *Viginti Duæ Lectiones de Totidem Religionis Capitibus*, fol., Oxford, 1648; and *Fasciculus Controversiarum Theologicarum ad Juniorem*, 4to, Oxford, 1648. A list is given in Watt's *Bibliotheca Britannica.* (See Wood's *Athenæ Oxonienses.*)

PRIEGO, a town of Spain, Andalusia, in the province of Cordova, partly on a fertile plain, and partly on the slopes of the Sierra di Algarrinejo, 34 miles S.E. of Cordova. It is well built, and has broad, straight, and well-paved streets, adorned with several fountains, some of which are very elegant structures. Here are the ruins of a castle built by the Romans, and afterwards repaired and enlarged by the Moors. The public buildings include various churches, hospitals, and schools; a town-hall, theatre, flesh-market, &c. Oil and flour mills, tanneries, and potteries are the chief manufactories of the place. Priego was formerly a very wealthy town, on account of its numerous silk factories; but this branch of industry is not now extensively pursued here. This town was the birthplace of the sculptor Don Jose Alvarez. Pop. 13,464.

PRIESSNITZ, VINCENZ, the originator of the water-cure, was the son of a farmer, and was born at Gräfenberg in Austrian Silesia in 1799. He had not attained to manhood when circumstances occurred which were the means of leading him to his great discovery. The death of his father compelled him at an early age to take an active part in the management of the farm. One day as he was out in the fields driving a cart, the horse knocked him down, and the wheel passed over his side. The medical man who was called in found two of his ribs broken, and expressed a fear that he would be a cripple for life. It was then that Priessnitz resolved to try a new method of curative treatment. Having adjusted his broken ribs by expanding his chest to the utmost, he began to employ the regimen of drinking water plentifully, and applying wet cloths to the bruised parts of his body. His experiment proved successful. In a few days he was able to walk about, and at the end of a year he was performing his part in the labours of the farm. Similar cures were then applied to the maladies of his neighbours, and were attended with similar results. All the opposition of the medical faculty and of the enemies of innovation could not prevent the new science of hydropathy from gradually gaining a footing in the credit of the public. At length, in 1829, Priessnitz established cold baths at his native place, and became a hydropathist by profession. His efficiency in his new vocation was abundantly testified by the steadily-increasing popularity which he continued to gain. The Austrian government, so intolerant for the most part of all empirics, not only permitted him to practise, but even gave him their patronage. The number of patients who resorted to him annually from all parts of Europe increased in course of time to hundreds. The farm of Gräfenberg, on the slope of one of the Sudates, expanded into an extensive hospital of many houses, where invalids sought to regain health by means of sweating, pure air, exercise, plain diet, and lively conversation. The example spread; and before Priessnitz died in 1851, he had the gratification of seeing several hydropathic establishments in different European countries. (See Claridge's *Hydropathy*, London, 1842; and Selinger's *Vincenz Priessnitz eine Lebensbeschreibung*, 12mo, Vienna, 1852.)

PRIEST (Saxon, *preostor;* French, *prêtre;* Dutch, *priester;* Spanish, *presbutero;* all remotely derived from the Greek πρεσβύτερος, *an elder*, and immediately from the Latin *presbyter*), a person set apart for the performance of sacrifice, and other offices and ceremonies of religion. Before the promulgation of the law of Moses, the first-born of every family, the fathers, the princes, and the kings were priests. Thus Cain and Abel, Noah, Abraham, Melchizedec, Job, Isaac, and Jacob, offered themselves their own sacrifices. Amongst the Israelites, after their departure from Egypt, the priesthood was confined to one tribe, and it consisted of three orders,—the high priest, priests, and Levites. The priesthood was made hereditary in the family of Aaron, and the first-born of the oldest branch of that family, if he had no legal blemish, was always the high priest. This divine appointment was observed with considerable accuracy until the Jews fell under the dominion of the Romans, and had their faith corrupted by a false philosophy. Then, indeed, the high priesthood was sometimes set up to sale, and instead of continuing for life, as it ought to have done, it seems, from some passages in the New Testament, to have been nothing more than an annual office. There is sufficient reason to believe, however, that it was never disposed of except to some descendant of Aaron capable of filling it, if the older branches were extinct. In the time of David the inferior priests were divided into twenty-four companies, who were required to serve in rotation, each company by itself, for a week. The order in which the several courses were to serve was determined by lot; and each course was, in all succeeding ages, called by the name of its original chiefs.

All nations have had their priests. The pagans had priests of Jupiter, Mars, Bacchus, Hercules, Osiris, Isis, and other divinities; and some deities had also priestesses. The Mohammedans have priests of different orders called *scheiks* and *muftis;* and the Indians and Chinese have their Brahmins and Bonzes.

It has been very much disputed whether, in the Christian church, there be any such officer as a priest (ἱερεύς), in the proper sense of the word. The Church of Rome, which holds the propitiatory sacrifice of the mass, has of course her proper priesthood. In the Church of England the word priest is retained to denote the second order in her hierarchy, but with very different significations, according to the different opinions entertained of the Lord's Supper. Some few of her divines, of great learning and of undoubted Protestantism, maintain that the Lord's Supper is a commemorative and eucharistical sacrifice, and consider all who are authorized to administer that sacrament as, in the strictest sense, priests. Others hold the Lord's Supper to be a feast upon the sacrifice once offered on the cross; and these, too, must consider themselves as clothed with some kind of priesthood. Great numbers, however, of the English clergy, perhaps the majority, agree with the Church of Scotland in maintaining that the Lord's Supper is a rite of no other moral import than the mere commemoration of the death of Christ. These, therefore, cannot consider themselves as priests in the rigid sense of the word, but only as presbyters (πρεσβύτεροι), or, in other words, elders.

PRIESTLEY, JOSEPH, a distinguished natural philosopher and theologian, was born on the 24th of March 1773, at Field-head, in the parish of Bristall, in the West Riding of Yorkshire. His father was a cloth-manufacturer, and both his parents were respectable Calvinistic dissenters. A strong desire of reading was one of the first passions which this philosopher exhibited, and which probably induced his parents and friends to change their mind respecting his destination, and, instead of bringing him up as a tradesman, to qualify him for some learned profession. He acquired a knowledge of Hebrew, Greek, and Latin, in the school of an eminent teacher at Bartley; and, at the age of nineteen, he became a theological student in the academy of Daventry. When about the age of twenty-two, he was made choice of as assistant minister to the Independent congregation of Needham Market in Suffolk. Having resided at Needham for about three years, he received an invitation to become pastor of a small flock at Namptwitch in Cheshire, which he accepted. Here he opened a day school, in the management of which he displayed that turn for research, and that spirit of improvement, which were afterwards destined to form such prominent features in his character. His reputation as a man of extraordinary talents and diligent inquiry soon spread amongst his professional brethren; and when Dr Aitken was chosen to succeed the Reverend Dr Taylor as professor of divinity at Warrington, the vacant department of belles lettres was assigned to Mr Priestley.

His literary career may probably be said to have commenced at Warrington; and the extent, as well as the originality of his pursuits, were soon announced to the world by a variety of valuable publications. He composed *The Theory of Language and Universal Grammar*, 1762; on *Oratory and Criticism*, 1777; on *History and General Policy*, 1788; on *The Laws and Constitution of England*, 1772; an *Essay on a Course of Liberal Education for Civil and Active Life*, 1765; *Chart of Biography*, 1765; *Chart of History*, 1769. Much of his attention about this period was taken up with general politics, on which he delivered a number of lectures. Although it was reasonable to think that his time would be sufficiently occupied by his academical and literary employments, yet his unwearied activity and industry found means to accomplish the first great work in philosophy which laid a foundation for his future fame. Having long amused himself with an electrical machine, and felt himself interested in the progress of discovery in that branch of physics, he undertook a *History of Electricity*, with an account of its present state. This work made its first appearance at Warrington in the year 1767, and was so well received by the learned world that it went through a fifth edition, in quarto, in the year 1794. It is justly deemed a valuable performance, and its original experiments are allowed to be very ingenious. About the year 1768 he was chosen as pastor of a large and respectable congregation of Protestant dissenters at Leeds, which led him to give a very large share of his attention to theological subjects. His mind is said to have been from childhood strongly impressed with sentiments of piety and devotion; and although he changed most of those religious sentiments in which he had been instructed for such as he regarded more rational and consistent with truth, his piety and devotion never deserted him. He was at the head of the moderate Unitarians, whose leading tenet is the proper humanity of Christ; confining every species of religious worship and adoration to the one Supreme Being. Some, we believe, have charged him with a design to subvert the Christian religion; but, since zeal for Christianity, as a divine dispensation, and the most valuable of all gifts bestowed upon the human race, was his ruling passion, such an imputation cannot, in fairness, be admitted. His *History and Present State of Discoveries relating to Vision, Light, and Colours* appeared in 1772 in 2 volumes quarto. This is allowed to be a performance of great merit and lucid arrangement; but it did not bring him such a large share of popularity as his *History of Electricity*, because it is probable that he was scarcely qualified to explain the more abstruse parts of the science.

In the year 1770 he quitted the town of Leeds for a situation entirely different from that which he had held there. His philosophical writings, and the recommendation of Dr Price, had made him favourably known to the Earl of Shelburne, who held out to him such advantageous proposals for residing with him, that a regard for his family did not permit him to reject them. The domestic tuition of Lord Shelburne's sons having been previously committed to a man of merit, they received no instructions from Dr Priestley further than some courses of experimental philosophy. He also attended his lordship on a visit to Paris, where he had an opportunity of seeing some of the most celebrated men of science in that country, whom he astonished by asserting a firm belief in revealed religion, which had been presented to their minds in such colours that they thought no man of sense could hesitate in rejecting it as an idle fable. In the year 1775 he published his *Examination* of Dr Reid on the *Human Mind;* Dr Beattie on the *Nature and Immutability of Truth;* and Dr Oswald's *Appeal to Common Sense.* The design of this volume was to refute the doctrine of Common Sense said to be employed as the test of truth by the metaphysicians of Scotland. He never intentionally misrepresented either the arguments or the purposes of an opponent; but he measured the respect with which he treated him by that which he conceived for him in his own mind. In the year 1777 he published his disquisitions relating to *Matter and Spirit*, in which he gave a history of the philosophical doctrine respecting the soul, and openly supported the material system, which makes it homogeneous with the body. This subjected him to more odium than any of his other productions. As he materialized spirit, so he in some measure spiritualized matter, by assigning to it penetrability and several other subtle qualities. About the same period he became the champion of philosophical necessity; a doctrine not less obnoxious to many than the former, on account of its supposed effects on morality. So astonishing was the versatility of his mind, that he at the same time carried on that course of discovery concerning aëriform bodies which has rendered his name so illustrious amongst philosophical chemists. A second volume was published in 1775, and a third in 1777. Some of his most memorable discoveries were those of nitrous and dephlogisticated or pure air; of the restoration of vitiated air by vegetation, of the influence of light on vegetables, and of the effects of respiration on the blood.

The name of Priestley was by these means spread throughout all the countries of Europe, and honours were heaped upon him by nearly every scientific body. The term of his engagement with Lord Shelburne having expired, Dr Priestley found himself at liberty to choose a new situation, and retired with a pension for life of L.150 a year. He chose the vicinity of the populous town of Birmingham, which was then the residence of several men of science, such as Watt, Withering, Bolton, and Keir, whose names are well known to the public. Here he was invited to become pastor of a dissenting congregation, an offer which he accepted about the latter end of the year 1780. Soon after this appeared his Letters to Bishop Newcome *On the Duration of Christ's Ministry*, and his *History of the Corruptions of Christianity*, works which were afterwards followed by his *History of Early Opinions.* He displayed his attachment to freedom by his *Essay on the First Principles of Government*, and by an anonymous pamphlet on the *State of Public Liberty* in this country; and he evinced a warm interest in the cause of America at the time of its unfortunate quarrel with the mother country. On the 14th of July 1791 the celebration of the anniversary of the destruction of the Bastile, by a public dinner, at which Dr Priestley was not present, gave the signal for those riots which have brought lasting disgrace on the town of Birmingham, and in some degree on the national character. Amidst the conflagration of places of worship and of private dwellings, Dr Priestley was the great object of popular rage; his house, library, manuscripts, and apparatus, were given as a prey to the flames; he was hunted like a criminal, and experienced not only the furious outrages of a mob, but the most unhandsome treatment from some who ought to have supported the character of gentlemen and friends of good order. He now lay under a load of public odium and suspicion, and, besides, he was constantly harassed by the petty malignity of bigotry. It was not to be wondered at, therefore, that he looked for an asylum in a country to which he had always showed a friendly attachment, and which, he supposed, was in full possession of all the blessings of civil and religious liberty. In the year 1794 he took leave of his native country, and embarked for North America. He took up his residence at Northumberland, a town in the interior of the state of Pennsylvania, which he selected on account of the purchase of landed property in its neighbourhood; otherwise its remoteness from the seaports, its want of many of the comforts of life, and of all the helps to scientific pursuit, rendered it a peculiarly undesirable abode for one of Dr Priestley's habits and employments. The loss of his amiable wife, and of a most promising son, as well as repeated attacks of disease, severely tried the fortitude and resignation of this ill-fated philosopher. In America he was received with general respect, and the angry contests of party were not able wholly to deprive him of the esteem due to his character. He was heard as a preacher by some of the most distinguished members of Congress; and he was offered, but declined, the place of chemical professor at Philadelphia. It became his great object to enable himself, in his retirement in Northumberland, to renew that course of philosophical experiment, and especially that train of theological writing, which had occupied so many of the best years of his life. By numerous experiments on the constitution of airs, he became more and more fixed in his belief of the phlogistic theory, and in his opposition to the new French chemical system, of which he lived to be the only opponent of any celebrity. By the liberal contributions of his friends in England, he was enabled to commence the printing of two extensive works, upon which he was zealously bent, a *Church History* and an *Exposition of the Scriptures;* and during the progress of his final decline he unremittingly urged their completion. Since an illness which seized him at Philadelphia in the year 1801, he never recovered his former state of health. His complaint was constant indigestion, and a difficulty of swallowing food of any kind. But during this period of general debility he was busily employed in printing his *Church History*, in writing the first volume of his *Notes on the Scriptures*, and in making new and original experiments. During this period, likewise, he composed his pamphlet of *Jesus and Socrates Compared*, and reprinted his *Essays on Phlogiston.* From about the beginning of November 1803 till the middle of January 1804, his complaint grew more serious; yet, by judicious medical treatment and strict attention to diet, he, after a time, seemed to be, if not regaining strength, at least not getting worse; and his friends fondly hoped that his health would continue to improve as the season advanced. He, however, considered his life as very precarious. Even at this time, beside his miscellaneous reading, which was at times very extensive, he read through all the works which are quoted in his *Comparison of the different Systems of Grecian Philosophers with Christianity;* composed that work, and transcribed the whole of it in less than three months, thus leaving it ready for the press. In the last fortnight of January his fits of indigestion became more alarming than ever, his legs swelled, and his weakness increased. Within two days of his death he became so weak that he could walk but a little way, and that with great difficulty. He was fully sensible that he had not long to live, yet he talked with cheerfulness to all who called for him. He dwelt upon the peculiarly happy situation in which it had pleased the Divine Being to place him in life; the great advantage he had enjoyed in the acquaintance and friendship of some of the best and wisest men of the age in which he lived; and the satisfaction he derived from having led a useful as well as a happy life. On the 9th of February 1804 he breathed his last, so easily that those who were sitting close to him did not immediately perceive his death. He had put his hand to his face, which prevented them from observing his last moments.

In the constitution of Dr Priestley's mind, great ardour and vivacity of intellect were united with a mild and placid temper. With a zeal for the propagation of truth which nothing could subdue, he joined a calm patience and an unruffled serenity of temper which rendered him proof against disappointments. The rights of private judgment were rendered sacred to him by every principle of his understanding, and his heart would not have suffered him to injure his bitterest enemy. He was naturally disposed to be cheerful, and when his mind was not occupied with serious thoughts, he could unbend, with playful ease and negligence, in the private circle of friends; but in large and mixed companies he commonly spoke little. In the domestic relations of life he was uniformly kind and affectionate; his parental feelings were those of the tenderest and best of fathers; and not even malice itself could ever fix a stain upon his private conduct or impeach his integrity. The autobiography of Dr Priestley, written, as he informs us, during one of his summer excursions, concludes with the date, "Northumberland, March 24, 1795." It was published in America after his decease, with a continuation by his son, Joseph Priestley, and observations on his writings by Thomas Cooper and the Rev. William Christie. This has been incorporated by John Towell Rutt with the collected edition of Priestley's *Theological and Miscellaneous Works*, in 25 vols. 8vo, Hackney, 1817, containing, at p. 537 of the second volume, a complete list of his writings.

PRIMATE. See ARCHBISHOP.

PRIMATICCIO, FRANCESCO, a celebrated Italian artist, was born of a noble family at Bologna in 1490. His parents had intended him for the mercantile profession, but his own genius soon opened up for him a successful career in the province of the fine arts. Becoming a pupil of the great ornamental decorator Giulio Romano, who was then working at the palace Del T in Mantua, he speedily outstripped all his fellow-disciples in design and colouring. His growing excellence secured the patronage of the Duke Frederigo; and in 1531 he was sent by that potentate to France, with strong recommendations to King Francis. There he continued till his death in 1570, introducing Roman taste into France, and a new era into the history of French art. The efforts of his genius were especially expended on Fontainebleau. The walls of that palace were ornamented with frescoes and stucco-work, the halls were studded with ancient Roman marbles, and the gardens were adorned with bronze casts of some of the most famous sculptures of antiquity. It seemed, in fact, as if a miniature Rome had sprung up in the middle of France. (See Vasari's *Lives of the Painters*, &c., and Lanzi's *History of Painting.*)

PRIMING. See GUN-MAKING.

PRIMOGENITURE is that right or custom whereby a title of dignity or an estate in land comes to a person in virtue of his being the eldest male. Among the Jews, the eldest son or first-born had a double portion of his father's inheritance; but before the time of Moses there was no certain rule as to who should be considered the first-born Moses decreed the abolition of this custom, and ordained that the first-born in point of time should be recognised. Among the Greeks, and especially among the Athenians, Primogeniture.

the custom of primogeniture seems even to have been more severe towards females than among the Jews. If the father died without heirs-male of his body, and without a will, the nearest kinsman on the father's side was entitled to claim the estate, to the exclusion of any daughters whom he had left. If he had made a will, it should have bequeathed his estates to parties bound to marry his daughters. The Mohammedans held that females should inherit a certain portion of whatever their fathers might leave, allowing the males a double portion. Among the Romans a somewhat different policy seems to have prevailed; at all events, it was not till the time of Justinian that daughters were placed exactly on the same footing as sons with respect to the succession to intestate property. The Germanic nations generally, with the single exception of the Visigoths, gave a decided preference to heirs-male in regard especially to the succession to land. Females were occasionally excluded from succession to the inheritance under any circumstances; and in the case where they were more favourably treated, it was almost invariably on their having no brothers.

The custom of *gavel-kind*, which still prevails in Kent, seems to have existed previous to the Conquest, and most probably extended over the larger portion of England and Wales. By this custom, lands within the county of Kent, unless specially excepted by an act of the legislature, descend, where the father dies intestate, leaving sons and daughters, in equal portions to the sons, to the exclusion of the daughters; but in the event of his leaving daughters only, they share the property equally among themselves. This law still exists in the copyholds of the manors of Stepney and Hackney in Middlesex, and in a few other places beyond the bounds of Kent. The custom of *borough English*, by which the youngest son succeeds to the whole of the inheritance on the intestacy of the father, has prevailed in Stamford, and one or two other places, time immemorial. The same custom still exists as to copyholds in different parts of England. But whether, previous to the Conquest, property descended to the sons, or indifferently to both sons and daughters, the introduction of the feudal system led to a change in the succession to property in land, and paved the way for the universal introduction of the custom of primogeniture.

Some writers have taken a very unfavourable view of the influence exercised by this custom in modern times. Adam Smith says, "Nothing can be more contrary to the real interest of a numerous family than a right which, in order to enrich one, beggars all the rest of the children." (*Wealth of Nations*, by M'Culloch, p. 171.) But however apparently reasonable, or however well supported this opinion may be, we are of opinion that it has really no good foundation. How much of the enterprise and industry, of the superior wealth and civilization of modern Europe, may be ascribed to the influence of the custom of primogeniture? It is beyond a doubt that the possession from infancy of a competency is, of all others, the most powerful obstacle to energy and enterprise. Those so situated seldom seek any kind of honourable distinction, and fold their hands in contentment with the humble mediocrity which has fallen to their lot. It is not to be expected that the monied fortunes accumulated for the younger children should equal those of the elder brother. If they be furnished with the means of establishing themselves in a profession, the capacity to rise is put into their hands; the sense of inferiority will stimulate them to exertion, and inspire them with a determination to rise to the same or even to a higher level. It is no rule for the division of property in land to tell us that merchants, bankers, and others of that class divide their property equally among the different members of their families, without any bad effects resulting from it. Such parties may carry on the business in partnership as advantageously as their father. The children of a landed proprietor can with great difficulty do this. The views of the co-heirs, so different and conflicting, are generally found to be all but insurmountable. Add to this, that the custom of primogeniture provides for the cultivation of all that is most elevated in art, in literature, and in science,—of everything, in a word, that communicates splendour and gives an enduring celebrity to nations. While doing so, it imbues all classes with the spirit of industry and enterprise. It does not appear, therefore, that the objections raised against the custom of primogeniture are entitled to any considerable notice. It is not imperative; it is a *custom* only, and not a right, and may be defeated in the event of the misconduct of the eldest son.

Primum Mobile || Prince of Wales Island.

The personal property of one dying intestate shall by this rule be divided—after the widow's proportion is deducted—equally among all the children; but that the real estate shall go, in addition, to the eldest son. There is one respect in which the English law of intestacy stands much in need of revision. The personal property of the intestate is the first fund for their debts, although secured upon their estates; and it is the surplus only, if there be any, that is divisible among the children. This is in all respects a most objectionable arrangement. When an estate is burdened to its full value, the eldest son should have nothing to look to save his share of the personal property. This is in accordance with the law of Scotland. In that country, if the eldest son take the real, he gets no part of the personal estate. He is permitted to renounce the succession to the real property, and have it valued and included in a common fund with the moveable property, of which he can demand an equal share with his brothers and sisters. (*The Succession to Property Vacant by Death*, by J. R. M'Culloch, 1848.)

PRIMUM MOBILE, in the Ptolemaic astronomy, the ninth or highest sphere of the heavens, the centre of which is that of the world, and in comparison with which the earth is but a point. This is supposed to contain within it all other spheres, and to give them motion, turning them quite round, as well as revolving itself, in twenty-four hours.

PRINCE is the Latin *princeps* (*primus-capio*), a word used originally to denote the *princeps senatus* of the Roman state. Originally, he was custos of the city; subsequently the name became a title of dignity, and he was called by the censors. Augustus and his successors adopted the title of princeps, and it was employed henceforward to denote the master of the Roman world. By and bye the term prince came to be applied to individuals having personal pre-eminence, such as the old princes of Wales, who enjoyed the same right and exercised the same power which belong to kings. Of a somewhat different kind were the powers enjoyed by the heads of certain German states comprehended in the Germanic confederation. The term is employed in a somewhat arbitrary manner on the Continent, possessing none of the definiteness which belongs to such words as king, duke, marquess, &c., but rather to denote persons of eminent rank. In England the term is almost entirely restricted to persons of the blood-royal. The eldest son of the sovereign is made Prince of Wales by creation.

PRINCE'S METAL, Prince Rupert's Metal, or Pinchbeck, an alloy of copper and zinc, which has a resemblance to gold.

PRINCE OF WALES ISLAND (called by the natives *Pulo Penang*,—*i.e.*, "Betel-nut Island"), an island belonging to Great Britain, in the Strait of Malacca, off the west coast of the Malay peninsula, lying between N. Lat. 5. 16. and 5. 30., E. Long. 100. 9. and 100. 25. Its form is an irregular oblong; its length 15 miles, breadth at the northern extremity 12, and at the southern 8; area, 160 square miles. The island presents a beautiful and picturesque appearance, the coasts, which are generally bold, being everywhere skirted with groves of cocoa-nut trees, while groups of the graceful betel-nut palm are everywhere scattered over the country, and the hills in the centre are covered with luxuriant forests to within a few hundred feet of their bare summits; and the whole of the country, where not cultivated, is densely wooded. A chain of hills traverses the island from N. to S., rising to the height of 2000 or 2500 feet above the sea. On each side of this chain there are fertile and well-cultivated plains extending to the coast. That on the east, which is known under the name of the Valley, is the more populous of the two, the western plain being swampy and less densely inhabited. In its geological character, Prince of Wales Island belongs to the primitive formation. The mountains are for the most part granitic; mica and quartz are also found in some places. No mineral of value has been obtained from the island, though the mountains are said to be rich in tin ore, which has never been wrought. There are no rivers of any size in the island, but the country is watered and fertilized by many small streams and rivulets. The climate is very healthy, especially in the higher regions, where it is somewhat like that of Madeira. The rainy and dry seasons are not so distinctly marked here as in most tropical countries, for showers fall during almost every period of the year excepting January and February, which are dry months. In the hills the mean temperature of the year is about 70°, and the annual range not more than 10°, while in the valley the heat varies from 76° to 90°. The air is clear and bracing; and this, along with the varied beauty of the scenery, makes Penang a frequent and agreeable resort for invalids.

The island generally possesses a fertile soil, which is for the most part a light black mould mixed with gravel or clay, and in many parts sandy. It is chiefly formed from the decayed leaves of trees, from which originated a fine vegetable mould, the whole island having been for ages covered with immense forests. This has in some degree disappeared as the woods were cleared and the surface exposed to the weather; but the soil in the interior is still very rich. The eastern portion of the island is almost entirely employed in the raising of rice, for which it is very well suited; the south-western side is occupied by plantations of spice and pepper plants. Cloves are grown on the tops of the hills, and tea, cotton, and tobacco on their sides. Coffee, sugar, nutmeg, and many kinds of fruit are also produced here. The forests which are found in this island abound in excellent timber for ship-building and for other uses.

The island contains many buffaloes and cattle, a few goats and sheep, and numerous hogs. The principal wild animals are the Malayan elk, deer, monkeys, wild cats, and snakes. Fish abound in the surrounding seas, and pearly banks have recently been discovered on the east coast. The people of Prince of Wales Island are of very various origin, and there is probably hardly another tract in the world of equal size that is occupied by so many distinct races. The original inhabitants were a few Malays; but after the island was settled by the British, many people from China, India, Siam, Burmah, &c., resorted hither to enjoy the British protection. An active trade is carried on here, as the island is advantageously situated for being an emporium between the countries of China, the East Indian Archipelago, India, and Great Britain. The total value of the exports and imports of Prince of Wales Island in 1854 was L.581,240. This island, along with Province Wellesley, a strip of land on the opposite shore of the Malay peninsula, Malacca, and Singapore, form the Eastern Straits settlements, of which the seat of government is Georgetown, on this island. This town is built on the most easterly point of the island, and has a population of 20,000, chiefly Chinese. When first visited by Europeans, the island was an almost uninhabited waste, overgrown with forests. In 1785 the King of Quedah, to whom it then belonged, gave the island to Captain Light, who had married his daughter; and the East India Company being then desirous of establishing a port on the straits, acquired possession of it on condition of paying annually to the King of Quedah 6000 Spanish dollars, or about L.1275 sterling. Captain Light was appointed superintendent of the settlement, and under him the land was rapidly cleared and improved. Until 1805 Prince of Wales Island formed part of the presidency of Bengal; but in that year it was made a separate presidency; and in 1830 it was united with the other settlements in the straits, and again placed under the government of Bengal. Finally, in 1851, the dependency on Bengal was removed, and the governor declared subordinate only to the government of India. Pop. (1855) 39,589.

PRINCE EDWARD ISLAND, a British colony in North America, on the S. side of the Gulf of St Lawrence, between N. Lat. 45. 58. and 47. 10., W. Long. 62. and 64. 20.; separated from New Brunswick and Nova Scotia on the S. by Northumberland Strait. Its length from E. to W. is about 130 miles, its greatest breadth is 34, and its area 2173 square miles. Its form is very irregular, and its surface is neither mountainous nor monotonously flat, but, like that of New Brunswick, is agreeably diversified with hill and dale. There are no mountains properly so called, but a chain of hills intersects the island from N. to S. about its middle. It abounds with streams and springs of the purest water; and numerous arms of the sea penetrate so far inland that no part of the country is more than 8 miles removed from the flux and reflux of the tide. When first seen, it presents the aspect of a flat country, covered with trees to the margin of the ocean; but, on a nearer approach, the more inviting prospect discloses itself of villages and farms situated in valleys or on green and gentle declivities, with the other smiling features which result from agricultural industry or spontaneous fertility. Unlike Cape Breton, Newfoundland, and other contiguous islands, Prince Edward Island is very rarely visited by fogs; and although the winter is equally severe, the transitions from one extreme to another are less violent. The heat of summer is less extreme than it is in Lower Canada, whilst the cold is not so intense during the winter. Altogether the climate is very salubrious, and there are few countries where health is enjoyed with less interruption.

The soil is fertile, and consists of a thin layer of black or brown mould, composed of decayed vegetables, superimposed upon a light loam. This extends about one foot downwards, and then a stiff clay, resting upon sandstone, predominates. The latter rock is the base of the island, and it appears to extend under the bed of Northumberland Strait, into the contiguous islands, and also into the continent. A solitary block of granite occasionally presents itself; but neither limestone, gypsum, nor coal have been discovered, although their presence was to have been expected from the occurrence of the sandstone formation. Indeed, no minerals of any importance have been found here, and building-stone is so scarce as to be imported from Nova Scotia. A great part of the island was formerly covered with wood, and though large portions have been removed, either for export or to make room for cultivation, there are still considerable remains of the primeval forests. Pine, birch, maple, beech, and other trees are those that compose the forests of the island.

Amongst the quadrupeds native to the island may be mentioned bears, once very numerous and destructive, but now much reduced; lynxes, foxes, hares, and various kinds of fur-bearing animals, whose numbers have been very much diminished. During summer and autumn seals frequent the shores, and they come down in great numbers on the ice of the Polar seas after it has broken up. The rivers abound with excellent fish, such as trout, eel, mackerel, flounders, oysters, lobsters (the last two being very large and very fine), and the coast with cod-fish and herrings. The fisheries of Prince Edward Island are among the best in the Gulf of St Lawrence, but they are not prosecuted to any great extent by the inhabitants. In 1855, 11,249 quintals and 6089 barrels of fish, to the value of L.12,093, were exported from the colony.

Prince Edward Island is essentially an agricultural colony, for which its climate, soil, and the configuration of its surface, admirably adapt it. All kinds of grain and vegetables raised in England arrive here at perfection. Crops of wheat, barley, oats, potatoes, turnips, pease and beans, are raised in abundance and of excellent quality. The produce in 1855 was 357,078 bushels of wheat, 110,629 of barley, 1,380,950 of oats, 1,673,345 of potatoes, 756,557 of turnips, 20,959 of buck-wheat, 6187 lb. of clover-seed, and 3112 tons of hay. Sheep, cattle, and swine thrive well in the island, and the horses, though small, are strong and hardy. The colony had in 1855, 14,513 horses, 55,159 horned cattle, 98,049 sheep, and 32,207 goats. The breed of useful animals generally has been much improved of late years, and agriculture has made decided advances. The manufactures of Prince Edward Island are of little importance, being chiefly destined for domestic use. Linen and flannel, woollen cloth and leather, are the principal articles made. Ship-building, however, is extensively carried on. The number of vessels built in 1854 was 106, tonnage 24,111, value L.168,777; in 1855 the number was 90, tonnage 14,451, value L.86,706. The commerce of the island consists in the export of timber, agricultural produce and live stock; and the importation of manufactured goods, iron, hardware, wines, spirits, tea, tobacco, &c. With the exception of timber, which is all sent to the United Kingdom, the produce of the island finds its chief market in the United States and the British colonies of North America; the imports come in nearly equal quantities from these three sources. The total value of the imports in 1855 was L.268,516, and that of the exports L.144,732. The total number of vessels that entered in the same year was 962, tonnage 53,003; those that cleared were 962, tonnage 60,669. The government of the colony is similar to that of Nova Scotia, of which it once formed a part. There is a lieutenant-governor, with a salary of L.1500; an executive council of nine, appointed by the lieutenant-governor and confirmed by the crown; a legislative council of six, appointed by the crown; and a house of assembly of twenty-four popularly-elected members. The public revenue amounted in 1855 to L.28,054, and the expenditure to L.30,193. About a half of the people are Roman Catholics, about a third Presbyterians, and a ninth Episcopalians. The whole number of churches in the island in 1855 was 127. The number of schools in the same year was 247, attended by 12,187 scholars; and the amount of public money expended for education was L.7946. The population of Prince Edward Island is of mixed origin, about a fourth being emigrants from the United Kingdom, and the rest natives of the country, descended from the French Acadians, or from Scotch settlers, or from loyalists from the United States, who came hither after the Revolution. The colony is divided into three counties, and the capital is Charlotte Town, on an inlet on the south coast.

This island was discovered by Cabot on the 24th of June 1497, being St John's day, and hence derived its original name of St John. The English, however, neglected to avail themselves of this right of possession; and the French, who appear at first to have entertained more correct views of its importance, took possession of it when they made the conquest of Canada, apparently without any remonstrance on the part of Britain. For a long period it continued attached to the crown of France, but it was conquered by Great Britain in 1758. At that time the population in the various settlements appears not to have amounted to 6000. At the peace of 1763 this colony and Cape Breton were confirmed to Britain, and annexed to the government of Nova Scotia; and a plan of settlement was agreed to by which the island was divided into townships, of about 20,000 acres each, granted to individuals who were considered as having claims on the government, and who were to pay a small sum as quit-rent. The plan, however, was unsuccessful, as the grants were in many cases merely used for the purpose of speculation. In 1768 the island was erected into a separate government from that of Nova Scotia, at the request of a majority of the proprietors, and a governor was appointed, who set vigorously about settling the island, and under whom it made gradual progress in prosperity. The colony obtained a complete constitution in 1773, when the first house of assembly met. During the American war it continued true to the interests of the mother country, and was resorted to by ships of war, as well as converted into a military station. As a mark of respect for the Duke of Kent, commander of the British army in America in 1799, and at the same time to remove the confusion of a name common to it with the capital of Newfoundland and New Brunswick, the island was then named Prince Edward Island, a designation it has since retained. Since that period no event has occurred of such moment as to require particular mention here. Pop. (1855) 71,502.

PRINCE'S ISLAND (Portug. *Ilha do Principe*), an island of Africa, belonging to Portugal, in the Bight of Biafra, 140 miles S.S.W. of Fernando Po; length from N. to S., 10 miles; breadth, about 5 miles. It is mountainous and of volcanic origin, the summits of some of the hills rising to the height of 4000 feet. The soil is in general hard and stony, but in some places it is of great fertility. It is watered by many springs and streams. Timber for various uses, and dye-woods, are obtained here in abundance. Much of the island is occupied by plantations of coffee, which is the principal produce, and of which 3487 cwt. were exported in 1842. The atmosphere is extremely moist; and, except for a few months, showers prevail during the whole year. The trade of the island, which was once considerable, has for some time been in a declining condition. St Antao, on the N.E. coast, is the chief town. Pop. of the island, 4584, chiefly slaves.

PRINCES' ISLANDS, or Daimonnisoi, a group of islands, nine in number, belonging to Asiatic Turkey, in the Sea of Marmora, near the entrance of the Bosphorus, from 10 to 12 miles S.E. of Constantinople. Their scenery is exceedingly beautiful; and they contain many villages, gardens, country seats, and convents. The largest of the group is Prinkipo, on which is a town of the same name. One of the most beautiful is Kalki, so called from its ancient copper mines. A steamer sails daily from Constantinople to the Princes' Islands, which attract many visitors by the beauty of their scenery and the amenity of their climate. Pop. of the group, 10,000.

PRINCIPAL. See Agent.

Principal. See Organ.

PRINCIPATO CITRA, a province in the kingdom of Naples, bounded on the N.W. and N. by the provinces of Naples, Terra di Lavoro, and Principato Ultra; E. by that of Basilicata; S. and W. by the Mediterranean. Length from N.W. to S.E., about 80 miles; greatest breadth, 42 miles; area, 2265 square miles. The central chain of the Apennines runs along the eastern boundary, and several branches from it extend into the interior. The greater part of the province is watered by the Sele and its affluents. This river rises in the Apennines near Conza, and flows S. and S.W. until it falls into the sea, not far from the ruins of Pæstum. Its chief tributary is the Negro or Tanagro, which flows from the S.E. through the Val di Diano, and joins the main river from the left. Except this valley, and a level tract of country along the coast, the province is nearly all occupied with mountain ranges. These are for the most part well wooded, especially with chestnut trees. The soil of the valleys is generally rich and fertile; but the plains along the coast for some distance on both sides of the Sele are marshy and unhealthy. The valleys and slopes to the south of the ruins of Pæstum, however, are of a different nature, and have been celebrated both in ancient and modern times for their fertile soil and delightful climate. The principal minerals of the province are copper, marble, and gypsum; and the most important articles of produce are timber, chestnuts, wine, oil, and fruits of various kinds. The principal live stock of the province are swine; and there are productive fisheries along the coast. Paper-making and weaving of woollen and linen fabrics are carried on. There is some trade in timber, dried fruits, hides, and pork. The province is divided into 4 districts, 44 arrondissements, and 165 communes. The capital is Salerno, on the gulf of the same name. Pop. (1856) 583,979.

PRINCIPATO ULTRA, a province of the kingdom of Naples, bounded on the N. by the province of Molise, E. and S.E. by those of Capitanata and Basilicata, S. by that of Principato Citra, and W. by that of Terra di Lavoro; length from E. to W., 47 miles; greatest breadth, 46; area, 1409 square miles. It is almost entirely mountainous, being traversed towards its eastern limits by the central chain of the Apennines, but lying chiefly between that and the lower western ridge of these mountains. Part of this latter ridge is formed by Monte Taburno, the ancient *Taburnus*, which separates this country from the plains on the sea-coast. The chief rivers are the Calore, an affluent of the Volturno; its affluents, the Tamaro and Sabbato; and the Ofanto, which flows eastward into the Adriatic. Principato Ultra enjoys a mild and healthy climate; and the soil is fertile and well cultivated, especially in the valleys. Corn, timber, wine, fruits, &c., are raised; and cattle and sheep are pastured among the mountains. Paper-mills, iron-foundries, and woollen factories are the chief manufactures in the province. Rural produce is exported to a considerable extent. Principato Ultra is divided into 3 districts, 34 arrondissements, and 134 communes. The capital is Avelino. The territory of Benevento, belonging to the Papal States, is entirely surrounded by this province. Pop. (1856) 375,313.

PRINGLE, SIR JOHN, a distinguished physician, was the younger son of Sir John Pringle of Stitchel, Roxburghshire, and was born on the 10th of April 1707. He was educated at home under a private tutor, and subsequently at St Andrews, at Edinburgh, and at Leyden, where he took the degree of Doctor of Physic. He at first settled in Edinburgh as a physician, but was soon after appointed assistant and successor to the professor of moral philosophy in the university. In 1742 he became physician to the Earl of Stair, then commanding the British army in Flanders; and in the same year he was constituted physician to the military hospital there. On the resignation of the Earl of Stair in 1745, Dr Pringle was appointed by the Duke of Cumberland physician-general to the forces in the Low Countries. He returned to Britain during the same year, and was chosen a fellow of the Royal Society on his passing through London. In 1747 and 1748 he attended the army abroad; and in 1749, having settled in London, he was made physician in ordinary to the Duke of Cumberland. He read a series of papers to the Royal Society, which are to be found in the *Transactions*, and which gained for him the gold medal of Sir Godfrey Copley. He married in 1752 a daughter of Dr Oliver, a physician in Bath; and in the same year he published his great work, entitled *Observations on the Disorders of the Army in Camp and Garrison*. In 1761 he was made physician to the household of the young Queen Charlotte, and physician in ordinary to the Queen in 1763. He was raised to the dignity of baronet of Great Britain in 1766, and was in 1768 made physician in ordinary to the King's mother, with a salary of L.100 a year. After having acted for many years as a member of the council of the Royal Society, he was, in November 1772, elected president of that distinguished body. He received his last medical honour in 1774, as physician extraordinary to the King. After passing his seventieth year, he resigned his presidency, and resolved to spend the remainder of his days in his native country. Removing to Edinburgh in 1780, he was doomed to disappointment. He found the place much changed; the keen winds of the northern metropolis were too severe for him; and perhaps these evils were exaggerated by his increasing infirmities. He returned to London in September 1781, and died in the January following, in the seventy-fifth year of his age. There is a monument to him in Westminster Abbey, executed by Nollekens.

PRINGLE, *Thomas*, a man distinguished not more for his poetical talents than for his ill-requited worth, was born at Blaiklaw in Teviotdale in 1789, and attended the university of Edinburgh. Lame, friendless, and barely sustaining himself by acting as a clerk in the Register Office of the Scottish capital, the rustic youth set himself to acquire an honourable position in life. His first efforts were made as much from necessity as from inclination in the province of literature. He became a contributor to Albyn's *Anthology*, and published in the *Poetic Mirror* a poem entitled "The Autumnal Excursion." The notice which these attempts gained induced him to lay down his clerkship for a time, and to devote all his attention to literary pursuits. He started and conducted the *Edinburgh Monthly Magazine*, which was soon changed into *Blackwood's Magazine*. At the same time, he was editing the *Edinburgh Star* and *Constable's Magazine*, and publishing a volume entitled *The Excursion, and other Poems*. His activity, in fact, was in a fair way of securing for him a place in his new profession, until untoward events occurred to drive him to another field of labour. In 1820 Pringle set sail to try his fortune at Cape Colony. He succeeded in gaining the situation of government librarian at Cape Town. He then attempted to eke out his income by establishing an academy, by starting a periodical called the *South African Journal*, and by undertaking the editorship of *The South African Commercial Advertiser*. All these enterprises were succeeding most favourably when the despotic intolerance of the governor compelled him to discontinue them, and to repair to Britain in 1826. The life of Pringle only assumed a more gloomy character after his return to London. It is true that in 1827 he obtained the important and congenial position of secretary to the Anti-Slavery Society; but when that association had attained its object and was broken up in 1834, he was again thrown upon the world. All the efforts and influence he could employ to obtain a public appointment were fruitless. An attack of consumption at the same time rendered it absolutely necessary that he should seek a warmer clime. He was actually preparing to return to the Cape when he died suddenly on the 5th December 1834. Pringle's poetical works consist of stray effusions classed under the two heads of *African Sketches* and *Ephemerides*. They were published in a collected form, accompanied with a memoir of the author, by Leitch Ritchie, London, 1839.

PRINTING.

Printing is the art of taking one or more impressions from the same surface, whereby characters and signs, cast, engraven, drawn, or otherwise represented thereon, are caused to present their reverse images upon paper, vellum, parchment, linen, and other substances, in pigments of various hues, or by means of chemical combinations, of which the components are contained on or within the surface from which the impression is taken, or in the fabric of the thing impressed, or in both.

The most important branch of printing is what is called *letterpress* printing, or the method of taking impressions from letters and other characters *cast* in relief upon separate pieces of metal, and therefore capable of indefinite combination. The impressions are taken either by superficial or surface pressure, as in the common printing-press, or by lineal or cylindrical pressure, as in the printing machine and roller-press. The pigments or inks, of whatever colour, are always upon the surface of the types; and the substances which may be impressed are various. Woodcuts and other engravings *in relief* are also printed in this manner.

Copperplate printing is the reverse of the above, the characters being *engraven* in intaglio, and the pigments or inks contained within the lines of the engravings, and not upon the surface of the plate. The impressions are always taken by lineal or cylindrical pressure; the substances to be impressed, however, are more limited. All engravings in intaglio, on whatever material, are printed by this method.

Lithographic printing is from the surface of certain porous stones, upon which characters are *drawn* with peculiar pencils. The surface of the stone being wetted, the chemical colouring compound adheres to the drawing, and refuses the stone. The impression is taken by a scraper, that rubs violently upon the back of the substances impressed, which are fewer still in number. Drawings upon zinc and other materials are printed by this process. (See Lithography.)

Cotton and calico printing is from surfaces engraven either in relief or in intaglio. The chemical compounds are either on or within the characters, as pigments or chemical colours, or in the fabric to be printed, but mostly in both; the combination of chemical substances producing colour when the fabric and the engraving are brought into contact. The impression is either superficial or lineal, but mostly lineal. (See Dyeing.)

LETTERPRESS PRINTING.

The origin and history of an art which has exercised such an influence on civilization, and contributed in so essential a manner to the cultivation of the human intellect, have naturally become a matter of inquiry amongst the learned, and have almost as naturally been the source of earnest controversy; for there are few effects of human invention or industry that have been originated and brought to perfection at a particular epoch, without any previous train of thought or circumstance, so that the precise day or year could be noted in which the perfect Minerva started forth in full maturity. On the contrary, it is difficult to say at what period of time the germ of the art of printing did not exist. So obvious is the reproduction of similar appearances from an impression of the same surface, that the most early of mankind must have noted it; and even the impression of a foot or a hand must have suggested a simple and intelligible mode of conveying an idea, before the invention of any kind of writing. Accordingly, these and similar signs are found to compose the chief characters of the earliest writing.

Observing this general law of the gradual perfectibility of human arts, we must look back to the most remote ages for the first steps of that of printing. We shall accordingly find certain evidence, that, more than two thousand years before our era, a method of multiplying impressions, rude and imperfect in the extreme, was certainly practised.

The earliest practice which can with propriety be called *printing* was probably that of impressing seals upon a plastic material, the purpose being confined to the single effect of each single impression. The next step of which the diligence of inquirers has taken note, and which is a step thus much further in advance that its object was the multiplication of impressions for the purpose of diffusing information,—the practice, namely, of impressing symbols or characters upon clay and other materials used in forming bricks, cylinders, and the walls of edifices,—was an art confined, so far as our knowledge extends, to the ancient centres of civilization in Egypt and Asia. Some examples of this art found their way many years ago into the great public museums and chief private collections of Europe, where they were objects of curiosity and wonder. In the present day, the researches of Sir Gardner Wilkinson and others into the antiquities of Egypt, and of Sir Henry Rawlinson and Mr Layard into the ruins of the buried cities of Asia, have produced a vast quantity of materials illustrative of the subject. The relative antiquity of the Egyptian and Asiatic remains belong to another inquiry. Among the Egyptian remains are numerous bricks of clay stamped with the *nomen* and *agnomen* of the king inclosed within a cartouche. The mode by which the impressions were made is manifest. The prints are very irregularly placed, without any reference to parallellism with the sides, and are always more or less awry, according to the manual skill and care of the workman: the surface of the bricks around the depression is forced up considerably, which is exactly the effect of pressing the hand or any substance into a plastic material; and the edges, both of the general depressions and of the figures, present the effect of the stamps having been drawn up whilst the clay was yet damp and adherent to it. It is therefore evident that the inscriptions were stamped in after the clay had been turned out of the mould, and were not produced by any part of it. To make the evidence complete, there have been found many stamps of wood, having on the face cartouches and inscriptions precisely resembling in kind those which must have been used for stamping the bricks. On some of these stamps and impressions there are slight traces of colour. Numerous specimens both of the bricks and stamps are in the British Museum, and of the bricks in many collections. There have also been found in Egypt numerous figures of baked clay and porcelain on which hieroglyphic characters have apparently been impressed singly, side by side, by stamps; and on the walls of their ruder buildings hieroglyphic and pictorial figures of considerable size have been produced by the same means and afterwards coloured. Of articles of domestic use are certain instruments called *tesseræ*, having incised characters, the use of which has certainly been to stamp plastic materials; and there have also been found leather belts and ornaments on which figures have been impressed singly by tools.

The ruins of the cities of Asia supply us with numerous examples similar to those of Egypt, but carrying the art farther. The ruins contain countless bricks, on which are impressed inscriptions similar to those of Egypt, but much more elaborate. Mr Layard says, that the characters on the Assyrian bricks were made separately: some letters may have been impressed singly with a stamp, but from the careless and irregular way in which they are formed and grouped together, it is more probable that they were all cut by an instrument and by hand; but that the inscriptions on the Babylonian bricks are generally enclosed in a small square, and are formed with considerable care and nicety; they appear to have been impressed with a stamp, on which the entire inscription, and not isolated letters, was cut in relief. From this circumstance, Mr Layard ascribes greater antiquity to the Assyrian remains.

Mr Layard's researches have further made evident that the ancient inhabitants of these cities practised a more advanced and elegant usage of imprinting in their domestic and ornamental arts. He has discovered great quantities of tiles and tablets covered with *incised* or *incussed* characters, on which was impressed, while the clay was yet wet, a line of characters or symbols,—apparently an authorisation or verification,—produced by the rolling of engraved cylinders; and other tiles, of which he says, "The most common mode of keeping records in Assyria and Babylon was on prepared bricks, tiles, or cylinders of clay, baked after the inscription was *impressed;*"—this impression must not be mistaken for the application of a stamp; it is effected by the use of an instrument in the hand, by which various combinations of the same form were indented into the moist clay, and therefore partakes more of the character of *impressed writing:* in many of the specimens thus impressed, the writing (or text) does not cover the entire tile or tablet, and the blank is filled up by repeated impressions of the same seal; and in some cases the entire text has been surrounded by an impression from a cylinder rolled round, forming an endless scroll, by which any addition to the text is rendered impossible. Great numbers of cylinders have been found. They are elaborately engraven on various stones; some are perfect cylinders, some barrel-shaped, others slightly curved inwards. Others again are of baked clay, on which the characters have been *incussed* while the clay was yet moist. Many of them are perforated longitudinally, and revolve on a metal axis. In describing an engraved cylinder of great beauty found in the mounds opposite Mosul, Mr Layard says, that on each side there were sixty lines written in such minute characters, that the aid of a magnifying glass was required to ascertain their forms. The habitual use of these elaborate articles is unknown,—by some they are supposed to be charms,—by others, records of family or personal transactions. The smaller examples, we have seen, were used to impress plastic materials as signets; but it is clear, from the shapes of the greater number, and from the circumstance that the characters they bear are invariably engraven or impressed in the order in which they are to be read, and not reversed, that they were not intended to multiply impressions on soft surfaces by way of diffusing information. In the library of Trinity College, Cambridge, has long been preserved a very celebrated Babylonian cylinder of clay, baked to vitrifaction. It is barrel-shaped, about 7 inches in length, and 3 in diameter at the ends. There are two inscriptions, separated by a blank band round the centre. The inscription is in vertical lines (counting on a drawing), thirty-two in number, consequently each less than a quarter of an inch in width. In one of the columns there are thirty characters; consequently, in both inscriptions there will be about 1800 characters. The cylinder presents many appearances of having been formed in a mould. It was presented to the college by the late Sir John Malcolm.

That a similar art was known to the inhabitants of the old world generally, may safely be assumed. It is therefore not a little remarkable that peoples so original and ingenious as the Greeks, and so imitative as the Romans, should have left almost no vestige of their having practised any such means as this to multiply their beautiful creations of fancy, or to embellish the tasteful appliances of domestic life; especially when we consider the easy application of the art to pottery, and the beauty, taste, and ingenuity which they exhibited in that manufacture. For, excepting a few paltry designs *en creux* on some of the coarser specimens, and a few marks upon the Roman military vessels, evidently stamped, there is no appearance of either people having had any idea of this kind. There are, however, in the British Museum numerous instruments presenting a singular instance how very nearly we may approach to an important discovery, and yet pass on unheeding. These are stamps of various sizes, having on their faces inscriptions in raised characters reversed. The material is brass or bronze. The letters of the inscriptions are considerably raised, and the face of them is rough and rounded, as though they were rudely cast in a mould. To the back of most a handle has been fastened; some have a loop to allow the fingers to pass through; some a boss to rest in the palm of the hand; some a ring. One use of these stamps has probably been to press the inscription into a soft material; but the more common application, especially of the smaller specimens, has evidently been to *print* the inscription on surfaces by the aid of colour. It has been suggested that their purpose was to imprint the coverings of bales of goods with the marks of their owners. Among relics of this kind is the signet of C. Cæcilius Hermias. The face of this is two inches by four-fifths of an inch, and the inscription (reversed)

CICAECILI
HERMIAE. SN.

with a border, is in relief, the surrounding parts being cut away to a considerable depth. It should be especially noticed, that the surface of the back-ground is very rough; and there is a ring at the back by which it could be handled or suspended.[1] These circumstances render the use of it very clear. It would be very much easier to incise the required inscription, and to let the field stand (indeed the art of engraving *en creux* was well known and used), than to cut away the field and leave the letters in relief; and it would produce a much more beautiful effect if it were used to impress any soft substance; whereas, cut as it is, the impression sunk into wax or clay would not only be ugly, but illegible, and the rough surface of the back-ground would present the most ungainly appearance upon the prominent parts of the wax, being the parts most presented to the eye. Its use therefore is evident. The relieved inscription, and no other part, being covered with ink or pigment, was impressed upon an even surface (papyrus, linen, parchment), and consequently left a perfect but reversed imprint of itself. This is the precise effect of printing with types. From the Greek *agnomen*, Cæcilius probably lived under the emperors, when literature had become one of the pursuits of the great, and when the difficulties and expense of procuring books by the slow process of copying were bitterly felt. It is singular, therefore, that the Romans should have overlooked so obvious an improvement upon their own signets as the engraving whole sentences and compositions upon blocks, and thence transferring them to paper—even if they had gone no farther than this.[1]

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[1] The Antiquarian Society of Newcastle possesses a similar stamp with a Greek inscription.

From this time a vast period elapses before any circumstance can safely be instanced as showing that the practice of transferring characters was known to any, even comparatively civilized people. From the rough and imperfect attempts above indicated an early and obvious advance was engraving pictures upon wooden blocks. The first practice of this is involved in obscurity; but most writers on the fine arts agree that the art was invented towards the end of the thirteenth century, by a brother and sister of the illustrious family of Cunio, lords of Imola, in Italy. By some the whole narrative is considered as apocryphal, but it is nevertheless generally admitted. The engravings were discovered by a Frenchman of the name of Papillon, in the possession of a Swiss gentleman, M. de Grœder, who deciphered for him the manuscript annotations found upon the leaves of the book in which they were bound. These purported that the book had been given to Jan. Jacq. Turine, a native of Berne, by the Count of Cunio, with whose family he, Turine, appears to have been intimately acquainted. Then follows a romantic history of the twins, and the cause of their invention. The book is entitled—"The Heroic Actions, represented in figures, of the great and magnanimous Macedonian king, the bold and valiant Alexander; dedicated, presented, and humbly offered to the most Holy Father Pope Honorious IV., the glory and support of the Church, and to our illustrious and generous father and mother, by us Alessandro Alberico Cunio, cavaliere, and Isabella Cunio, twin brother and sister; first reduced, imagined, and attempted to be executed in relief, with a small knife, on blocks of wood, made even and polished by this learned and dear sister; continued and finished by us together, at Ravenna, from the eight pictures of our invention, painted six times larger than here represented; engraved, explained by verses, and thus marked upon the paper, to perpetuate the number of them, and to enable us to present them to our relations and friends, in testimony of gratitude, friendship, and affection. All this was done and finished by us when only sixteen years of age." (*Ottley.*) This title is here given at full length, because, if genuine, it presents us at once with the origin, execution, and design of these first attempts at block-printing. The book consists of nine engravings, including the title; the figures are tolerably well designed, and the draperies graceful, with here and there attempts at cross-hatching; under the principal personages are their names; above, are inscriptions indicating the subject, and below, four lines of poetical Latin explanatory of it; and in some part of each print is an inscription indicating the share the twins respectively had in the execution. The colour of the pigment is gray.

The first subject is Alexander on Bucephalus. Upon a stone, *Isabel. Cunio pinx. et scalp.*

The second subject, the Passage of the Granicus. *Alex. Alb. Cunio Equ. pinx. Isabel. Cunio scalp.*

The third subject, Alexander cutting the Gordian Knot. *Alex. Albe. Cunio Equ. pinx. et scalp.*

The fourth subject, Alexander in the tent of Darius. *Isabel. Cunio pinx. et scalp.*

The fifth, Alexander giving Campaspe to Apelles. *Alex. Alb. Cunio Eques. pinx. et scalp.*

The sixth, the Battle of Arbela. *Alex. Alb. Equ. et Isabel. Cunio pictor. et scalp.*

The seventh, Porus brought to Alexander. *Isabel. Cunio pinx. et scalp.*

The eighth, the Triumph of Alexander upon his Entry into Babylon. *Alex. Alb. Equ. et Isabel. Cunio pictor. et scalp.*[2]

From the dedication of this book to Pope Honorius IV., it is deduced that these engravings must have been executed between 1284 and 1285, inasmuch as this pope only enjoyed the pontificate two years; and it is suggested that a copy of it might be found in the library of the Vatican. The narrative appears to be confirmed by many incidental circumstances, which could not be the invention either of Papillon or his informer. The name of Alberico seems to have been a favourite with the family of Cunio, and a Count of that name actually figures in history in the very year of the presumed invention; a relative of the twins, of course, not the male artist himself.

The interval between the time of the twin Cunio and the next mention of any similar usage is very perplexing; but upon examination it will appear that that long period was not altogether a blank in the art. The next earliest evidence is a document of the government of Venice, discovered amongst the archives of the Company of Printers in that city. It bears the date of 1441, and as it throws some degree of light upon the controversy relative to the invention of printing, it is here given from Ottley's *History of Engraving.*

"MCCCXLI. October the 11th. Whereas the art and mystery of making cards and printed figures, which is used at Venice, has fallen into total decay; and this in consequence of the great quantity of playing-cards, and coloured figures printed, which are made out of Venice; to which evil it is necessary to apply some remedy; in order that the said artists, who are a great many in family, may find encouragement rather than foreigners. Let it be ordered and established, according to that which the said masters have supplicated, that from this time in future, no work of the said art that is printed or painted on cloth or on paper, that is to say, altar-pieces (or images), and playing-cards, and whatever other work of the said art is done with a brush or printed, shall be allowed to be brought or imported into this city, under pain of forfeiting the works so imported, and xxx livres and xii soldi, of which fine one-third shall go to the state, one-third to the Signori Giustizieri Vecchi, to whom the affair is committed, and one-third to the accuser. With this condition, however, that the artists who make the said works in this city may not expose the said works to sale in any other place but their own shops, under the pain aforesaid, except on the day of Wednesday at St Paolo, and on Saturday at St Marco, under the pain aforesaid." (*Ottley.*)

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[1] The Chinese printing is not unlike this, and must by no means be supposed to have much similarity to the modern art. They assert that it was used by them several centuries before it was known in Europe; in fact, fifty years before the Christian era. They certainly may have used their method centuries before our art, for it differs in nothing but extent from that of the old Roman. The following is a description of their method at the present day, and it is probably the same in every respect as that in practice two thousand years ago in an empire where nothing is changed. As their written language consists of from eighty to one hundred thousand characters, it would be utterly impracticable to use moveable types, and the use of block-printing would be the most easy and rapid. The sentences, therefore, desired to be multiplied, being drawn upon their thin paper, this is made to adhere with the face downward to a block of soft wood, so that the characters appear though *reversed.* The plain wood is then cut away with most wonderful rapidity, and the drawing left in relief. Both sides of the block are similarly operated upon. The engraved wood is then properly arranged upon a frame, and the artist, with a large brush, covers the whole surface, the field as well as the relief, with a very thin ink; he then lays very lightly over it a sheet of paper, and passes a large soft brush over it, so slightly, yet so surely, that the paper is pressed upon the raised figures, and upon no other part. The rapidity with which this is performed is extraordinary; for Du Halde asserts that one man can print 10,000 sheets in one day, a number which would appear incredible, did not very good testimony exist at the present time that one man can print 700 sheets per hour. The method of putting the thin sheets together when printed is as different from ours as their printing and mode of reading. The sheets are printed on one side only; but instead of the blanks being pasted together to form one leaf, the sheet is so folded that no single edge of paper is presented to the reader, but only the double folded edge, the loose edges being all at the back of the book. The late emperor had punches or matrices cut, from which copper types were cast; but the number of characters required—about 60,000—is so great, that composition is almost impracticable.

[2] It is not unlikely that the twins may have been directed in the choice of their subject by the identity of the name of the great conqueror with that of the brother; at least such coincidences are not without parallel in the history of literature.

From this it seems manifest that the art of printing from wood-blocks was not lost, but, on the contrary, had been so long practised as to become an extensive and profitable business in Venice, and had spread over the Continent to such a degree as to destroy the trade of the Venetian artists. The establishment of an important manufacture, and its decay, necessarily infer a long period. From the constant conjunction of the two arts of painting and printing in this document, we may infer (what the existence of prints and cards of later date prove) the method in which these figures and cards were manufactured, namely, that the outline was first printed, and that the colours and shading were filled in by the painter and illuminator. The history of playing-cards now becomes of some importance to the narrative. When cards first came into use is uncertain; but mention is made of them in the year 1254, when they were interdicted by St Louis on his return from the Crusade: they were also forbidden by the Council of Cologne in 1281. In 1299 they are expressly mentioned under the name *carte;* and in *Das Gülden Spiegel,* printed by Gunther Zainer in the year 1472, it is said that cards first came into Germany in 1300. An old French poet, who wrote "En l'an mil iij cent xxviij," has the line, "Jouent aux dex, aux cartes, aux tables." (See CARDS.) There is no evidence earlier than the Venetian decree to connect the art of printing from wood-blocks with the art of making cards; but as it is evident from that document that such connection did exist, it is a fair presumption that it originated not very long after the introduction of the game; and as the sum paid by Charles VI. for "trois jeux de cartes" was so small as fifty-six Parisian sols, it has been conjectured that they must have been illuminated prints. The Venetian decree against the importation of painted and printed figures from abroad now brings us to the country from which the chief export was made. It appears, therefore, that in the Low Countries the manufacture was carried on to a great extent; and we shall also find that in Holland and Germany, and probably over most of Europe, religion had called this art to her aid; that whilst the noble and wealthy recreated the mind and delighted the eye with the exquisite productions of the scribe and illuminator, the more humble were equally gratified with rude and simple illustrations of interesting portions of Scripture, or pictures of favourite saints. It is probable that the poorer classes hung up these drawings in their dwellings, where they excited as true and heartfelt devotion as the masterpieces of the painters' art in the oratories of the great. There is no evidence how early the art was practised, nor whether the outlining the figures of saints and sacred subjects preceded the printing of cards, or was suggested by the latter; but it is certain that at the end of the fourteenth and the commencement of the fifteenth century the practice was very common. The impressions were taken by means of a burnisher, the gloss caused by the friction being distinctly visible on the backs both of cards and prints preserved to this time. As facility in practice increased, a distich or quotation illustrative of the print became a natural improvement; and to this was frequently added a coat of arms, the name of the saint, or the title of the subject, all in the field, or over the head of the figure; and, lastly, sometimes a date. The earliest print of which the date is given within the print itself,[1] is a wood-cut of St Christopher carrying the infant Jesus across the sea. It is of folio size, and coloured in the manner of our playing-cards. At the bottom is the inscription,—

Cristofori faciem die quacunque tueris
Illa nempe die morte mala non morieris.

Milleſimo cccc°
xx° terno.

It was found in the monastery of Buxheim, near Meiningen, and is now in the possession of Earl Spencer.

The next advance was obvious. Instead of a single block, a series of blocks were employed, with additional literary illustrations; and thus were the first printed books formed. The earliest and most memorable of these are the *Historia Sancti Johannis Evangelistæ*, the *Ars Memorandi*, the *Ars Moriendi*, the *Biblia Pauperum*, the *Historia Virginis Mariæ*, and the *Speculum Humanæ Salvationis.* (See BIBLIOGRAPHY.) The most important of these works is the *Historiæ Veteris et Novi Testamenti seu Biblia Pauperum*—truly the Poor Man's Bible. It consists of forty leaves printed upon one side of the paper only, by friction, from as many blocks; the colour is brown; the prints are placed opposite to each other, and the blank backs are pasted together into one strong leaf. The cuts are about 10 inches in height, and 7½ in width. Each print contains three sacred subjects in compartments, and four half-length figures of prophets in smaller divisions, two above and two beneath the principal subjects. Latin inscriptions are on either side of the upper figures, rhythmical verses on either side of the lower, and additional inscriptions are on labels at the bottom of the whole. The central subjects are from the New Testament, the others from the Old, and in some manner allusive to the former. There are many copies of this work, evidently from different blocks, and of different dates. Indeed it appears to have been a most popular book, and was printed repeatedly long after the introduction of legitimate printing; there are several editions in which the inscriptions are actually printed with moveable types. The exact date of these curious works is not ascertained; but Dr Horne possessed a copy contained in one volume with the *Ars Moriendi* and the *Apocalypse*, all works of the same style, the binding of which bore the date of 142( ). The original composition and design of this work is attributed, and not without some show of reason, to Ansgarius, who was bishop of Hamburg and Bremen in the ninth century. (See Plate II.)

A similar book is the *Canticles*, a small folio volume of thirty-two subjects, two being printed on each leaf, and on only one side of the paper, and the leaves also pasted back to back. It differs from the *Biblia Paperum* in that the inscriptions are engraven on scrolls fantastically dispersed amongst the figures. This is generally allowed to be of somewhat later date than the preceding, and to hold an intermediate space between it and the *Speculum Humanæ Salvationis*, to which a larger space must be devoted, on account of its importance in the controversy relative to the invention of printing.

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[1] There is said to be a print at Lyons with the date 1384, but its existence is doubtful. There has lately been discovered a print with the date of 1418, but its authenticity is yet under discussion. It was found by an inhabitant of Malines, who, in breaking up an old coffer which had been used to contain the archives of the former *Grand Conseil* of Malines, observed an ancient-looking print pasted inside the lid. The subject is the Virgin and Child, with Saints Catherine, Dorothy, Barbara, and Margaret, within a palisaded enclosure. On the top-bar of the gate is the date m : cccc °xviii. distinct and unmistakeable. The design and execution are very superior to those of the St Christopher and the block-books. The *Athenæum* of 1844 contains a full description of the print, and the volume of 1845 a *fac-simile.* The earliest dated print taken from an engraved metal plate is by Maso Finiguerra, 1460.

This is not, strictly speaking, a block-book; for whilst the form of the design and the portion of Scripture represented are engraven on wood, the inscription is in some cases engraven on wood also, but in others is printed in *moveable type*. The Latin edition, *perhaps* the first, consists of sixty-three leaves, divided into five unequal gatherings. The subjects are chiefly from the Old and New Testament; but sometimes such stories have been selected from ancient history as might seem in some way appropriate to the events recorded in sacred writ. Each subject has a short Latin inscription underneath it, and the text occupies the remainder of the page. Its size its folio; the impressions are taken with a burnisher, on one side of the paper; the colour of the ink is brown, and the backs are pasted together, as in the books previously described. The work is certainly of nearly the same date, though probably a little later, than the *Biblia Pauperum;* and it may even have been in part executed by the same artist, for in the earlier portions there is so much general resemblance, both in design and execution, as to make it probable that the same graver was employed in both. The latter part, however, is the work of another artist; the lines are not so bold, and there is an attempt at fineness of execution, of shading, and of distance, which the earlier master did not attempt; the design, though in better drawing, is not so spirited; the drapery is more correct, though not so graceful; and in fact the engraver was a better workman, but not so great an artist. It must be understood, that there are numerous editions of this work, many differing in essential particulars, but some so nearly similar as to require a microscopic eye to detect the variations. Of four of these, two are in Latin, two in Dutch; and between these four lies the contest for antiquity. Mr Ottley (whose beautiful *History of Engraving* contains a well-drawn-up account of his inquiry, illustrated by most convincing examples) has, from a minute and laborious examination, decided that the two Latin and two Dutch are printed from the self-same blocks, and by comparing them, and finding evidences of fractures in the one which do not exist in the other, he has very satisfactorily awarded the palm of antiquity. First, although the Latin inscriptions in the earlier part of the *first* Latin edition (so called by commentators) are engraven on blocks of wood, these blocks are not of the same piece as the figures, the work having been divided between two artists, the one more skilled in engraving figures, and the other in engraving letters. *Secondly*, parts of the engraving broken in the *first* Dutch are perfect in the *first* Latin; parts imperfect in the *first* Latin are unbroken in the *second* Dutch, whilst the *second* Latin is the most perfect of all; from which the conclusion is drawn that the *second* Latin is the most ancient, then the *second* Dutch, next the *first* Latin, and lastly the *first* Dutch. This order of succession is of considerable importance, because the *first* Latin is printed with moveable—some commentators say fusile—types. The printing of this work is claimed for Laurence Koster.

But by whomsoever these curious works were printed, they bring us to the very threshold of the invention of printing, in the proper sense of the word. Bibliographers agree that the pictorial parts of the *Biblia Pauperum*, the *Canticles*, and the *Speculum* were engraven by the same engraver, but from the designs of different artists; and that while of the *first* Latin edition (placed *third* by Ottley) the plates numbering 1, 2, 4, 5, 6, 7, 8, 9, 10, 11, 13, 14, 16, 17, 21, 22, 26, 27, 46, are printed entirely from wooden blocks, the five leaves of which the preface consists, and the text of the remaining leaves—(there are 63 in all)—are printed from *moveable type*. Therefore, between the printing of the first edition of these three works, and the third of the *Speculum*, the art of printing with moveable type had become known to the printer. [Sotheby's *Principia Typographica* contains a great number of *fac-similia* of block-books, water-marks, &c., and an ingenious disquisition.]

We have now come fairly to the practice of printing in the real sense of the word; and we have also arrived at the long-pending, long-controverted question, of who invented it, and where? The honour is disputed by as many cities as contended for the birth of Homer. Only three of these can show the slightest argument for their pretensions; Harlem, Strasbourg, and Mentz. Harlem claims it for her citizen Laurence Koster, or Laurent Janszoon Koster (or Custos). The claim rests principally upon the narrative in the *Batavia* of Hadrianus Junius, a native of West Friesland, who dwelt at Harlem. The work was written in 1575, but not published until 1588. The following is a close translation of the narrative :—

"There lived, a hundred and twenty-eight years ago, at Harlem, in houses sufficiently splendid (as a workshop, which remains to this day entire, can serve as proof), overlooking the forum from the neighbourhood of the royal palace, Laurentius Joannes, by surname *Æditus*, or Custos[1] (which at that time lucrative and honourable office an illustrious family of that name [or, *a family illustrious by that name*] held by hereditary right), the person who now seeks back by just avouchments and oaths the lapsing glory (*recidivam gloriam*) of the invention of printing, nefariously possessed and seized upon by others [the man], with the greatest right to be presented with the greater laurel of all honours (*summo jure omnium triumphorum laurea majore donandus*). He by chance, walking in a suburban grove (as was the fashion of citizens in easy means to do after dinner in those days), began first to fashion beech-bark into letters, which being impressed upon paper, reversed in the manner of a seal, produced one verse, then another, as his fancy pleased, to be for copies to the children of his son-in-law; which when he had happily accomplished, he began (for he was of great and acute genius) to agitate higher things in his mind, and first of all devised with his son-in-law, Thomas Peter, who left four children, all of whom obtained the consular dignity (a thing which I mention that all may understand the art arose in an honourable and talented, not a servile family), a more glutinous and tenacious species of writing ink, which he had commonly used to draw letters; thence (*experiretur*) he expressed entire figured pictures with characters added; in which sort I have myself seen *Adversaria* printed by him, the traces of the works (*operarum*) being only on opposite pages, not printed on both sides (*haud opistographis*). That book was in the vernacular tongue by an anonymous author, bearing for title *Speculum Nostræ Salutis;* in which it is to be observed among the first beginnings of the art (for never any is found and perfected at once), that the reverse pages being smeared with glue, were stuck together, lest they, being blank, should present a deformity. Afterwards he changed beech-blocks for lead;

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[1] In the original, Koster is simply said to have been surnamed *Æditus*, seu *Custos*, but no mention is made of the Cathedral. The statement, therefore, that he was curtos of the cathedral is a gratuitous insertion of after narrators. The word Custos has been Dutchified into Coster or Koster; but there is no apparent reason why we may not suppose that *Custos* was a barbarous Latin word for keeper, or constable, or any other translation the word will bear.

afterwards he made them of tin, because it was a material more solid and less flexible, and more durable: from the relics which remained of which types very ancient wine-flasks being made, they are to this day to be seen in those houses of Laurentius which I have mentioned looking upon the forum, inhabited afterwards by his grandson Gerard Thomas, whom I name for honour's sake, a noble citizen, who departed this life a few years ago. The studies of men favouring, as it happened, the new art, since a new merchandise, never before seen, brought buyers from every side with most eager quest, at once the love of the art increased, the establishment (*ministerium*) increased, workmen in the art being added to the family, the first touch of evil; among whom was a certain Joannes, either (as the suspicion is) that Faustus of ominous name, faithless and unlucky (*infaustus*) to his master, or some other of the same name, I do not greatly care which, because I am unwilling to disquiet the shades of the silenced, touched with the plague of conscience while they lived. He being sworn by oath to the processes of printing, after he had (as he thought) learned thoroughly the art of putting the characters together, the knowledge of fusile types, and whatever else may relate to the matter, taking an opportunity, than which he could not have found one more fit, on the very eve which is sacred to the birth of Christ, on which all in common are accustomed to labour at the sacred ceremonies, stole the whole materials,[1] tied up a package of the instruments of his master used in that art (*instrumentorum herilium ei artificio comparatorum supellecticem convasat*); thence with a servant hurried from the house, went in the beginning to Amsterdam, thence to Cologne, until he arrived at Mayence, as to the altar of an asylum, where he might live safe beyond the reach of arrows (as the saying is), and having opened an office, enjoyed the rich fruit of his robberies. Indeed, from it, in the space of the (or a turning) year, in the year 1442 from the birth of Christ, with the same types which Laurentius had used at Harlem, it is certain that he produced to light the *Doctrinale* of Alexander Gallus, which grammar was then in most famous use, with the *Tractates* of Peter Hispanus, his first productions. These are, for the most part, things which I have formerly heard from aged men worthy of belief, who have received them as things delivered from hand to hand, as a torch in a race, and have found others relating and attesting the same things. I remember that Nicholaus Galius, the instructor of my youth, a man with iron memory, and venerable for his long years, related to me, that when a boy he had heard, not once only, a certain Cornelius, a bookbinder, and rendered serious by age, nor less than eighty years old (who had lived as an under workman in that office), relating with much mental anger, and with fervour, the course of the proceeding, the manner of the invention (as he had received it from his master), the improvement and increase of the art, and other things of the kind; and that the tears would burst from him against his will at the shame of the affair, as often as he talked of the robbery. Which things do not differ from the words of Quirinus Talesius Con., who confessed to me that he had formerly the same from the mouth of the same bookbinder."

Beyond this narrative of Hadrian Junius there is little, or rather no testimony to the truth of Koster's claim, all subsequent argument being either drawn from or referred to this statement. Many very learned bibliographers have given full credence to Hadrian; whilst others not less acute absolutely deny Koster any pretence whatever—Santander calling in question his very existence; and there is a third party who, being unable to decide between the opposing arguments, and willing to take refuge in a middle course, allow to Koster the credit of having invented printing from blocks, but assign to his rivals that of printing from moveable types.

The whole argument may, however, be reduced into a reasonable compass. The probability of Hadrian's narrative will naturally be the subject of inquiry. *First*, the roundabout way in which this hearsay evidence reached Hadrian, is in itself an unsatisfactory circumstance. Little belief can be accorded to an uncertain bookbinder, even had any circumstances been adduced besides the name Cornelius, by which this bookbinder could be identified. *Secondly*, Talesius was many years secretary to Erasmus, who, although a Dutchman and resident in Holland, repeatedly and unhesitatingly ascribes the invention to John Gutenberg of Strasbourg at Mentz.[2] It is not at all probable that, had Erasmus ever heard of this story, or given the slightest credence to it if he had, he would have omitted some mention of a circumstance so gratifying to his national vanity; or that he should have remained in ignorance of a story well known to his secretary, and commonly bruited about, and therefore known to some of the learned men amongst whom Erasmus lived. *Thirdly*, the story of the engraving on beech-bark accidentally, when it is quite certain that the art of taking impressions from wood-blocks of the figures of cards and of saints and sacred subjects, with religious and legendary inscriptions, had been known and extensively practised, not only in Italy and Germany, but in Holland itself, for more than a century, is absurd. *Fourthly*, every author who has written upon the matter has given up all claim on Koster's behalf for the invention of cast type, the evidence in favour of others being too strong to be got over. *Fifthly*, the tale of the conversion of the relics of these types into drinking-cups, which were yet to be seen (1575), is discredited by the circumstance that no one has since seen or heard of them, although a controversy for the honour of a discovery in which they would have been evidence, was even then and has ever since raged furiously. *Sixthly*, the story of John Fust having stolen all his printing materials on the eve of Christmas, and decamped, first to Amsterdam, then to Cologne, and lastly to Mentz, and his publishing there within the same year, is self-contradictory; for type is not a very portable commodity; nor would he easily have escaped pursuit at Amsterdam, a town under the same government. Again, John Fust was originally no printer, but a wealthy goldsmith of Mentz, and certainly never worked as any printer's journeyman. Indeed this is such a palpable mis-statement, that commentators upon Hadrian have boldly supposed that the thief was John Gutenberg,—not he of Mentz, but a brother, also named John. Unfortunately Gutenberg's brother was not named John, but Friele; there was a cousin John; but the only evidence by which we become aware of the existence of these persons excludes the supposition that either practised the art; nor is it at all likely that members of a noble family, and wealthy men, should have worked in the service of any man. If it should be asserted that it was *the* John Gutenberg, his time is so well accounted for that it is impossible, since he was then resident at Strasbourg, and never was at Amsterdam or Cologne. Thus, then, the narrative of Hadrian Junius appears upon examination to be utterly incredible, being at once at variance with itself and with all probability.

Arguments for and against the claim of Harlem may be urged not derived from this narrative. Although these circumstances are not to be believed, the main facts *may* nevertheless be correct. Koster *may* have printed the *Speculum* and other block-books attributed to him. Ottley says that they were certainly printed in Holland, for that the types are not those used in Germany, but closely resembled such as were afterwards cut or cast in Holland; and that they are of greater antiquity than any books printed by those who afterwards used the art in the Low Countries. He also attempts to show, by the water-marks in the paper, that the works in question were produced in these parts. Water-marks, however, and some bearing a general resemblance to these, were common in the papers used by printers of Cologne, Louvain, and elsewhere; and the argument is worth little or nothing, for no evidence can be given even of the dates of these works, and much less of the printer. The *Speculum* was printed again and again after the invention of letterpress printing; nor is there the slightest evidence, supposing these assertions to be correct, to connect them with the name of Koster. It is a conclusive argument *against* him, that those other works ascribed to him and his descendants are executed with the self-same types used at Utrecht in 1473 by Ketelaer and De Leempt. Van Mander, who lived at Harlem in 1580, in his *History of the Lives of Dutch Painters and Engravers*, treats the claim of Harlem with contempt; for, speaking of printing, he describes it as an art "of which Harlem, with much presumption, arrogates to herself the honour of the invention;" nor does he make the slightest mention of his famous fellow-citizen. There is not the least evidence that his *three* grandsons (not *four*, as Hadrian says) ever carried on his business; for where are their works? and in their time printers had become so proud of their art as not only to put their names to every work, but even to add a long history of their undertaking and progress. Where are the books ascribed to them? what mention is made of them by their contemporaries? In a subsequent part of this article it will be seen that Caxton, the first English printer, is asserted to have been sent to Harlem to learn the art, and if possible to carry off one of the workmen. These things being also matter of controversy, cannot fairly be used in argument; nevertheless it is of some value that Caxton, who, supposing it to be true, would be an excellent witness in favour of Harlem, upon all occasions refers the invention to Gutenberg, and makes no mention whatever of Harlem or Koster.

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[1] Or whatever else *choragium* may mean; literally it signifies the *properties* of a theatre.

[2] Anno Christi 1440. Magnum quoddam ac pene divinum beneficium collatum est universo terrarum orbi, a Johanne Gutenberg Argentinensi, novo scribendi genere reperto. Is cum primus artem impressoriam, quem Latini vocant *excusoriam*, in urbe Argentinensi invenit; inde Moguntiam veniens eandem feliciter complevit. (*Epit. Rerum Script.* 1502, cap. 95.)

Santander labours to disprove the very existence of any such person. But there is no necessity to go so far as Santander: we may allow Koster's identity; we may even allow that he practised the art of taking impressions from wood-blocks; but this is very different from acknowledging his claim to the invention of the art of printing. The most strenuous champion of Koster is Meerman, an eminent French bibliographer of the last century, who, in his *Origines Typographicæ*, published at the Hague in 1765, strongly maintains this narrative of Hadrian; which is not a little singular, seeing that the Newcastle Typographical Society published a letter from him to Wagenaar, of eight years' prior date, in which he expresses a precisely contrary opinion. He calls Seitz's (Hadrian's) story a mere supposition, and the chronology a romantic invention; gives to the *Speculum* the date of 1470 as the earliest possible; attributes the honour to Gutenberg, and incidentally mentions his intention of publishing a pamphlet on the subject. Notwithstanding this, in his work, without any new fact whatever, he accredits Hadrian's story, finds consistency in the dates, believes the *Speculum*, and denies John Gutenberg,—completely reversing his previous conclusion, though his premises remain the same.

The statement of Ulric Zell, given in the *Cologne Chronicle*, though always referred to by bibliographers, has not received the attention it seems to deserve. Ulric Zell is supposed to have been one of the workmen employed in the office of Fust and Schœffer at Mentz, when that city was taken by the Count of Nassau in 1462. On this event Zell betook himself to Cologne, where he established a press, from which in 1467 he issued his first work. He continued to carry on the art in this city for many years. The *Cologne Chronicle* was printed by Koelhoff in 1499. Under the head of "Invention of Printing," it contains an account of its discovery communicated by Ulric Zell, which, considering the place where it was published, the nearness of the time, and the intimate connection of the narrator with the first movements of the art, carries great weight.

"*Item*, this most worthy art aforesaid [was] first of all invented [*vonden*] in Germany, at Mayence, on the Rhine; and that is a great honour to the German nation, that such ingenious people are to be found there; and that happened in the year of our Lord 1440.

"*Item*, although the art was invented at Mayence as aforesaid, in the manner it is now commonly used, yet the first idea [*verbyldung fonden*] originated in Holland from the Donatuses, which were printed there even before that time; and from out of them has been taken the beginning of the aforesaid art, and has been invented much more masterly and cunningly than it was according to that same method, and is become more and more ingenious."

Now we know that the *Donatuses* were block-books of a rude form, in no way resembling the art used by Zell and his contemporaries; and such as they are, there is no evidence that Koster printed any one of them.

All evidence, then, and the general consent of the learned, in failure of Koster, unhesitatingly ascribe this invention to

JOHN GUTENBERG, surnamed Genzfleisch, Gensfleisch, or Gensefleisch, von Solgenloch or Sorgenloch. He was a native of Mentz, and of a noble family, possessed of considerable property in various places in the neighbourhood. Fortunately the life of Gutenberg does not rest merely upon hearsay evidence, or the doubtful guesses of bibliographers from dateless woodcuts; legal documents supply most important information. It appears that, for some reasons unknown, he resided for many years at Strasbourg, and had even acquired rights of citizenship. The first document presents him in no amiable light. It is a lawsuit instituted to compel him to perform his marriage-contract with Anne von Isernen Thür; and it would appear that he was compelled to make good his promise, the name of Anne Gutenberg being found in the same register of the nobility liable to the wine-duty in the city of Strasbourg, in which Gutenberg's name also appears. The next document is so curious that an ample abstract of it cannot but be interesting.

It appears that he had contracted an engagement with Andrew Dritzehen, John Riffe, and Andrew Heilmann, to instruct them in the secrets of certain arts, and had entered into partnership with them for their better advantage. Andrew Dritzehen and Andrew Heilmann having called upon him one day, perceived that he was engaged in a wonderful and unknown art, the secret of which he was desirous of keeping to himself; that, moved by their importunities, he consented to enter into partnership with them for the term of five years, on two conditions,—first, that they should pay him the sum of 250 florins, 100 immediately, and the remainder at a certain fixed period; second, that if any one of the partners should die during the term of the copartnership, the survivors should pay to his heirs the sum of 100 florins, in consideration of which the effects should become the property of the surviving partners. Andrew Dritzehen died before the expiration of the period agreed on, being still indebted to Gutenberg in the sum of 85 florins. George and Nicholas, brothers of the deceased, demanded to be admitted to the partnership, and on refusal, brought an action against Gutenberg as principal partner. The magistrates gave judgment on the 12th of December 1439, relieving Gutenberg from the demand upon payment of the sum of 15 florins, being the difference of the sum of 100 florins, stipulated to be paid to the heirs of a deceasing partner, and the sum of 85 florins due to Gutenberg by Andrew on the original contract. The following evidence was produced on the trial :—

"Anna, the wife of John Schultheiss (*holzman, marchand de bois*), deposed, that on one occasion Nicholas Beildeck came to her house to Nicholas Dreizehen, her relation, and said to him, 'My Nicholas Dreizehen, Andrew Dreizehen, of happy memory, has placed four *stücke* (pages ?) in a press, which Gutenberg has desired that you will take away and them from one another put off, that no man may know what it may be, for he is not willing that any one should see.'

"Also John Schultheiss says, that Laurence Beildeck some time came to his house to Nicholas Dreizehen, when Andrew Dreizehen his brother was dead, and that the said Laurence Beildeck thus spoke to said Nicholas Dreizehen: 'Andrew Dreizehen, your brother, now happy, had four *stücke* lying underneath in a press. Therefore John Gutenberg desires you that you will take them therefrom and upon the presses take from one another so that no man can see what that is.'

"Also Conrad Sahspach deposed, that sometime Andrew Heilman came to him upon the Street of Merchants and said, 'Dear Conrad, as Andrew Dreizehen is departed, as you made the presses, and know about the matter, do you go thither, and take the *stücke* from the presses, and thoroughly separate (*zerlegen*) them from one another, so that no man may know what it is.'

"Laurence Beildeck says that he was sent by John Gutenberg to Nicholas Dreizehen, after the death of Andrew his brother, to say to him, 'That he the presses which he under his care has to no man should show; which also this witness did. And he further conversed with me, and said he should take so much trouble as to go to the presses, and with the two screws upon or from them so separate the *stücke* (*und die mit den zweyen würbelin uff den so vielen die stücke*) from one another, and these *stücke* he should then in the presses [*or*, on the presses] separate, so that thereafter no man can see nor understand.'

"The same witness also said that he knew well that Gutenberg, a little before the feast of the Nativity, had sent his servant to both Andrews to take away all *stücke*, which were broken up in his sight, that none of them might be found perfect. Moreover, after the death of Andrew, this witness was not ignorant that many were desirous of seeing the presses, and that Gutenberg had commanded that some one should be sent who might hinder any one from seeing the presses, and that his servant was sent to break them up.

"Also John Dunne, goldsmith, said, that three years or thereabouts previous he had received from Gutenberg about 300 florins for materials relating to printing."[1]

From this curious document may be learnt, that separate types were used; for if they were blocks arranged so as to print four pages, how could they be so pulled to pieces that no one should know what they were, or how could the abstraction of two screws cause them to fall to pieces? It appears that some sort of presses were used, and the transfers no longer taken by a burnisher or roller; and, lastly, that the art was still a great secret at the time when Koster was at the point of death. Hence it is manifest that the ingenuity of Gutenberg had made a vast advance from the rude methods of the time, and had in fact invented a new and hitherto unknown art.

These documents would be decisive in favour of Strasbourg as the place in which printing was invented, had it appeared that any effects were produced by this establishment. This, however, does not seem to have been the case, as Gutenberg and his successors make no mention of the fact, but, on the contrary, claim for themselves the production of the first book at Mentz. Indeed the partnership appears to have expired without any attempt at entering into fresh engagements; for, about the year 1450, Gutenberg returned to his native city with all his materials, without any opposition from his partner. In this place he entered into partnership with John Fust, a wealthy goldsmith and citizen, who engaged, upon being taught the secrets of the art (a fact that completely overthrows the fable of his having been one of Koster's workmen, and of his having stolen his types), and being admitted into a participation of the profits, to advance the necessary funds; and he did accordingly advance the considerable sum of 2020 florins. The new partnership immediately commenced operations, and hired a house called Zum Jungen, and took into their employ Peter Schœffer and others. Their subsequent operations we again find curiously chronicled in the records of another lawsuit,[2] in which Gutenberg was soon engaged with his new ally; for Fust, dissatisfied with their proceedings, sought to recover from Gutenberg money advanced, with interest, including 800 florins of the sum advanced in virtue of the deed of partnership. Gutenberg in defence alleged, that the 800 florins had not been paid at once, as stipulated; and that they had been expended in preparation for the work (apparently meaning thereby that this sum of money should have been paid down for his own use, in consideration of his communicating the secrets of his art, and that instead of so applying it to his private purposes, he had expended it for the joint benefit); whilst, as to the other sums, he offered to give an account of their appropriation, but denied that he was liable for the interest. The judges awarded that Gutenberg should pay the interest, as well as the part which his accounts showed he had applied to his individual use. This decision took place on the 6th of November 1455. Upon this, Fust obtained from the public notary the following document :—

"To the Glory of God, Amen. Be it known unto all those who shall see or hear read this instrument, that in the year of Our Lord 1455, third indiction, on Thursday the sixth day of November, the first year of the Pontificate of our very Holy Father the Pope Calixtus III., appeared here at Mayence, in the great parlour of the Bare-footed Friars, between eleven o'clock and mid-day, before me, the Notary, and the undersigned witnesses, the honourable and discrete person, James Fust, citizen of Mayence, who, in the name of his brother, John Fust, also present, has said and declared clearly, that on this same day, and at the present hour, and in the same parlour of the Bare-footed Friars, John Gutenberg should see and hear taken by John Fust an oath, conformable to the sentence pronounced between them. And this sentence read in the presence of the honourable Henry Gunter, Curé of St Christopher of Mayence, of Henry Keffer, and De Bechtoff de Hanaw, servant and valet of the said Gutenberg; John Fust, placing his hand upon the Holy Evangelists, has sworn between the hands of me, the Notary Public, conformable to the sentence pronounced, and to a letter which he has sent to me, and has taken the following oath, word for word: I, John Fust, have borrowed 1550 florins which I have transmitted to John Gutenberg, which have been employed for our common labour, and of which I have paid the rent and annual interest, of which I still owe a part. Reckoning, therefore, for each hundred florins borrowed, as above is recited, six florins per annum, I demand of him the repayment and the interest, conformably to the sentence pronounced; which I will prove in equity to be legal, in consequence of my claim upon the said John Gutenberg. In presence of the honourable Henry Gunter, of Henry Keffer, and of Bechtoff de Hanaw aforesaid, John Fust has demanded of me an authentic instrument, to serve him as much and as often as he hath need, in the faith of which I have signed this instrument, and have set thereto my seal."

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[1] The original German text of these documents is given in M. Leon de Laborde's interesting tracts on the origin of printing.

[2] Wolfii *Monumenta Typographica*. Fournier, *Origine de l'Imprimerie*.

From this it would appear (indeed the mortgage of his printing materials to Fust, mentioned in this document, proves) that Gutenberg had expended the whole of his considerable private fortune in his experiments, and had fallen into the power of his more wealthy associate; for in consequence of this judgment, and owing probably to his being unable to repay the sums demanded, the whole of his materials, constructed with so much perseverance, fell into Fust's hands; for the initial letters used by Gutenberg and his partners, in works known and supposed to have been executed between 1450 and 1455, are likewise used by Fust and Schœffer in the Psalter of 1457 and 1459. After such a mortifying result of so many years' labour, it would have been no matter for wonder had Gutenberg abandoned the unprofitable pursuit. On the contrary, he appears to have immediately started anew with fresh vigour, and this time with success. Another legal document gives curious information.

"We, Henne (John) Genszfleisch de Sulgeloch, named Gudinburg, and Friele Genszfleisch, brothers, do affirm and publicly declare by these presents, and make known to all, that, with the advice and consent of our dear cousins, John, and Friele, and Pedirmann Genszfleisch, brothers, of Mentz, we have renounced and do renounce, by these presents, for us and for our heirs, simply, totally, and at once, without fraud or deceit, all the property which has passed by means of our sister Hebele, to the convent of St Claire of Mentz, in which she has become a nun, whether the said property has come to it on the part of our father Henne Genszfleisch, who gave it himself, or in whatsoever manner the property may have come to it, whether in grain, ready money, furniture, jewels, or whatever it may be, that the respectable nuns, the abbess, and sisters of the said convent, have received in common or individually, or other persons of the convent (have received), from the said Hebele, be it little or much; and we have promised and do promise, by these presents, in good faith, for us and for our heirs, that neither we, nor any person on our part, nor yet our said cousins, nor any of their heirs, nor any person on their part, shall either demand, gain, nor claim of the said convent, nor of the abbess, nor of the convent in general, nor of the persons who may be found therein individually, the said property, of whatever kind it may be, either wholly or in part, and that we will never demand it again, either through an ecclesiastical or civil court, or without the aid of the law; and that neither we nor our heirs will ever molest the said convent, either by words or deeds, either secretly or publicly, in any manner. And as to the books which I, the said Henne, have given to the library of the convent, they are to remain there always and for ever; and I, the said Henne, propose also to give in future, without disguise, to the library of the said convent, for the use of the present and future nuns, for their religious worship, either for reading or chaunting, or in whatever manner they may wish to make use of them according to the rules of their order, *all the books which I, the said Henne, have printed up to this hour, or which I shall hereafter print, in such quantities as they may wish to make use of;* and for this the said abbess, the successors and nuns of the said convent of St Claire, have declared and promised to acquit me and my heirs of the claim which my sister Hebele had to the sixty florins, which I and my said brother Friele had promised to pay and deliver to the said Hebele, as her portion and share arising from the house which Henne our father, assigned to him for his share, in virtue of the writings which were drawn up thereupon, without fraud or deceit. And in order that this may be observed by us and by our heirs, steadfastly and to its full extent, we have given the said nuns and their convent and order these present writings, sealed with our seals. Signed and delivered the year of the birth of J. C. 1459, on the day of St Margaret."

From this it will appear, that his new establishment had actually produced the long wished-for effect. He appears to have carried on the business ten years; for in 1465 he entered into the service of Elector Adolphus of Nassau, as one of his band of gentlemen pensioners, with a handsome salary, as appears from the letters-patent, dated the 17th January 1465, and finally abandoned the pursuit of an art which, though it caused him infinite trouble and vexation, has been more effectual in preserving his name and the memory of his acts, than all the warlike deeds and great achievements of his renowned master and all his house. Gutenberg died on the 24th of February 1468. His printing-office and materials had passed into the hands of Conrad Humery, syndic of Mentz, who had probably assisted him with money, and who appears to have been in some degree his partner. He afterwards sold them to Nicholas Bechtermunze of Elfield, whose works are greatly sought after by the curious, as they afford much proof, by collation, of the genuineness of the works attributed to his great predecessor.

There does not appear to be any record of the early life of JOHN FUST or PETER SCHŒFFER before their partnership with Gutenberg, save that the former was a wealthy goldsmith and an ingenious man, and that Schœffer, surnamed de Gernsheim, was a scribe. It is very likely that the combination of character and qualifications of these three men may afford a good clue to the wonderful taste and beauty which distinguish the works issued from their press, and consequently to the great general improvement of the art during their life. The ingenuity of Gutenberg would readily suggest a new and expeditious method of manufacturing types; the practical skill of Fust as a worker in metals (and the working in gold and silver had at that time attained a most extraordinary nicety and beauty), and his large pecuniary resources, would readily provide the necessary appliances, while the taste of Schœffer would give all possible grace and beauty to the new forms. For Schœffer, it must be recollected, was a scribe, one of the ancient and honourable craft whose occupation was destined to fall before the new art; a transcriber, perhaps an illuminator, of the manuscript works in use before printed books; and those who have had the happiness of viewing those exquisite specimens of skill which beguiled our ancestors into study and devotion (when will modern typography produce such feasts for mind, and eye, and imagination?) will readily conceive that Schœffer's eye was already schooled for the conception, and his hand for the execution, of all the beauty the trammels of a new art and limited skill would allow. Aided by his own taste and his partners' invention and wealth, Schœffer proceeded to a new enterprise, namely the *casting* of type. The entire conception and execution of this invention has been generally attributed and allowed to Schœffer. It seems most probable, however, that where three ingenious men are bound together by art and interest, no one of them can lay exclusive claim to any invention or undertaking executed in the workshops and for the mutual benefit of all. Allowing, therefore, to Schœffer the honour of having suggested some such plan, the other two may fairly put in a claim for their portion of the credit on the score of their suggestion and assistance; especially since Fust, as a worker in metals, would have been the party to engage workmen to elaborate the conceptions of his partners' brain. Accordingly the only evidence upon the subject appears to show that the partners had for some time practised a method of taking casts of types in moulds of plaster; for it must be remembered that the types of Gutenberg's earlier efforts, both at Strasbourg and at Mentz, were cut out of single pieces of wood or metal with infinite labour and imperfection. This method of casting, however, although a great improvement, was at best but a slow and tedious process. Almost every type cast would require a new mould; no skill or care could enable the workman to impress so small a thing as a type is at the face, yet so elongated in the shank, fully, freely, and steadily, into a soft material; and it would be necessary afterwards, under the most favourable circumstances, that the squareness and sharpness so indispensable in type should be given by another slow process; so that at best this advance was but an imperfect and tedious operation. Schœffer has therefore an undoubted claim to be considered as one of the three inventors of printing; for he it was who first suggested the cutting of punches, whereby not only might the most beautiful form of type the taste and skill of the artist could suggest be fairly stamped upon the matrix, but a degree of sharpness and finish quite unattainable in type cut in metal or wood could be given to the face; whilst to the shank, by the very same process by which the face was cast, the mould would give perfect sharpness and precision of angle. Add to this, that the punch being once approved of, could be kept ready to stamp a new matrix in precisely the same condition and form as the first, should that be worn out or mislaid, or make a duplicate should the demands of business require it. It is nevertheless rather singular, that the mould represented on the right side of the press of Ascensius, shortly after the time of Schœffer, should be precisely the same in form and manner of use as that of the present day. This was evidently an immense stride toward perfection; let Schœffer therefore take a place on the right hand of the inventor.

Whatever may have been the several shares of the masters in perfecting their art, their joint labours were effectual. The first productions of their press—passing over an *Alphabet*, the *Doctrinale* of Alexander Gallus, and a *Donatus*, which are of doubtful authenticity, and are merely block-books—were three editions of Donatus, the first *books* known to have been printed entirely with moveable types. In 1455 they printed the celebrated *Litteræ Indulgentiæ Nicolai V. Pont. Max.*, which is the first work,—it is only a single page,—printed with moveable types which is dated. In 1455, or thereabouts, for it has no date, they printed the famous *Biblia Latina Vulgata*, generally known as "the Mazarine Bible." It has no colophon or *Explicit*. And it should be noted, that there is no book known which bears the conjoint names of Gutenberg, Fust, and Schœffer, nor any which has the imprint of Gutenberg alone.

Within eighteen months of their separation from Gutenberg, Fust and Schœffer produced the celebrated Psalter. This was printed with large cut type. As it is impossible that a new fount could have been prepared, and so splendid a work printed, within that short space, it must be evident that the partners did great injustice to Gutenburg in suppresing his name from the colophon. This book was produced in the month of August 1457, and is the first book which bears the name of the place where it was printed, those of its printers, and the date of the year in which it was printed. This Psalter was reprinted in 1459, 1490, and 1502, and always in the same type, which, it is remarkable, was never used for any other work, probably because its great size made it unfit for any other works than those not intended for popular reading, but to lay on desks like our church Bibles. On the 16th of October 1459 Fust and Schœffer published the *Durandi Rationale Divinorum Officiorum*, with an entirely new fount of type; in 1460 the *Constitutiones Clementis V.*; and in 1462 the celebrated Latin Bible. In 1465 they printed *Cicero de Officiis*, in which occur the first printed Greek types. Fust enjoyed this successful and glorious practice of his art but ten short years; yet in this period what an immense advance from the misshapen and irregular lumps of their first efforts, ugly in themselves, and more ugly in their utter want of relative proportion and allignement, to the well-proportioned, evenly-standing type of the Bible! The plague carried him off in Paris about the year 1466, full of years, and perchance full of honours. Schœffer survived many years, and, in conjunction with Conrad Henlif, produced a great number of works. His name is found in the colophon of the fourth edition of the Bible of 1402, about which time he is supposed to have deceased. There are ten books which are known to have been printed by Fust and Schœffer conjointly. Schœffer continued to print during a period of thirty-five or thirty-six years after the death of Fust, and his productions are very numerous.

Were we to take tradition for our guide as regards the character of Fust, we should regard him as a conjuror and an adept in the black art. The popular story (and many "grave and discrete old men" have given credit to the tale) runs, that having kept these proceedings profoundly secret, as soon as their Bible was finished, Fust transferred himself to Paris with many copies of the new work, and palmed them upon the learned as manuscripts—to which, as they were printed on vellum, in a type bearing much resemblance to the written books of the period, and the vignettes and initial letters were splendidly illuminated, they were not very dissimilar; that some eager scholar or devotee became the possessor of the first copy, supposing it to be a rare chance, at the moderate price of four or five hundred crowns; that as he brought the work into the market, the price fell rapidly to sixty, and then to thirty crowns, by which time the extraordinary glut produced suspicion, and Fust was accused of multiplying Holy Writ by the aid of the Devil, and was accordingly persecuted by the priesthood, whilst the laity, looking to their temporal interests, prosecuted him for his inroad into their pockets; and that from these things Fust was obliged to quit Paris precipitately.

Having thus given a sketch of the origin and history of the art of printing, a brief account of the works issued by the illustrious triumvirate will not only be proper here, but will give the general reader a better idea of the astonishing perfection to which the art rose under the taste and genius of its inventors. As before remarked, there is not a single work of Gutenberg which bears his name; yet there are several which bear such internal evidences that the literati of all parties and opinions are unanimous in attributing them to his press.

Of these works, Dr Dibdin, the well-known bibliographer, gives the following account:—

"First, as to the *character of the type* used by the early Mentz printers. This appears to have been uniformly what is called *Gothic;* and if we except the varieties of the larger type (from three-eighths to two-eighths or to a quarter of an inch), which appear in the Psalters of 1457, 1459, and 1490 (the type common to most works executed about the same period), we shall observe three distinct sets or forms of letters used in the printing-office of Faust and Schoiffher. Of these three typographical characters, two only (if we except the one with which the Bible of 1455 was executed) are visible in the publications which appear to have been printed in the lifetime of Faust; that is to say, the larger Gothic used in the Bible of 1462, and the smaller Gothic in the *Offices* of Cicero, of the dates of 1465 and 1466. These appeared united, the former, for the first time, in the *Constitutions of Pope Clement V.*, of the date of 1460. Schoiffher introduced a type of an intermediate size, which may be seen, among other works, in the *Rudi-*

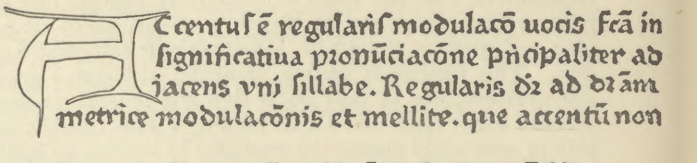
ments of Grammar of 1468, and in the *Decretals of Pope Gregory the Ninth*, of the date of 1479. This intermediate type is of a narrower form, and prints very closely. Of the three types here mentioned, the largest is undoubtedly of the handsomest dimensions; but they all partake of the *Secretary Gothic*, and may be said to be the model of that peculiar character which was adopted by the early Leipsic printers, Thanner and Boëttiger, and was more especially used by John Schoiffher and the other German printers for nearly the whole of the sixteenth century. Shew me Lisardo, one book, nay, one leaf only, printed in the *Roman type*, in the colophon of which the name of Faust or of Peter Schoiffher appears, and you shall immediately have the amount of the balance in my favour, at my banker's, be it great or small, be it L.200 or L.20, for such a precious and unheard-of curiosity.

"We shall now, in the second place, say a few words as to the *character of the printing*, or of the *mechanical skill*, of the early Mentz press. There can be but one opinion upon this point. Everything is perfect of the kind, the paper, the ink, and the register, or regularity of setting up the page. The Bible of the supposed date of 1455 is quite a miracle in this way;[1] but the Psalters are not less miraculous, nor is less praise due to the *Constitutions of Pope Clement V.*, of the date of 1460, and the *Bible* of 1462; while the *Durandus*, of the earlier date of 1459, exhibiting the first specimen of the smallest letter, strikes one as among the most marvellous monuments extant of the perfection of early typography. Almost all the known works before the year 1462 are printed *upon vellum*, doubtless because they ventured upon limited impressions; and even of the Bible of 1462 more copies have been described upon vellum than upon paper. Upon the whole, the vellum used by Faust and Schoiffher, although inferior to the Venetian, is exceedingly good, being generally both white and substantial.

"In the third place, let us notice the nature or character of the works which have issued from the press of Faust and Schoiffher. Whatever may be our partiality towards that establishment from which the public were first gratified with the sight of a printed book, candour obliges us to confess that the fathers of printing were not fortunate, upon the whole, in the choice of books which issued from their press.

"In the fourth place (for I told you I should be somewhat tautologous), consider what is the typographical appearance of those books which Gutenberg is really supposed to have executed. It is quite unique. A little barbarous, and certainly wholly dissimilar from any thing we observe in other contemporaneous productions of the Mentz press. You will please to understand that I think very doubtfully of the *Donatuses*, which are considered to have been printed by him; as well as of the *Speculum Sacerdotum*, and *Celebratio Missarum*; concluding the *Catholicon* of 1460, and the *Vocabularies* of 1467 and 1469, to be the more genuine productions of his press, or of the types used by him. Is it not surprising, I ask, that these works are executed in types quite different from anything we observe in the Mentz productions? and this from a man who is considered as the parent of printing in that city. No wonder, if they *be* the actual productions of Gutenberg, that Faust and Schoiffher thought so meanly of his talents, and that on a dissolution of partnership they adopted a different and a very superior character."

In confirmation of these remarks of the learned bibliographer, we shall here insert a specimen of Gutenberg's *Balbus de Janua*, which will also be a curious illustration of ancient art. Notwithstanding the appearance of these types, the reader is assured that the original is really printed from separate pieces of metal.[2]



Accentuſ ē regulariſ modulacō uocis fcā in
ſignificatiua pꝛonūciacōne pn̄cipaliter ad
jacens vni ſillabe. Regularis dꝛ ad drām
metrice modulacōnis et mellite. que accentū non

Dr Horne, in the appendix to his *Introduction to Bibliography*, says of the Psalter, "This precious work, as Santander justly calls it, is one of the most known among early printed books, from the various and correct descriptions of it which have been given by different bibliographers. Until the discovery of Pope Nicholas' *Literæ Indulgentiarum*, this was supposed to be the very first article ever printed with a date affixed; the book is executed on vellum, and of such extreme rarity that not more than six or seven copies are known to be in existence; all of which, however, differ from each other in some respect or other. The most perfect copy known is that in the imperial library at Vienna; it comprises 175 leaves, of which the Psalter occupies the 135 first and the recto of the 136th. The remainder is appropriated to the litany, prayers, responses, vigils, &c. The psalms are executed in larger characters than the hymns, similar to those used for missals prior to the invention of printing; but all are distinguished for their uncommon blackness. The capital letters, 288 in number, are cut on wood with a degree of delicacy and boldness which are truly surprising; the largest of these, the initial letters of the psalms, which are black, red, and blue, must (as Lichtenberger has remarked) have passed *three times* through the press. Copies are now in the Queen's library at Windsor, and in that of Earl Spencer at Spencer House." A facsimile of the initial B, and a portion of the first verse of this beautiful book, and of the colophon at the end, will be found in Plate III.

The extraordinary praise awarded by these eminent bibliomaniacs to the first productions of the Mentz press may perchance excite in the minds of the more sober public a suspicion that these writers have been led away by their enthusiasm beyond the limits of matter-of-fact truth, and have seen merit in defects, beauty in deformity, and lustre in antiquity. Assuredly, nevertheless, such is by no means the case; and the happy individual who gains access to the *chef-d'œuvres* of Fust and Schœffer will return from the inspection a wiser man; for the beauty of these works is inconceivable. England fortunately possesses several of these treasures of art, there being copies of the Bible of the supposed date of 1450–55 in the Royal Library, in the Bodleian, and in those of Earl Spencer and Henry Perkins, Esq.; whilst of the six known copies of the Psalter of 1457, two are in England, namely, one at Windsor, and one in the possession of Lord Spencer. Of the Latin Bible of Fust and Schœffer, 1462 (the first bearing date), there are copies *on vellum* at Blenheim, in the libraries of Lord Spencer, the Earl of Jersey, one formerly belonging to Sir M. Sykes, in the British Museum, and in the Bodleian (imperfect). Copies *on paper* are rarer still, there being but three in this country, viz., those in the Royal Library and the British Museum, and one lately in the possession of Mr Willett.

Apparently, in retaliation for the injustice done to Gutenberg by his partners in depriving him of any share of the honour of producing the Psalter of 1457, which, as before stated, must be the joint production of all three, although it was not finished until after the secession of Gutenberg, bibliographers have generally agreed in attributing the printing of the Bible of 1450-55 to Gutenberg alone, when it is equally manifest that Fust and Schœffer had as much claim to the honour as their coadjutor. It is an exceedingly beautiful book, in two very large folio volumes, in two columns, containing from forty-one to forty-three lines each, in very large well-cut types. It consists of six hundred and forty-one leaves; it has no title, paging, signatures, or catch-words; the initial letters are not printed, but painted in by illuminators, and the initial letters of each verse of the psalms are painted alternately red and black, by way of guide to the priests in their alternate reading. From the lustre and blackness of the ink, its evenness of colour, and beautiful execution, it is a very superb book; but it is nevertheless surpassed by the Fust and Schœffer edition of 1462, when they had attained greater experience in the practice of the art. By far the choicest, however, of these *editiones principes* is the Mentz Psalter or *Codex Psalmorum* before mentioned, the initial B and first few lines of which form part of Plate III. Dr Horne says that the six known copies of this edition differ from each other in some respects, and proceeds to give some particulars in which variations are found; but by collating the copies in the Royal Library, that at Windsor, and that at the British Museum, it will be found that, although bearing the same date, they are in fact three distinct editions. It would have excited no surprise had it been found that the printed ornaments differed, as nothing would be more easy than to change the colours with which the different blocks were worked; and in fact in the Museum copy the initial B is printed in a bright blue, and the scroll-work is red; but the text varies in such a manner that there can be no doubt of their perfect distinctness. Taking the first six lines, the following are the last words of each line:—

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[1] This is even sober praise. The mechanism of the press-work, and appearance of the ink, beautiful, regular, and glossy as the whole appears, does not strike one with more astonishment than the manufacture of the paper. "Charta," says Tungendres, "ejusdem est crassitudinis, qualem illo tempore libris imprimendis consumere mos fuit." And again, "Charta ob ejus densitatem atque spissitudinem haud ingratam ubique se maxime commendat." (*Disq. de Not. Charact. Libror.* p. 27, p. 46.) And see Meerman's testimony in favour of the paper of the Soubiaco press, *Orig. Typog.* vol. i. p. 9, note.

[2] The initial A is illuminated in a very brilliant blue. The reader who is desirous of obtaining the full effect of this specimen can fill up the printed outline in water-colour.

Windsor.	Earl Spencer.	British Museum.
. . . . abiit	. . . . qui non	. . . qui ═══
. . . . . . et	. . . . impiorz	. . . . evorare
. . . . . stetit	. peccatorum non	. . . . . et in
. . . . . non	. . . . . pesti	. . . . . et in
. . . . . dni	. . . . . sed	. . . . non se=
. . . . . lege	. . . . voluntas	

It must also be noted that in the Windsor copy each line is "justified out," which is not the case in Earl Spencer's copy; and that in the Museum copy the page commences with rubrical matter, which is continued down the two first lines of text, which are shortened. The difference is effected by variations in the contractions of many of the words. The book[2] is a very large folio, on vellum, consisting of about a hundred and thirty leaves, printed on both sides. There are generally twenty-three lines in a page, in Gothic type. Every psalm begins with a splendid initial letter, about two thirds of the size of the B, *printed* in two colours in almost every case. Occasionally, however, this appears to have been neglected, and then the letter is painted in by the illuminator, but *not* in imitation of the printed letters. The initials consist (like the B) of a bold character, of Gothic cut, surrounded by a scroll, which is sometimes of great length, that of the B extending from the top to the bottom of the page. The same wooden block is used as often as the letter occurs, but it is not always in the same colours. Moreover, every *verse* commences with a smaller initial printed in a red colour, in the same manner as the s in the specimen. Nor is this work destitute of the embellishments of the illuminator; for at the commencement of every psalm is a rubric, painted in a most brilliant red, in a smaller letter, of precisely the same character as the text, and also the music of the chant, with the words underneath it painted in black. The initial letters of both are splendidly illuminated in various colours. The paint is used in such profusion that the letters are absolutely in relief, often to the extent of one sixteenth of an inch; and besides these, the letter following the grand initial has a broad bar painted down it, and very frequently the first letter after the pauses indicated in our authorized version by a colon is illuminated in a similar manner. One page is particularly splendid; it consists of short verses, in which the first words are constantly repeated. It commences with a grand initial, and there are twenty-two smaller initials to the verses; the second letter of the first verse, and the first letter after every pause (twenty-three in number), having the broad illuminated bar. Wherever the psalm commences too near the bottom to allow of the full exuberance of the scroll, a piece of paper appears to have been laid over a portion of the cut, to prevent the impression from appearing; and in one psalm where the chant is of unusual length, the lower part of the initial O, and a corresponding portion of the scroll, are thus suppressed; the music being illuminated in its place, and the scroll continued below it. Sometimes the illuminator has omitted to add his initial letter; and in this copy the double device is omitted. The accuracy with which the coloured blocks are printed within the text and within each other is perfectly astonishing. From this description it may be conceived how very superb is the *first* book ever printed, the date, and place, and artist, of which can be accurately ascertained. Dr Dibdin in the *Bibliotheca Spenceriana*, Mr Savage in his work on *Decorative Printing*, Dr Horne, whose wood-block is not coloured, and several other writers, have given fac-similes of the same copy (Lord Spencer's), which, however, all differ from one another. The lines given in the specimen in Plate III. are copied from Dibdin, whose initial B does not accord with that of the Windsor copy; the B here given is very accurate, and the colours are as similar as possible to the latter copy, but the colour of the scroll in the original seems somewhat faded.

Early printers.

The capture of the city of Mentz by Count Adolphus of Nassau in the year 1462 had the effect of interrupting the labours of Fust and Schœffer; and moreover the distracted state of the city enabled, perhaps compelled, the workmen initiated in the mysteries of the art to flee into the neighbouring states, and thus spread its practice over the whole civilized globe. Such, indeed, was the fame it had already acquired, and such the idea entertained of its importance, that every community with the slightest pretensions to literature appears to have sought a knowledge of it with the greatest avidity. Thus, within six years of the publication of the Psalter, it had spread to several cities having some connection with Mentz, and within fifteen years to almost every town of consideration in Christian Europe. A chronological list of the cities which first seized upon the invention would be greatly too long for this article; it may be interesting, however, to extract a few of the principal, with a notice of such printers as are remarkable either for the beauty or the scarcity of their works. The reader is not to suppose that all, or indeed any great number of these, learned the practice of the art under the tuition of the first masters. A few are known to have been pupils of the inventors, and it is probable that many others of them were so; but the majority, in all likelihood, were men of learning, enterprise, or capital, who derived their typographical knowledge from such facts as had transpired, or from inferior

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[1] It is desirable that the subsequent pages of the several editions should be collated. If similar variations should be found throughout, it will give rise to much speculation. If they are found to be identical, the suspicion will arise, that the first and last pages were intentionally varied, perhaps for the purpose of misleading, and the story of these first books having been offered for sale as manuscripts will receive some countenance.

[2] The copy described is that at Windsor; the illuminations, no doubt, vary in every copy.

workmen of Fust and Schœffer or Gutenberg, supplying deficiencies by their own ingenuity.

Strasbourg. Mentelin. Some writers have claimed for Mentelin the invention of printing, representing that Gutenberg was his servant, without, however, showing the slightest ground for their assertions; but others, more reasonable, say that he was acquainted with Gutenberg, and instructed by him, and that on the latter's quitting Strasbourg he established a printing-office, and carried on the business successfully. Mentelin most probably printed about the year 1458. His type is rude and inelegant. The only book bearing his name is Beauvais' *Speculum Historiale*, of date 1473. Schœpflin says, that he, as well as Fust and Schœffer at Mentz, printed 300 sheets per day.

In 1461. *Bamberg.* Albert Pfister. He printed a collection of *Fables*, of date 1461. This book is excessively rare; it is printed with cast metal type, and is illustrated with 101 wood-cuts, in much the same style as the old *Biblia Pauperum.* All his other works are printed in the same type.

1465. *Subiaco* and *Rome.* Schweynheym and Pannartz. Their known works are, a *Donatus*, without date; Lactantius, 1465; St Augustin on *the City of God*, 1467; Cicero *de Oratore*, without date; and the *Commentary of De Lyra on the Bible*, 1471, all in folio. These works were printed in a new letter, very closely resembling the type now in use called *Roman*, and of which they were the introducers. In *De Lyra* are the earliest specimens of Greek types worthy of the name; some few letters appear in the *Cicero de Officiis* printed at Mentz, but so wretchedly imperfect that they are unworthy of mention. It is curious that the Greek fount of Schweynheym and Pannartz at Subiaco was evidently very small; but upon their removal to Rome they cast a much larger fount. The cut and appearance of this Greek is more than respectable. There is a very curious petition from them to the pope, praying for assistance on the ground that they had entirely ruined themselves by printing *De Lyra*, for which there was no sale, and representing that they had on their hands no less than eleven hundred folio volumes of that work. Subiaco is the first place in Italy in which printing was practised. At Rome Ulric Han and Lignamine were contemporaries. Their works, particularly those of Han, are excessively rare.

1467. *Elfield.* Henry and Nicholas Bechtermunze. They purchased from Conrad Humery the types and materials of Gutenberg. Their works are not at all remarkable for beauty, but are very rare, and much sought for as affording evidence of Gutenberg's works.

1467. *Cologne.* Ulric Zell. His type is Gothic, and of no beauty; but his works are rare.

1468. *Augsburg.* Ginther Zainer printed the first book in Germany with Roman type.

1469. *Venice.* John de Spira, whose works are of the utmost beauty. His edition of Pliny is splendid, and enormous sums have been given for those printed in vellum. He did not use Greek characters; but Greek passages are composed in Roman types. In the same city, at the same time, printed Nicholas Jenson, whose works are equal, if not superior, to those of Spira; they are not so rare, but are almost equally sought after. A copy of his folio Latin Bible of 1479, printed in Gothic type, was sold at Mr Edwards' sale for L.115. 10s. Venice was also the residence of Christopher Valdarfar, whose works gave rise to a most extraordinary event connected with bibliography, viz. the sale of the first edition of *Il Decamerone di Boccaccio*, printed by him in 1471. For many years it had been known that a single copy of this work was in existence, and the most devoted bibliomaniacs had used their utmost endeavours to discover it, but in vain. At length, about 1740, an ancestor of the Duke of Roxburghe obtained possession of it for the sum of one hundred guineas. In lapse of time it became the property of John duke of Roxburghe, the accomplished, indefatigable, and undaunted bibliomaniac, after whose death his gorgeous library was dispersed by the auctioneer in the year 1811. The interest excited amongst the learned by this sale was intense. It was known that the collection contained the most superb specimens of every kind of ancient lore; that the illuminated manuscripts were the most brilliant, the ballads the most obscure, the *editiones principes* the most complete that the world could produce; that the rarest Caxtons, the finest Pynsons, and grandest specimens of the foreign printers, were here to be found; above all, it was rumoured that a mysterious edition of Boccaccio's Decameron would become a bone of contention amongst the noblest of the literati. The public, learned and unlearned, were infected with the mania, and the daily papers teemed with notices of the sale. At length the important day arrived, the 17th of June 1811. St James' Square was the place. Mr Evans presided. The room was crowded; Earl Spencer, the Marquis of Blandford, the Duke of Devonshire, and an agent of Napoleon, were amongst the most prominent. The book was a small folio, in faded yellow morocco binding, black-letter. "Silence followed his (Mr Evans') address," says Dibdin. "On his right hand, standing against the wall, stood Earl Spencer: a little lower down, and standing at right angles with his lordship, appeared the Marquis of Blandford. The duke, I believe, was not then present; but my Lord Althorpe stood a little backward, to the right of his father Earl Spencer. Such was 'the ground taken up' by the adverse hosts. The honour of firing the first shot was due to a gentleman of Shropshire, unused to this species of warfare, and who seemed to recoil from the reverberation of the report himself had made. 'One hundred guineas,' he exclaimed. Again a pause ensued; but anon the biddings rose rapidly to five hundred guineas. Hitherto, however, it was manifest that the firing was but masked and desultory. At length all random shots ceased, and the champions before named stood gallantly up to each other, resolving not to flinch from a trial of their respective strengths. 'A thousand guineas' were bid by Earl Spencer; to which the marquis added 'ten.' You might have heard a pin drop. All eyes were turned; all breathing well nigh stopped. Every sword was put home within its scabbard, and not a piece of steel was seen to move or to glitter save that which each of these champions brandished in his valorous hand. See, see; they parry, they lunge, they hit; yet their strength is undiminished, and no thought of yielding is entertained by either. 'Two thousand pounds' are offered by the marquis. Then it was that Earl Spencer, as a prudent general, began to think of an useless effusion of blood and expenditure of ammunition, seeing that his adversary was as resolute and fresh as at the onset. For a quarter of a minute he paused, when my Lord Althorpe advanced one step forward, as if to supply his father with another spear for the purpose of renewing the contest. His countenance was marked with a fixed determination to gain the prize, if prudence in its most commanding form, and with a frown of unusual intensity of expression, had not bade him desist. The father and son for a few seconds converse apart; and the biddings are resumed. 'Two thousand two hundred and fifty pounds,' said Lord Spencer. The spectators are now absolutely electrified. The marquis quietly adds his usual 'ten,' and there is an end of the contest. Mr Evans, ere his hammer fell, made a due pause, and, indeed, as if by something preternatural, the ebony instrument seemed itself to be charmed or suspended 'in mid air.' However, at length down dropped the hammer, and, as Lisardo has not merely poetically expressed himself, 'the echo' of the sound of that fallen hammer 'was heard in the libraries of Rome, of Milan, and Saint Mark.' Not the least surprising incident of this extraordinary sale is, that the marquis already possessed a copy of the work, which wanted a few leaves at the end; he therefore paid this enormous sum for the honour of possessing a few pages. The prize of this contest is now in the possession of Earl Spencer."

1469. *Milan.* Lavagna. In 1476 Dionysius Palavasinus printed the Greek Grammar of Constantine Lascaris, in quarto, which is the first book printed entirely in Greek. The first printing in Hebrew characters was performed at Soncino, in the duchy of Milan, in 1482.

1470. *Paris.* Ulricus Gering, M. Crantz, and M. Friburger.

1471. *Florence.* Bernard Cennini. In 1488 Demetrius of Crete printed the first edition of Homer's works, in most beautiful Greek.

1474. *Basle.* Bernardus Richel.

1474. *Valencia.* Alonzo Fernandes de Cordova.

1474. *Louvain.* Joannes de Westphalia.

1474. *Westminster.* William Caxton, the Game of Chess.

1475. *Lubeck.* Lucas Brandis.

1476. *Antwerp.* Thierry Martins of Alost.

1476. *Pilsen* in Bohemia. *Statuta Synodalia Pragensia;* printer's name not known.

1476. *Delft.* Maurice Yemantz.

1478. *Geneva.* Adam Steinschawer.

1478. *Oxford.* Theodericus Rood.

1480. *St Albans. Laurentii Guillielmi de Saona Rhetorica Nova;* printer's name not known.

1482. *Vienna.* John Winterburg.

1483. *Stockholm.* Johannes Snell.

1483. *Harlem.* *Formulæ Novitiorum,* by Johannes Andriesson. This is the earliest book printed at Harlem *with a date.* In giving this as the first work *known* to be printed at Harlem, the claims of Koster, his grandsons and successors, must, of course, be reserved.

1493. *Copenhagen.* Gothofridus de Ghemen.

1500. *Cracow.* Joannes Haller.

1500. *Munich.* Joannes Schobzer.

1500. *Amsterdam.* D. Pietersoen.

1507. *Edinburgh.* A Latin Breviary; no printer's name. From a patent of James IV. it appears that the first printing press was established at Edinburgh in 1507. From the style and types, it is probable that they were imported from France.

1551. *Dublin.* Ireland was apparently the last country in Europe into which printing was introduced. The first book printed is a black-letter edition of the Book of Common Prayer, printed by Humphrey Powell.

1569. *Mexico.* Antonio Spinoza, *Vocabulario en Lengua Castellana y Mexicana.*

1639. *United States,* at the town of Cambridge. Printer Stephen Daye.

It was the custom of the early printers to distinguish their books by the most fantastic devices; and by these their works may be readily recognised. Many of them were of exceeding beauty, and all the skill and appliances of their art were employed to render them striking; they are really an ornament to their works. The invention of these has been ascribed to Aldus; but the very first printers, Fust and Schœffer, used each for himself, yet conjoined, devices of rare excellence. Their celebrated Bible is adorned with one which is well worthy of being adopted as the arms of the art and mystery of printing. This is given in the plate of illustrations with those of Caxton, Wynkyn de Worde, and Pierre Regnault, who, with his brother, printed the first English Testament at Paris.

Our chronological arrangement has precluded us from mentioning some of the most skilful typographers. Their works, however, are so numerous, and their efforts so well known, as to render it unnecessary to do more than mention their names. Such men as the Aldi,[1] Frobenius, Plantinus, Operinus, the Stephani, the Elzeviri, the Gryphii, the Giunti, the Moreti, and hosts of peers, have universal fame. The printing-office of Plantinus, in the Place Vendredi, at Antwerp, exists in its full integrity, and in the possession and use of his descendants the Moreti; the same presses, the same types, with the addition of every improvement modern skill has effected, are still in use, and an inspection of these singular relics of olden art will well repay the investigation of the curious.

The First Presses.

Of the mechanical means by which these beautiful impressions of the old printers were produced there is little or no record; but it is quite evident that they must have been effected by some more skilful process than mere manipulation, that is, than the appliance of a burnisher, as is evident in the first wood-cuts, or of a roller, or superficial pressure applied immediately by hand. It is very probable that one of the difficulties which Gutenberg found insuperable at Strasbourg, was the construction of a machine of sufficient power to take impressions of the types or blocks then employed; nor is it at all wonderful that the many years he resided at that city were insufficient to produce the requisite means; for, with cutting type, forming his *screws,* inventing and making ink, and the means of applying his ink when made, his time must have been amply occupied. Moreover, the construction of a press would require a versatile genius, and excellent mechanical skill, not to be looked for in one man. But upon his junction with Fust and Schœffer, the gold of the former, and the invention of all the three, would soon supply the defect; and, for aught that appears to the contrary, the press used in their office differed in no essential point from those in use until the improvements of Blaew in 1600–20. Fortunately, amongst the singular devices with which it pleased the earlier printers to distinguish their works, Badius Ascensius of Lyons (1495–1535) chose the press; and there are cuts of various sizes on the title-pages of his works. It appears from these, that, like that of Gutenberg, they could print only four pages at a time, and that at two pulls; and when it is stated that the table and tympan ran in, and that the platten was brought down by a powerful screw, by means of a lever inserted into the spindle, the professional reader will easily recognise the wooden presses laid up in ordinary in many old London houses.

The colour which the earliest typographers used was probably made according to the style of work in hand. The earliest copies of the *Speculum* and *Biblia Pauperum* were printed in a brown colour, of which raw umber is the principal ingredient. It appears to have been well ground and thin. It was, most likely, of the same tint as the old drawings of the same subjects, and would be better adapted for the filling up in various colours, as appears to have been the practice, than a black and harsh outline of ink. Fust and Schœffer, however, introduced, and their followers adopted, black ink, and were so skilful in compounding it that their works present a depth and richness of colour which excites the envy of the moderns; nor has it turned brown, or rendered the surrounding paper in the slightest degree dingy. From the above-mentioned colophons we have also the method of applying it to the types. This was by means of balls of skin stuffed with wool, in every respect the same as those used fifty years ago. The ink was laid in some thickness on a corner of a stone slab, and taken thence in small quantities and ground by a muller, and thence again taken by the balls and applied to the types. The types appear to have been disposed in cases very much the same as ours. The composing-stick differs somewhat, but cannot now be very clearly made out. The different operations of casting the type, composing, reading, and working, are mostly represented in the same apartment; but, it is probable, more for the sake of pictorial unity, than because such was really the custom. There must have been many workmen engaged in most of the old establishments; and they well knew the value of cleanliness, which is unattainable where all the operations are carried on together.

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[1] It should be mentioned that Aldus Manutius invented the beautiful character of type called *Italic* at the end of the fifteenth century. The first book printed with it is a Virgil, 1501.

Introduction into England.

As the invention of printing has itself become matter of serious controversy amongst the learned of all countries, its introduction into England has not been suffered to pass without an attempt of the novelty-seekers to overturn the received opinion on the subject, and to give to another the laurel of a public benefactor, torn from him to whom the general voice had for two centuries allotted it. Fortunately, the quarrel is divested of one of the great difficulties of the continental, inasmuch as there does not appear to be any vestige of an art in any degree similar (such as block-printing) having been practised prior to the introduction of type-printing; the art, when it was brought over, being in a state somewhat approaching maturity. This controversy concerns the claims of William Caxton and Frederic Corsellis to the introduction of the knowledge of the art, and the printing of the first book, in this country.

The general and original belief is that Caxton, who for thirty years resided in the Low Countries, under the reign of Charles the Bold, and who had taken every opportunity of learning the new art, and had availed himself of the capture of Mentz to secure one of the fugitive workmen of Fust and Schœffer, established a printing-office at Cologne, where he printed the French original and his own translation of the *Recuyell of the Historyes of Troy;* that whilst at Cologne he became acquainted with Wynkyn de Worde, Theoderick Rood, both foreigners, and Thomas Hunte his countryman, who all subsequently became printers in England; that he afterwards transferred his materials to England; that Wynkyn de Worde came over with him, and probably was the superintendent of his printing establishment; that his first press was established at Westminster, perhaps in one of the chapels attached to the abbey, and certainly under the protection of the abbot; and that he there produced the first book printed in England, the *Game of Chess*, which was completed on the last day of March 1474.

The correctness of these facts is not matter of dispute, all writers agreeing that Caxton did so set up his press at Westminster, and print his *Game of Chess* in 1474; but it has been asserted that Caxton was not the first printer, nor his book the first book printed, in this country. Neither does the controversy rest upon the contradictory statements of many writers, for all authors of the same and succeeding period agree in ascribing the honour to Caxton; and when, in 1642, a dispute arose between the Stationers' Company and certain persons who printed by virtue of a patent from the crown, concerning the validity of this patent, a committee was appointed, who heard evidence for and against the petitioners, and throughout the proceedings Caxton was acknowledged as incontestibly the first printer in England. Thus Caxton seemed to be established as the first English typographer, when, soon after the Restoration, a quarto volume of forty-one leaves was discovered in the library at Cambridge, bearing the title of *Exposicio Sancti Jeronymi in Simbolum Apostolorum ad Papam Laurentium,* and at the end, "Explicit Exposicio Sancti Jeronymi in Simbolo Apostolorum ad papam Laurentium, Oxonie Et finita, Anno Domini M.CCCC.LXVIII. *xvii.* die decembris." Upon the production of this book the claim for priority of printing was set up for Oxford. In the year 1644 Richard Atkyns, who then enjoyed a patent from the crown, and whose claims consequently brought him into collision with the Stationers' Company, and who was desirous of establishing the prerogative of the sovereign, published a thin quarto work, entitled *The Original and Growth of Printing, collected out of the History and the Records of the Kingdome; wherein is also demonstrated that Printing appertaineth to the Prerogative Royal, and is a Flower of the Crown of England.* The book was published "*by order and appointment of the Right Hon. Mr Secretary Morrice.*" In support of this proposition Atkyns asserted that he had received from an anonymous friend a copy of a manuscript discovered at Lambeth Palace, amongst the archiepiscopal archives. The following is an abstract of this document. "Thomas Bouchier, archbishop of Canterbury, earnestly moved the king, Henry VI. to use all possible means to procure a *printing* mold, to which the king willingly assented, and appropriated to the undertaking the sum of 1500 merks, of which sum Bouchier contributed 300. Mr Turnour, the king's master of the robes, was the person selected to manage the business; and he, taking with him Mr William Caxton, proceeded to Harlem in Holland, where John Guthenberg had recently invented the art, and was himself personally at work; their design being to give a considerable sum to any person who should draw away one of Guthenberg's workmen. With some difficulty they succeeded in purloining one of the under workmen, Frederic Corsellis; and it not being prudent to set him to work in London, he was sent under a guard to Oxford, and there closely watched until he had made good his promise of teaching the secrets of the art. Printing was therefore practised in England before France, Italy, or Germany, which claims priority of Harlem itself, though it is known to be otherwise, that city gaining the art from the brother of one of the workmen, who had learned it at home of his brother, and afterwards set up for himself at Mentz." The *Exposicio* is asserted by inference to be the work of Corsellis. That this document is a forgery may be safely assumed; because of the more than unsatisfactory manner in which it is said to have been obtained; because no one ever saw this copy; because no one, except the unknown, ever saw the original, for it is not amongst the archives nor in the library of Lambeth Palace, nor was it when the Earl of Pembroke made diligent search for it in 17(   ), nor was it found when the manuscripts, books, and muniments were moved into a new building; because Caxton himself, who took so important a share in the alleged abduction of the workman, states that twelve years afterwards he was diligently engaged in learning the art at Strasbourg, and repeatedly ascribes the invention to Gutenberg, "at Mogunce in Almayne;" because, when three years afterwards the Stationers' Company instituted legal proceedings against the University of Cambridge, to restrain them from printing, this document was rejected, as resting only on Atkyns' authority; because Archbishop Parker, in his account of Bourchier, mentions the invention of printing at Mentz, but makes no claim for his having introduced it into England, and Godwin, *de Præsulibus Angliæ*, says that Bourchier, during his primacy of thirty-two years, did nothing remarkable, save giving L.120 for poor scholars, and some books to the university, and that he minutely examined two registers of his proceedings during this term, without making any mention of his having found therein any record of so remarkable a transaction; because, since these transactions must have taken place before 1459, Henry VI. was at that time struggling fearfully for his throne and life, Edward IV. being crowned in that year; from internal evidence of the document itself, for, not to mention the weak evidence for the city of Harlem, it is quite certain that Gutenberg never printed there, and by Junius the theft is ascribed to John Fust, who certainly was a rich goldsmith of Mentz; whereupon Meerman, finding these statements at variance with possibility, boldly invents another theory, making the sufferers Koster's grandsons, who never printed, as far as is known, and the robber Corsellis himself; and, lastly, because six years elapsed between this asserted introduction and the publication of his *Exposicio*, and eleven years between this and any other publication from any Oxford press.

Although these facts entirely confute the pretensions of Corsellis, there nevertheless remains the book itself, and unless some evidence can be produced, Oxford will still maintain the distinction of having printed the earliest book in England. Some of the most learned bibliographers entirely refuse their assent to the genuineness of the book. Middleton asserts that there must be an error of an x in the imprint, and produces many remarkable instances of similar typographical errors. This, however, is mere assertion; and, as in the Lambeth record, the best evidence is to be sought in the production itself; accordingly the work is printed with *cast* metal types, which are not proved to have been used by Koster at all, that art being invented by Gutenberg, Fust, and Schœffer at Mayence. The letter is of very elegant cut, the pages regular, and the whole work has the appearance of having been executed at a considerably advanced era of the art. Another and a good argument is, that the work has signatures, or marks for the binder, at the foot of the page, which were not used on the Continent before 1472, by John Koelhoff at Cologne. The evidence in favour of Caxton is direct and strong; the date of the Oxford book is contradicted by internal evidence, and discredited by the story set up in its support; there seems, therefore, no sufficient ground for withdrawing from Caxton the fame of being the introducer of printing into England.

Caxton.

William Caxton was born about the year 1412, in the Weald of Kent. His father was a wealthy merchant, trading in wool. He was brought up to the business of a mercer, and conducted himself so much to his master's satisfaction, that on his death he bequeathed him the then considerable sum of twenty marks. Caxton then proceeded, probably as the agent of the Mercers' Company, into the Low Countries. He must have been a man of some wealth and consideration, for in 1464 he and Richard Wethenhall were appointed by Edward IV. "ambassadors and special deputies" to continue and confirm a treaty of commerce between him and Philip duke of Burgundy; and, upon the marriage of Edward's sister Margaret with Charles duke of Burgundy, he was appointed to the household retinue of the princess, by whom he appears to have been treated with much familiarity and confidence; for at her instigation he first commenced his literary labours, and he mentions her as repeatedly commanding him to amend his English. His first work was a translation of the *Recuyell of the Historyes of Troye*, which he afterwards printed at Strasbourg, when his leisure had allowed him to turn his attention to the study of printing. The first production of his press is allowed to be the French *Recuyell* above mentioned, his second the *Oracion of John Russell on Charles Duke of Burgundy being created a Knight of the Garter*, which took place in 1469. Of his transactions between 1471 and 1474 there is no record; probably he was engaged in the diligent pursuit of the art, and preparing to transfer his materials to England, which he accomplished some time before 1477, when we find him printing in or near the Abbey of Westminster, of which Thomas Milling, bishop of Hereford, was at that time abbot. The first production of his English press was the *Game of Chess*, bearing date 1474, which work, however, some assert to have been printed by him at Cologne. The following is a specimen of this famous book, the initial letter being printed in red:—

Thus ought the Quene be maad / ſhe ought to
be a fair lady ſittynge in a chayer and crowned
wyth a corone on her heed and cladd wyth a
cloth of gold ⁊ a mantyll aboue furrid wyth ermynes

His next production was the *Boke of the hoole lyf of Jason*; but his first book bearing date and place in the colophon is the *Dictes and Sayings of Philosophres*, a translation from the French by the gallant Earl Rivers, "at Westmestre, the yere of our lord m. cccc. lxxvij." From this time he continued both to print and translate with great spirit. His "capital work" was a *Book of the noble Historyes of Kyng Arthur*, in 1485, the most beautiful production of his press.

There is but one copy of any of Caxton's works printed upon vellum; it is the *Doctrinal of Sapyence*. "Translated out of Frensshe in to Englysshe by wyllyam Caxton at Westmestre. Fynyshed the vij day of May the yere of our lord m.cccc.lxxix. Caxton me fieri fecit." This unique copy is in the library at Windsor, and it is in beautiful preservation. It is moreover doubly unique, for it contains an additional chapter, to be found in no other copy whatever, and which is entitled "Of the negligencies happening in the Masse and of the Remedies. Cap. lxiiij." It is a curious treatise of minute omissions and commissions likely to occur in the service of mass, with directions how to remedy such evils. Of their importance here are two specimens, "If by any negligence fyl (fall) any of the blood of the Sacrament on the *corporas*, or upon any of the vestments, then ought to cut off the piece on which it is fallen, and ought well to be washen, and that piece to be kept with the other relics." "And if the body of Jesu Christ, or any piece, fall upon the palé of the altar, or upon any of the vestments that ben blessed, the piece ought not to be cut off on which it is fallen, but it ought right well to be washen, and the washing to be given to the ministers for to drink, or else drink it himself." This singular treatise finishes with this grave confession, "This chapitre to fore I durst not sett in the booke, by cause it is not convenient ne appertaining that every lay man should know it et cetera." At the usual termination of this work is that colophon of Caxton which is given amongst the illustrations of this article in Plate III.; it is, however, considerably reduced.

The Royal Library possesses another work of Caxton, which, as a *perfect* copy, is also unique. This is the "Subtyl Historyes and Fables of Esope. Translated out of Frenshe in to Englyshe by Wyllyam Caxton at Westmynstre In the yere of our lord m cccc lxxxiij Emprynted by the same the xxvj daye of Marche the yere of our lorde m cccc lxxxiiij And the fyrste yere of the regne of kyng Rycharde the thyrde." It consists of 142 leaves. Each fable is illustrated by a rude wood-cut, all of which are said to have been executed abroad, where similar editions of Æsop were frequently printed. They are, however, most probably copied; for there is nothing either in their design or execution that a most moderate artist might not perform; and this will equally apply to other wood-cuts interspersed in Caxton's works.

It has been said that the works of Caxton have been eagerly sought for by English bibliomaniacs. The most remarkable instances of this are the enormous prices given for some of them at the sale of the Duke of Roxburghe's library before mentioned. The *Chastysing of God's Children* was knocked down to Earl Spencer for L.146. The *Sessions Papers* were bought for the Society of Lincoln's Inn for L.378. The Duke of Devonshire gave L.351. 15s. for *The Mirrour of the World*, and L.180 for the *Kalendayr of the Shyppers.* Gower's *Confessio Amantis* produced L.366; *The Boke of Chyvalry*, L.336. The *Recuyell of the Historyes of Troye* gave rise to a startling contest. It was the identical copy presented by Caxton to Elizabeth Grey, queen of Edward IV. and sister of his patroness. "Sir Mark Sykes vigorously pushed on his courser till five hundred guineas were bidden; he then reined in the animal, and turned him gently on one side 'toward the green sward.' More hundreds are offered for the beautiful Elizabeth Grey's own copy. The hammer vibrates at nine hundred guineas. The sword of the marquess is in motion, and he makes another thrust—'One thousand pounds.' 'Let them be guineas,' said Mr Ridgway, and guineas they were. The marquess now recedes. He is determined upon a retreat; another such victory as the one he has just gained (the Valdarfar Boccaccio) must be destruction; and Mr Ridgway bears aloft the beauteous prize in question." (Dibdin.) At Mr Willett's sale *Tullius of Old Age* produced L.210, and became the property of the Duke of Devonshire.

The following are specimens of Caxton's *Pilgrimage of the Sowle*, and of the *Royal Book*:

O Glorious Jheſu. O mekeſt Jheſu. O mooſte
ſwetteſt Jheſu/I praye the/that I may haue trewe con-
feſſion/ contricion/ and ſatiſfaction or I dye/And that I

WHan I remembre and take hede of the conuerſacion of
vs that lyue in this wretched lyf.in which is no ſuerte
ne ſtable abydyng. And alſo the contynuel teſynes of euery

He must have been a man of wonderful perseverance and erudition, cultivated and enlarged by an extensive knowledge of books and the world. Of his industry and devotedness some idea may be formed, when Wynkyn de Worde, his successor, states, in his colophon to the *Vitæ Patrum*, that Caxton finished his translation of that work from French into English *on the last day of his life.* He died in 1491, being about fourscore years of age. His epitaph has been thus written by some friend unknown: "Of your charite pray for the soul of Mayster Willyam Caxton, that in hys tyme was a man of moche ornate and moche renommed wysdome and connynge, and decesed full crystenly the yere of our Lord MCCCCLXXXXI.

> Moder of Merci shyld him from thorribul fynd,
> And bryng hym to lyff eternal that neuer hath ynd."

The type used by Caxton is in design very inferior to that used upon the Continent even earlier than his period; but in the latter part of his life he very materially improved his founts, and some of his later productions are very elegantly cut. The design is peculiar to him, and is said to be in imitation of his own hand-writing; it bears, however, some resemblance to the types of Ulric Zell, from whom Caxton derived most of his instruction, and is something between *Secretary* and *Gothic.* He appears to have had two founts of *English*, three founts of *Great Primer*, one *Double Pica*, and one *Long Primer.*[1] He used very few ornamented initial letters, and those he did employ are very inferior in elegance to those of foreign printers. He preferred inserting a small capital letter within a large space, and leaving the interval to be filled up according to the taste of the illuminator, owing to which many excellent performances are destitute of these beautiful ornaments. Caxton's ink was not remarkable for depth of colour or richness; his paper was excellent; and he probably used presses of the same construction as the continental printers. His works are not very rare, but are highly prized by English collectors. Copies of one or more of his works are to be found in most collections of any pretension, and are well worthy of inspection. The number of his productions is sixty-two. Although Caxton was the first English printer, he was not the only one of his day, Wynkyn de Worde, Lettou and Machlinia, Hunte, Pynson, the Oxford printer whoever he may have been, and he of St Alban's, being his contemporaries.

Wynkyn de Worde.

WYNKYN DE WORDE came, as we have already seen, from Germany with Caxton, and remained with him in the superintendence of his office until the day of his death, when he succeeded to the business. He was a native of Lorraine, and evidently a man of considerable information and taste, and of great spirit in the conduct of his affairs. After his succession to Caxton's business, he carried it on in the same premises for about six years, when he removed to the "Sygn of the Sonne in flete strete, against the condyth." De Worde appears to have immediately commenced a complete renovation of the art, cutting many new founts of all sizes, with vast improvement of the design and proportion; he moreover provided his contemporaries, then becoming very numerous, with type; and it is even said that some of the letter used by English printers less than a century ago are from his matrices, nay, that the punches are still in existence. He was the first (or Pynson) to introduce Roman letters into England, which he made use of amongst his Gothic to distinguish any thing remarkable, in the same manner as Italic is used in the present day. His works amount to the extraordinary number of four hundred and eight. "His books are, in general, distinguished by neatness and elegance, and are always free from professed immorality. The printer has liberally availed himself of such aid as could be procured from the sister art of engraving; although it must be confessed that by far the greater, if not the whole, number of wood engravings at this period are of foreign execution; nor is it without a smile that the typographical antiquary discovers the same cut introduced into works of a directly opposite nature."

In his *Instruction for Pilgrims to the Holy Land*, printed in 1523, the text of which is in Roman, and the marginal notes in Italics, he makes the first use in England of Greek, which is in moveable type, of Arabic and Hebrew, which are cut in wood; and the author complains that he is obliged to omit a third part, because the printer had no Hebrew types. Appended to the work are three Latin epistles, in which he makes use of Arabic.

His works are, of course, not so rare as those of his predecessor, but are nevertheless much sought after; and, when sold by the side of the Caxtons at the Duke of Roxburghe's sale, produced large prices. *Bartholomæus de Proprietatibus Rerum*, the first book printed on paper made in England, was bought by the Duke of Devonshire for L.70. 7s.

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[1] These are terms by which modern English printers distinguish the sizes of their type.

Chaucer's *Troyius and Cresseide*, L.43; Hawys' *Exemple of Vertu*, L.60; *Passetyme of Pleasure*, L.81; *Castell of Pleasure*, L.61; *The Moste Pyteful Hystorye of the Noble Appolyon, Kynge of Thyre*, L.110.

De Worde died about the year 1534. In his will, still in the Prerogative Office, dated 5th June 1534, he bequeaths many legacies of books to his friends and servants, with minute directions for payment of small creditors and forgiveness of debtors, betokening a conscientious and kindly disposition. His device is generally that of Caxton, with his own name added to the bottom; but he also used a much more complicated one, consisting of fleurs-de-lis, lions passant, portcullis, harts, roses, and other emblazonments of the later Plantagenets and the Tudors. A fac-simile of the former will be found in Plate III.

Lettou.

JOHN LETTOU and WILLIAM MACHLINIA printed separately and jointly before the death of Caxton, but were very inferior to him in every respect; their type being most especially barbarous. Their works are not very numerous, and are principally upon legal subjects; they printed the first edition of Lyttleton's Tenures.

Pynson.

RICHARD PYNSON was a Norman by birth, and studied the art of printing under his "worshipful master William Caxton." It would seem that he was an earlier printer than Wynkyn de Worde, having established an office before the death of Caxton. His first work is of date 1493, and was printed "*at the Temple-bar of London.*" He enjoyed high patronage, and was appointed by Henry VII. to be his printer before 1503. He is perhaps inferior to De Worde as a typographer, his first types being extremely rude. He afterwards used a fount of De Worde's, and another peculiar to himself in this country, probably imported from France. Some of his larger works, Fabian's Chronicle, Lord Berner's translation of Froissart (which are the first editions of these important additions to English literature), and some of his law-works, are very fine specimens of the art. His device was a curious compound of R and P, on a shield which is sometimes supported by two naked figures.

Early English printers.

Of Julian Notary, William Faques, Henry Pepwell, and others, it is unnecessary even to mention their names, inasmuch as they add little that is interesting to the history of English typography.

Grafton.

RICHARD GRAFTON, however, claims especial notice. He was by trade a grocer, although of good family. Of his education nothing appears; but he was one of the most voluminous authors of his time, having, by his own account, written a considerable portion of Hall's Chronicles, an Abridgment of the Chronicles of England, and a Manual of the same, a Chronicle at Large, and other books of historical character, under what circumstances is not known. In 1537 Grafton published Thomas Mathew's translation of the Bible, which was printed abroad, but where is not satisfactorily ascertained; and in 1538 the Testament translated by Miles Coverdale, which was printed at Paris by Francis Regnault. At this time it would not appear that English printers were in high estimation; for Lord Cromwell, desirous of having the Bible in the English language, thought it necessary to procure from Henry VIII. letters to the king of France for license to print it at Paris, and urged Bonner to tender his earnest assistance. Bonner entered upon the undertaking with such zeal, that in recompense he was soon afterwards appointed to the bishopric of Hereford. Miles Coverdale had charge of the correctness (see his letter, Gent.'s Mag. 1791), and Richard Grafton and Edward Whitchurch were the *proprietors;* but under what arrangement does not appear. When the work was on the point of completion, the Inquisitors of the Faith interfered, seized the sheets, and Grafton, Whitchurch, and Coverdale, were compelled to make precipitate flight. The avarice of the lieutenant-criminal induced him to sell the sheets for waste paper instead of destroying them, and they were in part repurchased. The Testament was intrusted to Francis Regnault, whose brother used the tasteful colophon which will be found in Plate III. Under the protection of Cromwell they next, after many difficulties, obtained their types and other materials from Paris, and the Bible was completed at London in 1539. "Thus they became printers themselves, which before this affair they never intended." The edition consisted of 2500 copies. Cromwell next procured for them a privilege (not an exclusive one, however) for printing the Scriptures for five years. Very shortly after the death of Lord Cromwell, Grafton was imprisoned for printing Mathew's Bible and the Great Bible, his former friend Bonner much exaggerating the case against him. The prosecution, however, was not followed up; but in a short time he was, with Whitchurch, appointed printer to Prince Edward, with special patents for printing all church-service books and primers. The document is curious. It recites that such "bookes had been prynted by strangiers in other and strange countreys, partely to the great losse and hynderance of our subjects, who both have the sufficient arte, feate and treade of prynting, and partely to the setting forthe the bysshopp of Rome's usurped auctoritie, and keping the same in contynuall memorye;" and that, therefore, of his "grace especiall, he had granted and geven privilege to our wel-biloved subjects Richard Grafton and Edward Whitchurch, citezeins of London," exclusive liberty to print all such books for seven years, upon pain of forfeiture of all such books printed elsewhere.

One Richard Grafton, supposed to be the above, was member of parliament for the city of London in 1553–54, and also in 1556–57, and in 1562 was member for Coventry. He is supposed to have died about 1572, and not in very affluent circumstances. He used a punning, or, as the heralds would call it, a canting device, of a young tree or *graft* growing out of a *tun*. His works are distinguished for their beauty, and are very numerous and costly. He was one of the most careful and meritorious of English printers.

These are the titles of a few of his early Bibles, &c.

The Byble, 1537, folio. "The Byble, which is all the holy Scripture: In whych are contayned the Olde and Newe Testament truly and purely translated into Englysh by Thomas Mathew. Esaye 1 ☞ Hearcken to ye heauens, and thou earth geaue eare: For the Lorde speaketh. M.D.XXXVII." The title of the New Testament is, "The newe Testament of our sauyor Jesu Christ, newly and dylygently translated into Englyshe, with Annotacions in the Mergent to help the Reader to the vnderstandyng of the Texte." This was printed in France.

The New Testament, Latin and English. 1538. Octavo. "The new testament both in Latin and English after the vulgare texte; which is red in the churche. Translated and corrected by Myles Couerdale: and prynted in Paris, by Fraunces Regnault. M. CCCCC. XXXVIII in Nouembre. Prynted for Richard Grafton and Edward Whitchurch. cytezens of London. Cum gratia & priuilegio regis."

The Byble in Englysshe. 1539. Folio. "The Byble in Englyshe, that is to saye the content of all the holy Scrypture, bothe of ye olde, and newe testament, truly translated after the veryte of the Hebrue and Greke textes, by ye dylygent studye of dyuerse excellent learned men, expert in the forsayde tongues. *Prynted by Rychard Grafton, and Edward Whitchurche. Cum priuilegio—solum.* 1539." This is a very superb book, and is the one which was commenced at Paris and finished at London under the circumstances before related.

NEWE TESTAMENT IN ENGLYSSHE. 1540. Quarto. "Translated after the texte of Master Erasmus of Roterodame."

THE PRYMER. English and Latin. 1540. Octavo.

THE BYBLE IN ENGLYSHE. 1540. Folio. A noble volume, called, from the preface, Cranmer's Byble.

The Byble in Englyshe. 1541. Folio. "The Byble in Englyshe of the largest and greatest volume, auctorised and appoynted by the commaundement of oure moost redoubted prynce and soueraygne Lorde, Kynge Henrye the VIII, supreme head of this his churche and realme of Englande: to be frequented and vsed in euery Churche within this his sayd realme, accordyng to the tenoure of hys former Jniunctions geuen in that behalfe. Ouersene and perused at the cōmaundemēt of the kynges hyghnes, by the ryght reuerend fathers in God Cuthbert byshop of Duresme, and Nicholas, bisshop of Rochester." The lines of the title are printed alternately red and black.

Such, with many other manuals, primers, &c. were the productions of this most eminent British typographer.

John Day.

John Day was a printer of much eminence; and his works are numerous, beautiful, and useful.

Isaac Jaggard, Edward Blount, &c.

The first complete edition of Shakspeare's Plays was printed by Isaac Jaggard and Edward Blount, in folio, in 1623. Of his single plays, the earliest is "The first part of the Contention betwixt the two famous Houses of Yorke and Lancaster," which was printed by "Thomas Creed for Thomas Millington, and are to be sold at his shop, under Saint Peter's Church, Cornwall" (Cornhill), in 1594. These plays were printed by various typographers, amongst whom appear the names of George Eld, Valentine Simmes, R. Young, John Robson, and others who only give their initials.

Peter Parker.

The first edition of Milton's Paradise Lost was printed in quarto by Peter Parker in the year 1667; the Paradise Regained in 1671.

During the troublesome times that preceded the great rebellion, the Puritans, jealously watched and persecuted, introduced the anomaly of ambulatory presses, which were constantly removed from town to town to escape the vigilance of the Star-Chamber. At these presses many of Milton's controversial pamphlets were printed; and it is even said that the identical press at which the *Areopagitica* was printed is still in existence, and was lately in the possession of Mr Valpy, the well-known printer of the Variorum Classics.

It is a very pleasing reflection, that the earlier practitioners of the art did, by their uniform good character and religious turn, tend much to render their profession productive of a highly moral class of literature, and to raise it in the estimation of all men. Had they been less respectable, had they turned their attention to the many ribald and tasteless writings of those times, the effect of the new art would have been to degrade literature and lower morals, to delay the spread of knowledge, and to give a depression to the character of the art and its practitioners, from which possibly they might never have recovered. These excellent and learned men appear to have received their temporal reward, in public estimation, sufficient wealth, and a length of years beyond the ordinary term of mortality.

Oxford.

Setting aside the claim of Corsellis, printing was first practised at Oxford by Theoderic Rood and Thomas Hunte from 1480 to 1485. In Rymer, vol. xv. is a grant by Queen Elizabeth to Thomas Cooper, clerk of Oxford, for the exclusive printing of his Latin Dictionary. In 1585 a printing press was established at the expense of the Earl of Leicester, chancellor of the university. Joseph Barnes was appointed printer to the university in 1585.

Cambridge.

At Cambridge John Siberch printed in 1521, when Erasmus resided there, and probably executed some of his books. Thomas Thomas, M. A. was the first printer to the university in 1584.

St Alban's.

At St Alban's printing was very early practised, certainly in the year 1480. It would appear that the printer was a schoolmaster. It has been asserted, but without shadow of argument, that printing was introduced here many years before Caxton.

Early Scottish printers.

Printing was not introduced into Scotland till thirty years after Caxton had set up his press at Westminster. Under the patronage of James IV., who was a zealous encourager of learning and the useful arts, Walter Chepman and Andro Myllar established the first printing press at Edinburgh, as appears by a royal privilege granted to them in 1507.[1]

The only publications known to have issued from the press of Myllar and Chepman are a collection of pamphlets, chiefly metrical romances and ballads, in 1508, of which an imperfect copy is preserved in the Advocates' Library;[2] and the Scottish Service Book, including the Legends of the Scottish Saints, commonly called the Breviary of Aberdeen, in 1509.[3]

It is difficult to account for the discontinuance of printing in Scotland for about twenty years after this time: probably the disastrous events at the close of the reign of James IV. may have contributed to render it an unprofitable trade; but in its revival by Davidson there was no deterioration, either in the magnitude and importance of the works attempted, or in the mode in which the mechanical part was executed. It was probably about the year 1536 that he printed, in a black-letter folio, "The History and Croniklis of Scotland, compilit and newly correckit be the Reuerend and Noble Clerke Maister Hector Boece. Translatit laitly be Maister Johne Bellenden. Imprentit in Edinburgh be Thomas Davidson, dwelling fornent the Frere Wynd;" and in 1540 he printed the whole works of Sir David Lindsay.

Davidson was succeeded by Lekprevik, Vautrollier, and others; but none were distinguished as printers till the time of Ruddiman.

A mere catalogue of printers would afford little amusement, and less instruction; especially since the productions of the English press, save in the works of the printers above named, not only exhibited no advance, but even much deterioration, in most requisites of good printing. Indeed, to so low a point had the art fallen, and so little spirit was exhibited by English typographers, that the regeneration was left to an alien, whose perception of the inferiority and capacity of improvement at once raised the art to the level of the finest productions of Bodoni and Barbou.

Baskerville, Bulmer &c.

This was John Baskerville, a japanner of Birmingham, who, having realized a considerable fortune, turned his attention to cutting punches for type, and succeeded in producing a series of founts of remarkable beauty, so excellently proportioned, and standing so well, that the best of modern type-founders (and this seems the Augustan age of type-founding) have done no more than vary the proportions and refine the more delicate lines and strokes. Added to this, his press-work is of most excellent quality; his paper the choicest that could be procured; and his ink has a richness of tone, the mode of producing which has died with him. The works of Baskerville are amongst the choicest that can adorn a library. He died in 1775. His types and punches were purchased to print the splendid edition of Voltaire's works at Paris. He was worthily succeeded by BULMER, whose magnificent Shakspeare and Milton are amongst the most superb books ever issued from the press, and, with Macklin's Bible and Ritchie's, Bensly's Hume, and other works, may be fearlessly produced to win for this country the palm of fine printing; whilst in Scotland, THOMAS RUDDIMAN and the two FOULIS may challenge the prize of classical typography from Aldus and the Stephani. Indeed, the larger Greek types of the Foulis are without parallel for grandeur, their press-work is beautiful, and their correctness beyond all praise.

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[1] "James, &c. To al and sindrj our officiaris liegis and subdittis quham it efferis, quhais knawlage thir our lettres salcum, greting; Wit ye that forsamekill as our lovittis servitouris Walter Chepman and Andro Millar, burgessis of our burgh of Edinburgh, has at our instance and request, for our plesour, the honour and proffit of our Realme and liegis, takin on thame to furnis and bring hame ane prent, with all stuff belangand tharto, and expert men to use the samyne, for imprenting within our Realme of the bukis of our Lawis, actis of parliament, crouiclis, mess bukis, and portuus efter the use of our Realme, with addicions and legendis of Scottis sanctis, now gaderit to be ekit tharto, and al utheris bukis that salbe sene necessar, and to sel the sammyn for competent pricis, be our avis and discrecioun thair labouris and expens being considerit," &c.

"Geven under our prive Sel at Edinburgh the xv day of September, and of our Regne the xx^ti^ yer."

[2] These pamphlets were reprinted in a handsome quarto volume, edited by Mr David Laing. The preface contains much accurate information regarding early printing in Scotland.

[3] Of this Service Book, which forms two volumes octavo, handsomely printed with red and black letter, in the years 1509 and 1510, a beautiful copy is preserved in the University Library of Edinburgh. As the name and device of Walter Chepman occur in the work, without any mention being made of his partner, we are led to the conclusion that Andro Myllar, if then alive, had relinquished his share in the concern.

Modern printers, with all their faults, are not degenerate successors of these worthies. The works from present offices that make pretensions to fine printing need not be ashamed of comparison with these *chefs-d'œuvres;* whilst, from the vast improvements in the mechanism of the art in all its branches, paper, presses, ink, type, and other adjuncts, the average of the printing of the present day is infinitely superior to that of the last century. But in what relates to practical skill, correctness, taste, and diligence, we cannot hope to excel, though we may perhaps equal, these departed masters.

PRACTICAL PRINTING.

The first operation when the new fount[1] has entered the doors of the printing-office, is to *lay* it in the *cases* (fig. 1). These are always in pairs; the *upper case* being divided into equal spaces or *boxes;* the part on the left of the broader division being appropriated to CAPITAL letters, figures, diæresis vowels, particular *sorts*, &c.; that on the right to SMALL CAPITALS, accented letters, and references. The letters and figures are arranged in alphabetical and numerical order, from left to right. The *lower case* is divided into unequal portions, according to the average occurrence of the particular letters; for the compositor (the workman whose duty it is to lay the fount, and afterwards to place together or *compose* the separate types into words) never looks at the face of the letter he picks up, but unhesitatingly plunges his fingers into any box, being sure that the letter he picks out thence is the one to which that box is appropriated, and consequently the one he requires. As there is no external mark or guide attached to the different boxes to denote the letters they contain, a stranger is not a little surprised and puzzled at the eccentric movements of the workman's hand. Accordingly, it will be observed, upon looking at fig. 1, that the letter e has a box one-half larger than c, d, m, n, h, u, t, i, s, o, a, r; and these are twice the size of b, l, v, k, f, g, y, p, w, or the comma; and four times the size of z, x, j, q, or the [] crotchets, full points, &c. These boxes are not arranged in alphabetical order, but those of most frequent occurrence are placed about the middle of the case to diminish the distance the hands of the compositor have to travel in picking up and receiving the types. There are also other pairs of cases similarly arranged for the *italic* letters. The following are the proportions of some of the letters in a fount of pica of 800 lb. weight:—

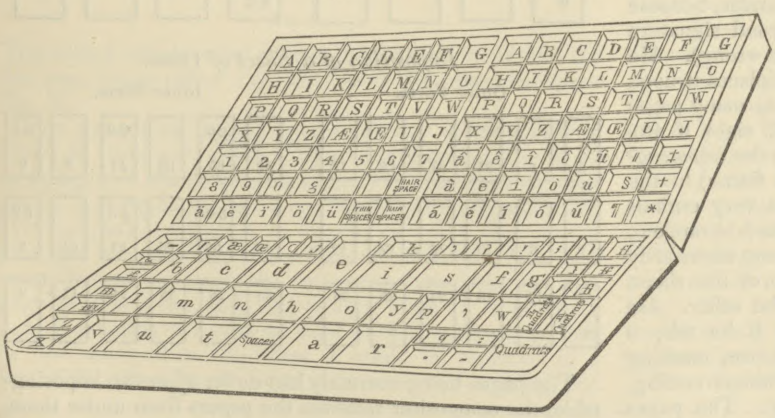
A B C D E F G A B C D E F G
H I K L M N O H I K L M N O
P Q R S T V W P Q R S T V W
X Y Z Æ Œ U J X Y Z Æ Œ U J
1 2 3 4 5 6 7 â ê î ô û ‖ ‡
8 9 0 £ HAIR SPACE à è ì ò ù § †
ä ë ï ö ü THIN SPACES HAIR SPACES á é í ó ú ¶ *
- æ œ k ! ; ff
b c d e i s f g fi
l m n h o y p , w
x v u t Spaces a r q : . - Quadrats

Fig. 1.

Capitals, from 400 to 600 of each, but of J 80, Q and X 180, and Z 180.

Small capitals, from 150 to 300 of each, excepting J, Q, X, and Z, which, as in the capitals, are reduced in number.

a	8,500	b	1,600	j	400	z	200
e	12,000	c	3,000	k	800	&	200
i	8,000	d	4,000	m	3,000	,	4,500
o	8,000	f	2,500	n	8,000	.	2,000
u	3,400	h	6,400	q	500		

In a whole fount there are about 150,000 letters, spaces, and figures.

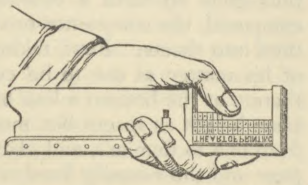

Fig. 2.

The compositor, having placed his copy upon a part of the upper case little used, and having received the necessary directions, takes up an instrument called a *composing-stick* (fig. 2), (which, as well as the way of holding it and its use, will be better understood by reference to the drawing than by description), and sliding the inner moveable portion wider or closer according to the desired width of the page, he fastens it with a screw; he then cuts a piece of brass rule to fit in easily between the end of the stick and slide, and which is called the *setting-rule.* This rule causes the letters to slip down without any obstruction from the screw-holes of the stick, or the nicks which serve to distinguish one fount from another and enable the compositor, by turning them outwards, to place the letters in their proper position. He then reads the first few words of his copy, takes first a capital letter from the upper case, the succeeding letters from the lower case, and at the conclusion of the word a *space*, which is merely the shank of a letter without any face, and not so high as a letter by about one-fourth part; and therefore, not receiving the ink, forms the blank space between words; but sometimes, through carelessness, it is allowed to stand up, in which case it is a fearful blotch upon a fair page, and must have been observed by most readers. He then proceeds with his next word, which will probably consist of lower-case letters only; and so on until he has arrived at the end of his line. It is most likely, however, that the words he has occasion to compose, with the necessary spaces, will not fill up the exact width of the line, and that there will be sometimes too much, sometimes too little room, for getting in the whole or part of the next word. In this case he has to consider whether it will be better to crowd the line and get in the word or syllable, or make the line more open and take it over to the next line; his care being that his matter, when composed, shall not look too open or too close. Having decided, he takes out the spaces he has inserted, and puts in their stead others of greater or less width, as the case may require, in such a manner that on the face of the line being touched, it shall not feel loose, or require any particular pressure to force down the last letter into its proper place. This being accomplished in an artist-like manner, he takes out his setting-rule and places it in front of his line, and with a gentle pressure of his thumb forces both back into the composing-stick; he then proceeds in a similar manner with other lines until his stick is full, when, placing it upon the *frame* on which the cases rest, his setting-rule being in front, he lifts his lines out of the stick and places them upon a proper instrument called a *galley*. If, however, the matter is to be *leaded*, that is, if the lines of types are to be more apart than usual, the process is a little different. The compositor then has before him a quantity of pieces of metal called *leads*, of the exact width of the page, only one-fourth, one-sixth, or one-eighth of the body of the type, and not higher than spaces. After composing a line, before moving his setting-rule, he takes one or more of these and places it before the line; he then takes out the setting-rule, and proceeds as above described. Having thus gone on until a considerable quantity of matter is composed, the compositor next makes it up into pages, and then into sheets. First, taking by portions as many lines of his matter as are to be contained in a page, he adds thereto at the bottom a line of quadrats, which are of the same height as spaces but much larger, varying in length from one to four m's, and places at the top the folio of the page and the *running head* or line which indicates the title of the work or the subject of the page or chapter, and then adds such leads or other things as may be necessary; taking care that in the first page he places the *signature* (a letter of the alphabet intended for a guide to the binder, because by keeping this always outside, and the second signature on the next leaf, he cannot fold the sheet wrong). He next ties it tightly round with page-cord, and places it upon a piece of coarse paper. Having made up as many pages as the sheet consists of, viz., four if folio, eight if 4to, sixteen if 8vo, he next lays them down upon the *imposing-table*[1] (a large plate of iron screwed on to a frame) in the necessary order. This is, to a stranger, a very curious arrangement; they appear to him to be placed at random, without any design or fixed rule, and as they are necessarily laid down in two divisions, one for each side of the sheet, one is of consequence the very reverse of the other. He may easily instruct himself, however: for if he take a sheet of paper and fold it into any required size, marking the folios with a pencil, and then open it without cutting, he will find they fall in curious irregularity. The pages are laid down on the table reverse of the order they have on the paper; for it must be remembered that every type and every page is like a seal, the reverse of the impression it leaves; consequently, were the pages laid down as on the marked paper, viz., the first page on the right hand, it would, in type, be at the extreme left, and so on. The following schemes of the *laying down* or *imposition* of a sheet of 4to, 8vo, 12mo, and 18mo, will give some idea of the apparent confusion of this process:—

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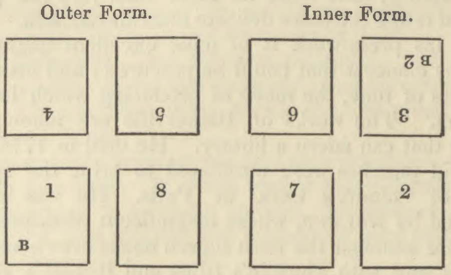
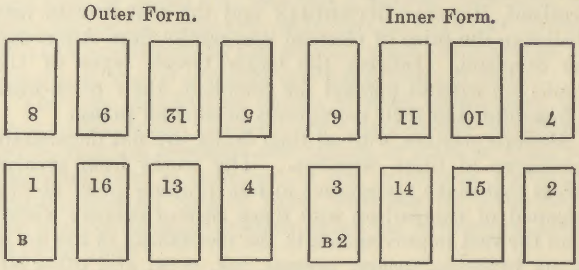
[1] A fount is any weight of type of the same body and face, consisting of every letter, stop, figure, &c., in certain proportions, as stated above, together with spaces and quadrats. (See TYPE-FOUNDING.)

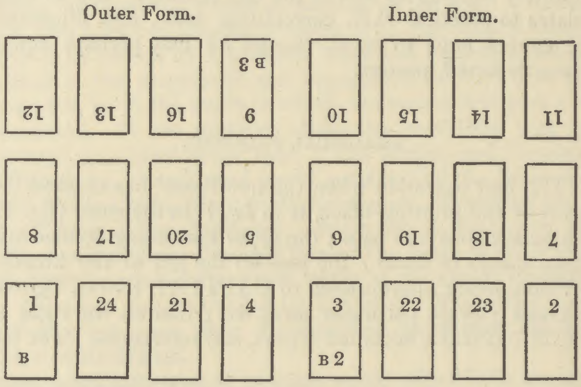
Imposition of a Sheet of 4to.



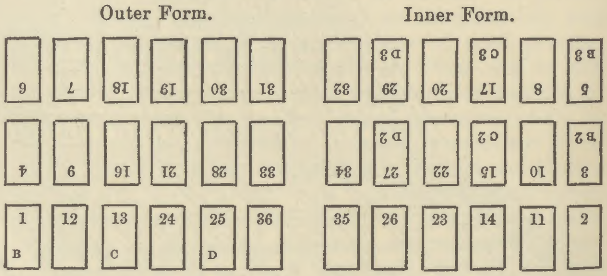
Imposition of a Sheet of 8vo.



Imposition of a Sheet of 12mo.



Imposition of a Sheet of 18mo.



The pages being correctly laid down upon the imposing-table, the compositor removes the papers from under them, and next takes in both hands a *chase* (a frame of iron divided by cross-bars into four compartments, the inner angles of which are made rectangular with much care) and places it over them; and then having ascertained the size of the paper to be used, adjusts pieces of wood or metal, called *furniture*, between them. Within the chase, but next to the pages, he places other pieces of wood or iron called *side* and *foot sticks*, which are rather wider at one end than the other, and between these and the chase small pieces of wood, which decrease in width in the same proportion as the side-stick, and which are called *quoins.* He now takes off the cords from the pages, and, as he removes each cord, he tightens the adjacent quoins that the letters at the sides of the pages may not slip down. When all the pages are untied, and the quoins pushed up with his finger and thumb, he planes down the pages gently with a *planer* (a piece of beech perfectly plane and smooth on the face, about 9 inches long, 4½ inches wide, and 2 inches thick), to prevent any of the letters from standing up. With a *shooting-stick* (which formidably-named weapon is merely a piece of hard wood,[1] a foot in length, an inch and a half in width, and half an inch in thickness) and a mallet he forces the quoins towards the thicker ends of the side and foot sticks, which consequently act as gradual and most powerful wedges, forcing the separate pieces of type to become a compact and almost united body, so that, the pages being securely *locked up* and again planed down, the whole mass, consisting of many thousand letters, may be lifted entire from the table.

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[1] Formerly a large slab of marble or stone was used for this purpose; but as it was liable to split, and to have its smooth surface indented, a plate of iron turned in a lathe is now very generally substituted.

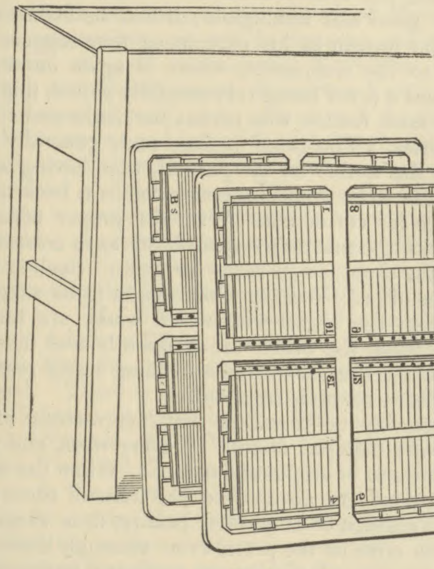

Fig. 3.

This united mass is called a *form;* that one which contains the first page being called the *outer form,* the other the *inner* (fig. 3).

The compositor is paid by the number of thousands of letters he composes, which is thus ascertained:—The letter m, being on a shank which is supposed to have its four sides parallel and equal, is taken as the standard; he ascertains how many m's the page is in length, including the running head and the white line at the bottom; that is, in fact, how many lines of the particular type used there would be in a page of the given size, supposing it were all solid type; next, how many m's (laid on their side) it is in width, that is, how many times the letter m would be repeated in a line of the given length were it to consist of nothing but m's so laid. This latter sum is then doubled, because experience shows that the average width of the letters is one-half of the depth, or one-half of that of the letter m. The length of the page is then multiplied by the product of this doubled width, then by the number of pages in the sheet, and the result will give the average number of letters in the sheet. This will be much better understood by the following *casting-up* of a sheet of 8vo in pica:—

Number of m's long........................	47
... m's wide 24, × 2..............	48
	376
	188
	2256
Number of pages in a sheet of 8vo......	16
	13536
	2256
	36096

The compositor therefore is paid for composing 36,000 letters; for the odd figures are dropped, unless they amount to or exceed 500, when they are paid for as if they completed another 1000. If the sheet be of solid type, of the ordinary size, the price paid in London is sixpence per 1000 letters; if in the small type called minion, sixpence farthing; in nonpareil, sevenpence; in pearl, eightpence. If the work be composed from print copy, the price is three farthings per 1000 less than it would be paid if the copy were manuscript. If, however, the type be leaded, the price is a farthing per 1000 less for founts above pearl. If the work is to be stereotyped, and high spaces are used, it is subject to an additional charge of a farthing per 1000; if low spaces, of a halfpenny per 1000. Works in foreign languages, in type of the ordinary size and character, are paid one halfpenny per 1000 more, and three farthings per 1000 more in the smaller. Greek, with leads and without accents, is eightpence halfpenny per 1000; without leads or accents, eightpence three farthings; with accents, tenpence farthing. Hebrew, Arabic, Syriac, &c., are paid double.[2] The compositor, it appears, must therefore pick up 72,000 letters before he can receive an ordinary week's wages, must make up his matter into pages and impose them, and, moreover, correct all the blunders mischance or carelessness may have occasioned, with great expenditure of time also in many other particulars; but, as is hereafter described, he must have previously placed every one of these 72,000 into the appropriate boxes whence he has withdrawn them in composition. Now it is usually reckoned that this latter operation, called *distributing,* occupies one-fourth of a compositor's time, and the other operations another fourth; he has therefore only one-half of his time for composition; consequently he must pick up letters at the rate of 144,000 per week, 24,000 per day, or 2000 per hour. His rapidity of motion is therefore wonderful, and the exertion is so long continued, that the business, although apparently a light one, is in fact extremely laborious.

The number of thousands of letters in a sheet necessarily varies with the size of the type, width and length of the page, and the number of the pages. The example above given is the casting-up of an octavo sheet of pica solid, the page being of moderate size; a similar sheet of brevier would contain 81,000 letters, and the cost of composing it would be L.2, 0s. 6d. Single tables, forming one uninterrupted mass of type, will sometimes contain 250,000 letters; and the labour of the compositor being very great in getting them up, he is paid double. Consequently the cost of composing such a table in pearl or diamond (as the 13th of Bell's *Chronological Tables*, 4th edit.) would be not less than L.16, 13s. 6d., without extra charges. Yet this large number of types, by the power of the wedge-formed side and foot sticks and quoins, is compressed into so solid a mass that it can be moved without much danger of disruption.

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[1] Iron or gun-metal is now generally substituted, as being more durable.

[2] In 1804, after a protracted litigation before the Court of Session, the journeymen compositors of Edinburgh succeeded in obtaining the sanction of the Court for an advance of one penny per thousand letters, or, upon an average, about one-fourth on the prices of their work. The grounds upon which the Court rested this decision were, that the wages were much too low; that they had remained for forty years unaltered, whilst the price of the necessaries of life had very much increased; that although it was proper to avoid a rise of wages which might lead to idleness, yet it was equally necessary to place the workmen upon a respectable footing, so as to enable them to do their work properly, and also to encourage them in cultivating and acquiring that degree of literature by which the public must infallibly be benefited; and that the fair criterion was, to make the wages of Edinburgh bear the same proportion to those of London which they did in the year 1785, before the London prices were raised. That a court of law, whose province it is not to legislate, but to apply and enforce existing statutes, should have entertained a question regarding the price of labour, for the regulation of which there not only existed no law, but which had never been deemed a fit subject for legislative interference, appears to be a very singular incident in the history of judicial procedure. The prices thus fixed, however (namely, 4½d. per 1000 for book-work, with an additional halfpenny if nonpareil, and a penny if pearl, and 5½d. for law-papers and jobs), being regarded as not unreasonable, have ever since been adhered to by every respectable establishment in Edinburgh.

The sheet being now imposed, an impression is taken, called a *proof*, which is carried down to the reader, who, having folded the proof in the necessary manner, first looks over the signatures, next ascertains whether the sheet commences with the right signature and folio, and then sees that the folios follow in order. He now looks over the running heads, inspects the proof to see that it has been imposed in the proper furniture, that the chapters are numbered rightly, and that the directions given have been correctly attended to, marking whatever he finds wrong. Having carefully done this, he places the proof before him, with the copy at his left hand, and proceeds to read the proof over with the greatest care, referring occasionally to the copy when necessary, correcting the capitals or italics, or any other peculiarities, noting continually whether every portion of the composition has been executed in a workman-like manner; and having fully satisfied himself upon these and all technical points, he calls his reading-boy, who, taking the copy, reads in a clear voice, but with great rapidity and often without the least attention to sound, sense, pauses, or cadences, the precise words of the most crabbed or intricate copy, inserting, without pause or embarrassment, every interlineation, note, or side-note. The gabble of these boys in the reading-room, where there are three or four reading, is most amusing, a stranger hearing the utmost confusion of tongues, unconnected sentences, and most monotonous tones. The readers plodding at their several tasks with the most iron composure, are not in the least disturbed by the Babel around them, but follow carefully every word, marking every error, or pausing to assist in deciphering every unknown or foreign word. This first reading is strictly confined to making the proof an exact copy of the manuscript, and ascertaining the accuracy of the composition; consequently first readers are generally intelligent and well-educated compositors, whose practical knowledge enables them to detect the most trivial technical errors. Having thus a second time perused the proof, and carefully marked upon the copy the commencement, signature, and folio of the succeeding sheet, he sends it by his reading-boy to the composing-room to be corrected by the workmen who have taken share in the composition. These immediately divide the proof amongst them, and each, taking that portion of it which contains the matter he had composed, and going to his cases, gathers the letters marked as corrections in the margin, together with a quantity of spaces of all sizes, and returns to the forms, which in the meanwhile one of them has *laid up* on the imposing-table and unlocked. He then with a bodkin lifts up each line in which a correction is required, draws out the wrong letter and inserts the right one, adjusting the spaces in such a way as to compensate for the increased or diminished size of the letter substituted, overrunning carefully several lines should any word have been added or struck out, so that the spacing may be uniform, and the corrected matter exhibit no indication of any alteration having been made. This is an operation requiring much practice and skill; and here is shown the value of attention in the preliminary operations. Should the types have been carelessly laid or inaccurately distributed, should the workman have been negligent in composition, capitalling, or spacing, he will consume as much time in amending his errors as in composing his matter, to the great detriment of his work, the injury and inconvenience of his employer and his companions, and great delay in every department of the printing-office. When every compositor has corrected his matter, that one whose matter is last in the sheet locks it up, and another proof is pulled, which, with the original proof, is taken to the same first reader, who compares the one with the other, and ascertains that his marks have been carefully attended to, in default of which, he again sends it up to be corrected; but should he find his revision satisfactory, he sends the second proof with the copy to the second reader, by whom it undergoes the same careful inspection; but this time, most technical inaccuracies having been rectified, the reader observes whether the author's language be good and intelligible; if not, he makes such queries on the margin as his experience may suggest; he sends it up to the compositor, where it again undergoes correction, and a proof being very carefully pulled, it is sent down to the same reader, who revises his marks and transfers the queries. The proof is then sent, generally with the copy, to the author for his perusal, who, having made such alterations as he thinks necessary, sends it back to the printing-office for correction. With the proper attention to these marks, the printer's responsibility as to correctness ceases, and the sheet is now ready for press. Such at least is the process of proof-reading which ought to be adopted; but now, from the speed with which works are hurried through the press, the proofs are frequently sent out with only one reading, the careful press-reading being reserved until the author's revise is returned.

It need scarcely be remarked that "correctness of the press" is a very material feature in every work, and more especially in those of a scientific nature. When the attention and the mind are devoted to the train of some close argument or passage of surpassing beauty, it is surprising how easily an error of the press, even although it may not injure the sense, and may be as evident "as the sun at noon," will destroy the charm, and break the "thread of the discourse;" and even in works of ordinary reading they are exceedingly offensive. Many curious anecdotes are related of the methods which the earlier printers adopted to attain correctness. It was the glory of the early literati to take charge of the accuracy of new works; and, in return, the value and sale of each edition varied with the skill and reputation of the corrector. Of these, Erasmus is an illustrious example. Many of the first printers were led to the practice of the art by their love of learning, and their anxiety to promote it by the production of classic authors. Hence several are better known in the world of learning than in the circle of bibliographers; as the editors and correctors of valuable works, than as the careful or beautiful printers of them. Aldus, it is true, has so admirably succeeded in both characters that he has fully established his double fame; but whether he most valued himself upon his learning or his skill may be doubted. It would appear from his letters that he considered it as his chiefest duty to correct every sheet that passed through his press. In all his bustle in preparing every material in use in his art, in all his occupations public and private, this important duty was never neglected. He tells us "that he has hardly time to inspect, much less to correct, the sheets which are executed in his office; that his days and his nights are devoted to the preparation of fit materials; and that he can scarcely take food or strengthen his stomach, owing to the multiplicity and pressure of business; meanwhile," adds he, "with both hands occupied, and surrounded by pressmen who are clamorous for work, there is scarcely time even to blow one's nose:" nor did his son or grandson depart from his ways, but did themselves insure the correctness of their works, even when the latter had risen to wealth and eminence, and enjoyed the laborious dignity of a professor's chair. The beautiful Greek works of the Stephani are especially valued for their correctness. Stephens corrected his own press with intense labour and minuteness, and is reported to have adopted a singular plan for obtaining perfect similarity to the copy, by employing females who had not the slightest knowledge of the Greek characters or language to compare every letter of the proof with the manuscript; a labour so intense as to be almost incredible. He is moreover said to have hung up proofs on the doors of his printing-office, and to have amply rewarded any who could detect inaccuracies therein. Coverdale, it will be recollected, corrected the first English Bible and Testament, and received a bishopric as his reward. Foulis, the celebrated printer at Glasgow, adopted the same plan to insure the accuracy of his edition of Horace, which is styled immaculate; in which, however, one error escaped detection, the ode commencing SCRIBERIS Vario, being printed, as originally issued, SCRIBFRIS Vario.

The experience of every printer will furnish a host of laughable errors; and indeed these defects have been deemed of such importance as to deserve preservation. (D'Israeli's *Curiosities of Literature.*) The omission of the word *not* from the seventh commandment, in an edition of the Bible printed by the Stationers' Company, is well known; and the company richly deserved the severe fine they incurred for spreading the immoral command, "Thou shalt commit adultery." The Bible so misprinted has received the name of the "Adultery Bible;" and a copy is preserved in the British Museum, the edition having been carefully suppressed. There is another Bible known as the "Vinegar Bible," from a misprint in the 20th chapter of St Luke, where "Parable of the Vinegar" is printed for "Parable of the Vineyard:" this proceeded from the Clarendon press. In the reign of Charles I. a very curious traffic in Bibles, &c., arose; they were printed by any one who chose, and imported in vast numbers from abroad. It will readily be imagined that these were made for *sale*, not for *use*, and that they abounded with egregious errors; but, what is worse than this, they were full of mistranslations and interpolations, and the omissions were fearful. All these were done as much by design as by accident, the Romanists and sectaries taking the opportunity of advancing their own tenets by interpolating and altering texts to suit their views. These monstrous anomalies produced, however, some good; they occasioned the necessity of the authorized version now in use, and printed under such authority as insures perfect fidelity, whilst there is sufficient competition to make it impossible that the Word of God can ever become a sealed book to the humblest and poorest Christian. Some of the blunders in these editions are sufficiently absurd to overcome the repugnance which must naturally be felt at such license. Thus, in Luke xxi. 28, *condemnation* has been misprinted for *redemption.* In Field's Bible of 1653, called the Pearl Bible, Rom. vi. 13, we find "Neither yield ye your members as instruments of *righteousness* unto sin," for *unrighteousness;* and 1 Cor. vi. 9, "Know ye not that the unrighteous *shall inherit* the kingdom of God?" for *shall not inherit.* It is said that these corruptions are in great measure owing to Field's cupidity, and that he received a bribe of L.1500 from the Independents to alter the text in Acts vi. 3, to sanction the right of the people to appoint their own pastors, "Wherefore, brethren, look ye out among you seven men of honest report, full of the Holy Ghost and wisdom, whom *ye* may appoint over this business," instead of *we.* This Bible is notorious, and, strange to say, valued, for its gross incorrectness. It is asserted that no less than six thousand errors of greater or less magnitude have been noted in it. But the most extraordinary example of carelessness is presented by the Vulgate, the printing of which was sedulously superintended by no less an authority than Sextus V., a curious example of the infallibility of the Pope. To the astonishment of the world, it swarmed with errors; and a whimsical attempt was made to remedy the defects by pasting printed slips of paper over the erroneous passages. As this, however, was exceedingly laughable, the papal authority was exerted to the utmost to call in the edition, and with such effect that it soon became very scarce, and a copy of it has produced the sum of sixty guineas. To add to the absurdity, the volume contains a bull from the Pope anathematizing and excommunicating all printers who, in printing it, should make any alteration in the text. The monkish editor of *The Anatomy of the Mass,* printed in 1561, a work consisting of 172 pages of text and fifteen pages of errata, very amusingly accounts for these mistakes by attributing them to the artifice of Satan, who caused the printers to commit such numerous blunders; but he does not inform us whether it was really the archangel fallen, or only his minor satellite, the printer's devil. The editor of an Ethiopic version of St Paul's Epistles innocently confesses, in palliation of his errors, "that they who printed the work could not read, and we could not print: they helped us and we helped them, as the blind helps the blind."

The sheet being printed off in the way hereafter to be described, and the forms returned by the pressmen to the composing-room, and very carefully washed with lye, and rinsed with water, the compositor lays them up on a letter-board in the sink, and there unlocks them; he then passes one hand backwards and forwards over the pages so as effectually to loosen the type, and at the same time with the other pours on water, till, the lye and ink being washed away, it runs off clear. The forms are then allowed to drain, and carried to the bulks at the ends of the frames. Each compositor employed on the work then takes a share of the letter, and, wetting the face of it plentifully with a sponge, which causes the types to adhere sufficiently to prevent accidents, yet not so much as to retard the workman, takes up a portion on his setting-rule, with the nick upwards, and the face turned towards him; he then takes between his fingers and thumb a few letters, gives a rapid glance at the face to see what letters they are, and then, passing his hand rapidly over the cases, drops each into its appropriate box. In this operation the greatest attention is necessary, for it must be remembered that every letter dropped into a wrong box in distributing is sure to cause an error in composing; for the workman, as before stated, never looks at the letter he takes up, relying upon the correctness of the distribution. Compositors, therefore, should be especially careful, when learning their business, not to sacrifice accuracy to swiftness; for in this instance most especially is it found that too much haste is little speed. If the rapidity of motion in composition strikes the stranger with wonder, what must that of distribution occasion? Most compositors distribute four times as rapidly as they compose; if, therefore, he pick up two thousand letters in an hour, he would distribute eight or ten thousand, or about three per second. His letter being properly distributed, he again proceeds to compose in the manner before described, until the work is finished. The number of times the types are returned to the cases must depend upon the size of the fount. A thousand pounds weight of types would get up five or six sheets; and therefore, in an ordinary octavo volume, the types would be returned five or six times.

Many attempts have been made to substitute machinery for the manual labour of the compositors. The machines of Messrs Young and Delcambre (1842), and of Major

Rosenborg, deserve mention for their great ingenuity; and Major Beniowski has attempted a process by which, by the use of a new description of type, logotypes, cases, and machinery, a great saving of time and money may be effected. But there are requirements in the process of composing which are independent of mechanism, and which have hitherto rendered these inventions practically useless.

THE PRINTING-PRESS.

The press is the machine whereby impressions are obtained of the type, when set up by the compositor as above described. On the skill and care of the pressmen depends the beauty of the work. If the press-work be not good, all the labour of the compositor is thrown away; his work makes no respectable appearance, and the master gets no credit.

It has already been mentioned that very little alteration had been made in the printing-press from the time of the first printers to that of Blaew of Amsterdam, about 1620. Blaew's improvements, although very great, only consisted in alterations in the details, and not in the principle. These presses have in their turn been superseded by those of Lord Stanhope; and the latter has found successful competitors in the Columbian, Albion, and others of more modern invention. Very few of Blaew's construction are now in existence, in England at least, save in old offices, where they are used as proof-presses, or kept merely as curiosities. As a description of these bygone pieces of mechanism would be of little utility, the Stanhope press, by which they have been superseded, has been selected for illustration, for which it is best adapted, from the simplicity of its construction and its being easily explained. The novelty of his lordship's invention consists in an improved application of the power to the spindle and screw, whereby it is greatly increased. Upon reference to fig. 4, it will be seen that this press possesses great strength and compactness. The heavy mass of iron AA, somewhat resembling a vase in outline, is called the *staple*. It is united at the top and bottom, but the neck and body are open. The upper part is called the *nut* B, and answers the purpose of the head in the old press; it is in fact a box with a female screw, in which the screw of the spindle C works; the lower portion of the open part, described as the *neck*, is occupied with a piston and cup D, D, in and on which the toe of the spindle works.

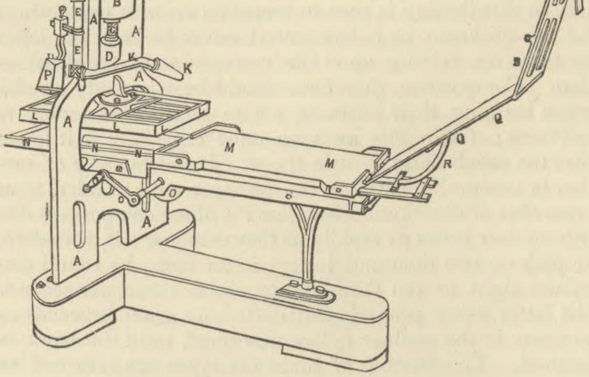

Fig. 4.

On the nearer side of the staple is a vertical pillar or *arbor* A (fig. 5), the lower end of which is inserted into the staple at the top of the shoulder; the upper end passes through a top-plate B, which being screwed on to the upper part of the staple, holds it firmly. The extreme upper end of the arbor (which is hexagonal) receives a head C, which is in fact a lever of some inches in length; this head is connected by a *coupling-bar* E to a similar lever or head D, into which the upper end of the spindle is inserted.

The bar or lever F, by which the power is applied by the workman, is inserted into the arbor, and not into the spindle, by which ingenious contrivance,—1*st*, the lever is in length the whole width of the press, instead of half, as in Blaew's press, and is, moreover, in a much better situation for the application of the pressman's strength; 2*d*, there is the additional lever of the arbor-head; 3*d*, the additional lever of the spindle-head; and, *lastly*, the screw itself may be so enlarged in diameter as greatly to increase its power. The *platten* L is screwed on to the under surface of the spindle; the *table* M has slides underneath, which move *in* the *ribs* N, N, instead of *upon* them, as in the old presses, and is run in and out by means of girths affixed to each end, and passing round a drum or wheel O. As the platten is of considerable weight, the workman would have to exert much strength in raising it from the form after the impression has been given, were not a balance-weight P suspended upon a lever and hook at the back of the press, which counterbalances the weight of the platten, raises it from the form, and brings the bar-handle back again, ready for another pull. These are the principal parts of the machinery whereby the impression is given, and are sufficient to give the general reader, with the aid of fig. 5, an idea of the mechanism of the Stanhope press. For the printer there are yet other appliances. At the right-hand end of the table is an iron frame Q, moving freely upon pivots, so as to fall upon the table, or rise until stopped by what is called the *gallows* R; this is covered with parchment very tightly stretched, and is then called the *tympan;* upon the tympan blankets are placed, which are covered by an inner tympan, and fastened by hooks; the whole forming a solid yet elastic and yielding surface, admirably fitted for impressing the paper upon the type (for this is its use), inasmuch as the surface of the parchment is soft and without grain, and readily receives the impression of the type, while the blankets give freely to every projection, without retaining any indentation. To protect those portions of the paper which are not intended to be coloured from ink or soil, there is at the upper end of the tympan another iron frame, of much lighter make, and also moving upon pivots, so as to fall upon the face of the tympan. This is covered with a sheet of coarse paper, and after an impression has been taken upon it, the exact size and form of the pages are carefully cut out therefrom, the parts left being an excel-

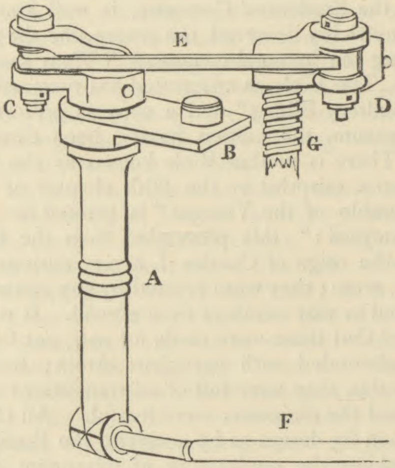

Fig. 5.

A, the arbor; B, the top-plate; C, the arbor-head; D, the spindle-head; E, the coupling-bar; E, the bar or lever; G, the spindle and screw.

lent protection of the paper under them. This is called the *frisket.*

Such is the ordinary Stanhope press. A notice of the principle of many other excellent presses which have been since invented, and very extensively introduced, will be found in a subsequent part of this treatise. The manner of working is the same in all.

On the left front of the press stands the inking-table. This is made of iron, about four feet high, and three feet four inches wide; at the back is a solid iron cylinder, turned perfectly true, against which a thin steel straight-edge is made to press by means of levers and weights, thus forming a trough for the ink; of which, when the cylinder is turned round, it becomes covered with a thin film, its thickness being regulated by adjusting the weights on the levers. Against this iron cylinder the inking-roller (which will be hereafter described) is dabbed, and being rolled backwards and forwards on the table, the ink is evenly distributed over its surface.

It must be fully understood that printers' ink is a very different composition from that used for writing. It is of such consistency that if a small portion be taken up between the finger and thumb, when they are opened it will produce a thread of an inch or an inch and a half in length. Of all the materials used in printing this is the most important, and the most opposite qualities are required in it. It must be of excellent colour. Formerly excellence of colour was deemed to consist in an exceeding dark hue, not exactly black, but black enriched with a hue of the darkest blue or purple. This gave indescribable effect to the works for which it was used, a richness and intensity which it is impossible to describe, but of which the works of Baskerville and Bulmer, especially the *Milton* of the latter, afford the best specimens. *Now* we hold perfection to consist in the intensest black, and all the resources of chemistry and the arts have been sought to attain this end. It must stand for ever; but here we have miserably failed. Compare the productions of the old printers with those printed twenty years back. What a difference! The works of the Aldi and Elzevirs, of Plantinus, Caxton, Pynson, and Grafton, preserve their colour as intense as on the day they were printed; there is no yellowness or brownness, no foxiness; whilst the books printed from 1810 to 1820 are wretchedly discoloured. Where fine printing, however, has been required *and paid for*, the modern ink is no whit inferior to the ancient. Witness the works of Bulmer, Macklin, Ritchie, Bowyer, Baskerville, and others; but certain it is that the ink in general use twenty years ago was of very inferior quality. It must be perfectly mixed, and ground until it is absolutely impalpable, otherwise it will speedily clog the types and inking apparatus; it must adhere to the paper, and not to the type, or it will tear off the face of the former, and clog up the latter; it must be sufficiently thick; it must keep perfectly undried when in large masses, and dry very quickly when it is transferred to the paper. Few printers of the present day make their own ink, although some add ingredients which they believe to improve the colour or quality. Ink-making is a distinct business; and by the aid of machinery, capital, and exclusive attention to the manufacture, the ink now supplied is admirable in the qualities of being thoroughly mixed and ground, drying, blackness, &c.; but whether it will stand the test of time, time alone can show. It is an expensive article, the commonest book-ink being one shilling and sixpence per pound, whilst the usual qualities are two shillings and sixpence, three shillings, and four shillings per pound; those used for superior work are five shillings or six shillings; and those for cuts as high as ten shillings—though it is questionable whether, at the latter price, the consumer is not paying for a mere name.

Every manufacturer has of course his own secrets both of ingredients and process. The universal ingredient is the finest possible lamp-black; the great secret probably consists in the manner in which, and the material from which, this is made. There are vast buildings appropriated to the sole purpose of burning oil, naphtha, spirits, coal-gas, &c., to produce this black, which is collected from the sides, ceilings, &c., of the buildings; it is brought from Germany and many other countries; and no expense is spared to get the most superior quality. The next most important article is nut or linseed oil boiled and burnt into a varnish; then oil of turpentine, &c. The following receipts have been given. The first is the method used by Baskerville and Bulmer, and nothing can be better than the results:—

1. Fine old linseed oil boiled to a thick varnish, and cooled in small quantities, three gallons; a small quantity of black or amber rosin dissolved therein; the mixture then stands for some months, that all impurities may be deposited; after which it is mixed with the finest lamp-black, and carefully ground for use.

2. One hundred pounds of nut or linseed oil are reduced by boiling and burning one-tenth or one-eighth of its bulk, and to the thickness of a syrup, two pounds of coarse bread and several onions being thrown in to purify it from grease. Thirty or thirty-five pounds of turpentine are boiled apart, until, on cooling it on paper, it breaks clean, without pulverising. The former is poured nearly cold into the latter, and well mixed. The compound is then boiled again. Lamp-black is next thoroughly mixed with it, in quantity according to the ink required, and being well ground, the ink is then ready for use. Some add indigo, some Prussian blue, which considerably improves the colour; but these inks are so difficult to work, and so clog up the type, that the *improvement* is better let alone. The turpentine is added to give greater varnish, and improve the drying quality; but if the oil be old and fine, the quantity required is proportionally less.

3. Mr Savage, an admirable artist, denies that any ink can be depended on of the varnish of which oil is the basis; he therefore gives the following receipt:—Balsam capivi, 9 oz.; best lamp-black, 3 oz.; Prussian blue, $1\frac{1}{2}$ oz.; Indian red, $\frac{3}{4}$ oz.; turpentine soap dried, 3 oz. This ink is of beautiful colour, but appears to work foul. There can be no doubt, however, that the best and cheapest plan is always to purchase what is required of a proper ink-maker.

At the right front of the press stand the *bank* and *horse.* The bank is a deal table of some size; the horse is an inclined plane which stands upon the bank; upon it is laid the white paper properly damped for working; and as each sheet is worked, it is taken off the tympan and laid on the bank. There are two pressmen to each press, one of whom attends to the inking only, to ascertain the excellence of which, whenever he has a moment to spare, he turns to the worked sheets upon the bank, glancing his eye rapidly over each, to see that every part is of its proper colour, and that no picks or other imperfections mar the work; the other attends only to the press, and gives the impression. These men are paid by every two hundred and fifty impressions, called a *token.* Thus, if the number be five hundred, and the price $4\frac{1}{2}$d. per token, each man receives 9d. for the five hundred impressions of each form, and the cost therefore is,

Inner form, two men, two token, at $4\frac{1}{2}$d.............1s. 6d.
Outer form, do. do. do. ....1s. 6d.
3s. 0d.

The price varies with the size of the type and the form; with the quality of the paper and the ink; with the number, and the care required. Common work used to be paid for at $4\frac{1}{2}$d., good at 6d., superior at 7d., the very best at 8d., 9d., or even 1s. per token. But now the price is matter of agreement between the master and pressmen.

One of the pressmen, having received the forms after the final correction, lays the inner form, or that one which contains the second signature, upon the table of the press, and secures it in the centre by quoins; the other in the meanwhile pastes a stout sheet of paper upon the frisket frame, and then secures it upon the tympan. The form is then inked, and an impression taken upon the frisket, and the printed parts only being cut away, that which is left protects the paper from ink or soil. The puller now carefully folds a sheet of the paper according to the crosses of the chase, and laying it upon the form, opens it carefully, by which the paper is made to lie evenly upon the form, with the same margin with which it is to be afterwards worked. Having slightly wetted the tympan, he turns it down upon the form, and takes an impression, when the paper will be found to adhere to the tympan, and thus become a guide whereby to lay all the subsequent sheets, and therefore much care should be taken to lay it properly. They now choose their *points*, which are thin and narrow pieces of iron, having a short point or spur projecting from one end, and a shank at the other made to screw on to the tympan-frame, which must be done in such a manner that the spurs may fall into the grooves in the cross of the chase; because if they did not, they would be battered or broken at the first pull. It is advisable to make the inner form *register*, for it may be very difficult to correct any error in the furniture when the *reiteration*, or outer form, is laid on.

The puller now brings his paper from the wetting-room; for before any good impression can be taken the paper must have been damped, by rapidly passing it, one-fourth or one-fifth of a quire at a time, through water, and then allowing it to soak for two or three days under a heavy weight, until it is evenly and thoroughly damped; and laying a ream upon the horse, he takes a sheet, and placing it carefully over the tympan-sheet, closes the frisket over it, shuts both tympan and frisket down upon the form, which in the meanwhile his companion has inked (a process that will be described below), runs the table in under the platten, pulls the handle of the bar or lever over by his full weight, until brought up by the stop, at which moment the platten descends, and exerts a powerful pressure to the tympan, &c., upon the form, producing upon the paper a perfect fac-simile in reverse of the surface of the pages. The pressman now gradually releases his hold, the balance-weight raises the platten, the bar returns to its first position, the table is run out, the tympan and frisket are raised by the workman, and the frisket thrown up to the catch. The sheet is taken off the spurs of the points, which have been forced through it by the pressure, and the back of the impression is carefully examined, to ascertain that every part of it is just and even, which is the great test of the workman's skill and the excellence of the press. The first impression is, however, invariably defective: the parchment may have been thicker in some parts than in others, the blankets worn, or one of two founts of type may not have been of equal height, in which respect "the estimation of a hair" would produce a manifest imperfection, but which may be remedied by the thinnest possible tissue paper. The pressman now proceeds to *overlay;* that is, by pasting upon his tympan-sheets portions of paper of the exact size of the defects, thicker or thinner as may be required, to *bring up* the form; he overlays the faint parts of the impression; or if the defect be great, he places a part of a sheet of paper within the tympan, or, which is a much better plan, he raises the form, and pastes the paper under the defective part. If there be any small portion of undue prominence, or that "comes off hard," he rubs down a portion of the tympan-sheet with his wet fingers, or cuts it away altogether. Having, as he supposes, remedied all blemishes, he takes another impression, which he again examines with equal closeness, and carefully removes every remaining defect by the same method; and having at length satisfied himself, and his master or overseer, that the form is well brought up, the work is proceeded with, the inker taking off from the table with the roller or balls even portions of ink, which has been well distributed on its surface, and rolls or beats the form, being very careful that every part is equally inked; the puller taking a sheet and laying it on the tympan as before. They thus proceed until the whole number of the white paper is worked off; when it is a good precaution to count the heap, to ascertain that the number printed is correct. The form is now lifted from the table, and carefully washed with very strong lye. The outer form is then laid on and made ready.

The making ready of this form varies a little from the mode previously described. It has been stated that the spurs of the points penetrate the paper at the first impression. The holes thus made are the guides whereby perfect *register* is obtained; that is, whereby not only the pages, but the lines, are made to fall exactly upon the back of each other, any variation in this respect being a great defect in good book-work. The outer form, therefore, having been placed on the table in precisely the same position which the inner previously occupied, a printed sheet is taken from the heap, and laid upon the tympan with its printed face inwards, in such manner that the spurs of the points pass through the holes made by them in the working of the inner form, but of course the opposite way; and an impression is taken. If the pages do not back, the points are shifted until they do; or if the defect arise from the furniture of the form, such alterations are made in it as may be necessary. The impression is then brought up as before, and when all is ready, a thin sheet of white paper, called the *set-off* sheet, is placed over the tympan-sheet and under the points. It must be remembered that one side has been worked, that the ink has not yet dried, that the paper is still damp; therefore at every impression some portion of the ink will be transferred to or impressed upon the set-off sheet. When this has taken place in many impressions, some of the ink of the print will be re-transferred from the set-off sheet to the sheet then working, producing a most unpleasing blurred appearance, very perplexing to the eyes, and utterly destructive of the beauty of the presswork. To obviate this, the puller, after a few impressions, moves the set-off sheet slightly, and when it has become very black, takes it off, and replaces it with another. The pressman should be very attentive to this; and the master should not grudge ample supplies of set-off paper, for it is not destroyed, but, when dried, may be used again for the same purpose, or in other departments as waste paper. The form is now lifted, and carefully washed with lye, and the two are ready for the composing-room, where they are laid up, as previously described. Two good pressmen are supposed to do about one token, or 250 impressions, per hour of fair work. This, however, must depend entirely upon the quality of the work required; with small type, stiff ink, and many rules, the work is more slow, and paid for accordingly. The finest work is seldom paid for by the token, the pressmen being placed upon weekly wages, and allowed as much time as they require, the rapidity being at the discretion of the overseer. Frequently they are limited to a certain number per hour, often as few as fifty, the most careful inspection being given to every sheet by both pressmen, and continual attention by the press-overseer and other chief persons in the establishment. In such work the very best materials are employed. Instead of parchment, the tympans are covered with fine calico, or even silk; instead of blankets the finest broad cloth; picked blotting-paper for the thick overlays, the thinnest tissue-paper for the finer. It will readily be understood that in all operations of the press-room, where everything depends upon the skill of the workmen, there are infinite minutiæ, which it would be tedious, if it were even possible, to enumerate. Seven years' apprenticeship are not more than sufficient to educate a good pressman; it is the accumulated labour of a life to make a first-rate one: and, after all, excellence depends upon the native talent and ingenuity of the man himself.

The ink is distributed over the type either by balls or by rollers. The rollers are of modern use. The balls, which are such prominent objects in the representation of ancient printing-offices, and which form part of the armorial bearings of the printers' guilds on the Continent, were formerly made of sheepskins, with the hair taken off by lime, and formed into a ball with wool, gathered at all corners, and nailed upon a wooden handle. One of these was held in each hand; and a small portion of ink being taken, they were well beaten upon the inking-table, and then upon each other, until the ink was so evenly distributed over the whole surface, that if touched gently with the finger, the prominent lines of the skin would be blackened, whilst the channels would be left perfectly clean. The balls were then beaten over every part of the type, so that the whole surface should be evenly covered; an operation requiring much skill and practice. The skins were prepared and softened by the nastiest processes imaginable, which converted a press-room into a stinking cloaca. Thanks, however, to the observation and ingenuity of Mr Forster, a practical printer, and Mr Donkin, an engineer, this has been entirely done away, and a press-room now regales the nose with a warm scent of ink and paper, anything but unpleasant. This invention has been of the greatest consequence to printing. The printing-machine is said to be the handmaid of modern literature; and so it is; but without this, printing-machines were mere old iron and brass. Earl Stanhope had attempted to substitute skin rollers for skin balls; but his plan failed owing to the difficulty of preparing the pelts, and the inevitable seam, which left a broad mark upon the type. But the use of rollers, which in the hand-press would have been merely an improvement on a process in use, was a necessity to the printing-machine, and the complete failure of the earliest of these machines was in a great degree owing to the imperfection of their inking appliances. For many years the workmen in the potteries had used a composition of glue and treacle for applying colours to their ware. Mr Forster observed that this composition possessed every requisite for the use of the printing-office, and he immediately proceeded to form balls of canvas, with a facing of composition. They answered admirably, proved beautifully soft, distributed satisfactorily, kept clean, and were easily washed and purified if soiled. Some opposition was offered by the workmen; but the advantages proved so great that they were readily adopted by the masters, and speedily drove away for ever the nasty skins. The next step, however, was more important still. Mr Donkin observing the adaptability of the composition to casting rollers for printing-machines, devised moulds, by which he was able to cast cylinders without seam, and of somewhat greater tenacity than the original compound. The rollers answered perfectly for printing-machines; and there was little difficulty in perceiving that at the hand-press the roller might be advantageously substituted for beating by balls. They were accordingly introduced, and after meeting with some opposition, are now in universal use. They consist of a solid wooden cylinder, with a thick coating of composition cast in a metal mould perfectly true; through the middle of the cylinder passes an iron rod attached to a curved bar, upon which are fixed two handles; the roller revolving freely upon the rod. The pressman regulates the quantity of ink to be taken by adjusting the pressure of the straight edge against the cylinder at the back of the table, as above described; and according as that pressure is greater or less, the cuticle of ink on its surface is proportionately diminished or increased in thickness. Having taken off upon the inking-roller a line of ink, he distributes it carefully upon the table until the entire face is evenly covered, and then rolls the form, taking care that the whole surface receives its due proportion. If he does this lightly and steadily, there is no fear of the result; he cannot in rolling leave any part without ink; but it nevertheless requires some judgment. If there be any heavy titles or large type, he must roll that portion several times; if there be blank pages, he must take care that the roller does not sink, and so leave the pages in line with them slightly touched. The greatest judgment, however, is displayed in choosing the exact quantity of ink required for the form. If the type be small, the quantity taken must also be small; it must be very carefully distributed, and the form rolled many times; for if the quantity be too great the type will become clogged, and if too little, the colour will become faint. The pressman must from time to time examine the sheets as they are printed, and in working the reiteration, turn up the corners of the sheets to see that the colour corresponds with that of the inner form, detecting with quick eye every defect; and he must be particularly careful that for every sheet of the same work he takes the same quantity of ink, so that the book when bound may present an even and beautiful colour, every bold line being perfectly covered, and yet every fine stroke clear and distinct. This can only be effected by careful distribution and repeated rolling, with nice judgment as to the quantity of ink to be taken.

The sheet having been thus worked off, the printed paper is taken away by the warehouseman, and hung by the boys upon poles stretched under the ceiling, by means of a *peel*, which is a handle with a broad end, upon which a quire or two is hung at a time, thence transferred to the poles, and distributed in portions of four or five sheets. Here they hang a day or two, until the ink and paper are perfectly dry. This should be a gradual process, for if by artificial heat the drying is hurried, a skin will be formed upon the surface of the ink, which will prevent that underneath from drying; the work will look very well until it is pressed or bound, when the skin breaks, the ink spreads, and the sharpness of the impression is entirely destroyed. When perfectly dry the sheets are taken down and laid in heaps upon the gathering-board, each signature separately; thus, first, a heap, say 1000, of B, then C, D, E, F, and, lastly, the title-sheet A. The boys then take one sheet from each heap; consequently, when they have got to the last signature, each boy has gathered one complete copy of the work. These are laid upon one another at the end of the gathering-board in such a manner that each book is perfectly distinct. The warehouseman then takes away this heap, and with a collator (a needle inserted in a handle) goes over the whole with great rapidity, ascertaining that no sheet has been carelessly omitted, and that more than one of each signature has not been taken. The books are then folded down the middle, counted out in tens, thirteens, or twenty-fives, and tied up in bundles of convenient size. The process of printing is thus complete, and the work is ready for the binder.

Works of finer description, indeed most works of the present day, are submitted to another process after they have been taken down from the poles, viz., hot or cold pressing, which very much improves their appearance. In cold pressing the sheets are placed one by one between glazed boards, which are sheets of coarse material pressed and glazed on both surfaces by burnishing on a steel plate with a steel ball. The heaps are then placed in a hydraulic press, with cold iron plates at small intervals, and the whole is subjected to considerable pressure for some hours; they are then taken out, and the sheets extracted from the boards, when the indentations consequent upon the working will have been all pressed out, the roughnesses of the paper smoothed out, a slight gloss given to the ink, and the whole will present a very agreeable smoothness to the eye and the touch. Hot-pressing is used when the paper is very stout and the ink strong. The sole difference is, that the iron plates are heated until they can hardly be touched. The effect produced is much greater than that by cold pressing; the whole surface of the paper is perfectly glazed, and the ink absolutely shines; but the effect is not so agreeable to the eye; it is too glossy. A machine of great power has been invented for superseding the use of glazed boards and the hydraulic: in this machine the sheets are placed between two plates of copper or zinc, and passed in rapid succession between two hard steel rollers, and come out more perfectly smoothed than by the ordinary hot or cold pressing. As these processes set the ink and also make the books lie perfectly flat, they render much beating by the binder unnecessary, which is a great advantage, as the beating causes the ink to set-off upon the opposite pages when the work is recently printed. The glazed boards must be often cleaned by rubbing with waste paper, or they will soil the sheets placed between them. Every printing-office of credit should have an hydraulic press and glazed boards; for it is incredible how much smartness pressing gives to the work, and how greatly the warehouse work is facilitated by the readiness with which the hydraulic is pumped up, and by its great power. A press of eight-inch ram will be found sufficient for most purposes; but where much hot and cold pressing are required, one of ten-inch ram will prove cheapest, because, from its immense power, a few hours are sufficient to give the requisite surface, and the press may therefore be filled twice or thrice a day.

Wood-blocks are very often worked along with the common type. The block, having been carefully reduced by the engraver to the exact height of the type, is placed in the composing-stick, and justified to the width of the page; it is then made up along with the other matter in its proper place. When laid upon the press for working, and an impression of the form has been taken, the pressman examines with great minuteness whether it stands well with the type; if not, the form is unlocked, and paper placed under it if it be too low, or under any corner that may be lower than the rest; if the block be too high, it must be scraped or filed at the bottom. The artist in wood contents himself with producing his lights and shades by cutting his lines in greater or less degrees of fineness upon a plane, leaving to the printer the task of producing the required effects by a tedious process of overlaying; so that the pressman becomes to a certain extent an artist, and must have a good eye for perspective and for the proper adjustment of tints. These effects he produces by careful and skilful overlaying. But Bewick and some other eminent engravers, instead of imposing this tedious process upon the pressman, used to cut away the parts of the block intended to appear light before engraving them; and thus, by repeated lowering and rounding, they so regulated the lights and shades that the cut left their hands in a fit state to be worked. This process was, however, very costly, and has been discontinued by modern artists. In machine-printing, to prevent the loss that would be incurred if the machine were to stand still during the operation of bringing-up, the machiner, some time before the sheet is laid on, takes an impression of the cuts, and by overlaying and other processes, so prepares them that they require very little additional work when the forms are laid on. Where it can be managed, the cuts should be worked in the outer form, to prevent setting-off and the impression of the reiteration upon them. The cuts may then be worked with the type without any other care than that of keeping them clear from clogging or picks. When done with, they must be very carefully cleaned with spirits of turpentine and a brush.

The working of woodcuts by themselves, as illustrations of works, differs from type-printing in no other respect than in the superior materials and skill required. The woodcut must be imposed in a chase, and locked up upon the table of the press, which is generally a smaller one than that used for ordinary printing, of most excellent construction, and in good order. The tympans are, as before stated, often of silk or cambric. For the inking, balls are preferred to rollers. The greater opportunity for manual skill offered by the former enables the pressman to exercise an artistic judgment which is not possible when rollers are used. The ink is generally brayed out by a muller on a slab.

There are in London, and probably in the larger provincial cities, parties who make an especial business of the manufacture of composition balls and rollers, which they supply to printers upon payment of a rent. The skill and experience of these persons enable them, as must be the case in every instance where a manufacture engages exclusive attention, to supply a much better and cheaper article than could be manufactured by any individual whose engagements are varied; consequently there are not many printers, either in town or country, who do not avail themselves of these opportunities. The rent is paid for each roller required, and by the quarter; that is to say, if a printer employs six presses, and consequently six rollers, he pays for six rollers, the manufacturer engaging to supply him with as many changes as he may require from their getting out of order or being injured; in fact, to keep him supplied with six rollers in good condition. The rent for a common press-roller is the moderate sum of six shillings per quarter: they are sent into the country in boxes fitted for the purpose. There are, of course, situations in which it is not easy to obtain a regular supply of the necessary article, and in this case the printer may very easily make them for himself; but the expense of the utensils is so great as to exceed the usual rent for years. They consist of the following:—For rollers, a hollow cylinder of iron, the bore of which must be most accurately turned and well polished; this mould consists of two semi-cylinders closely fitted, and brought into contact by screws along the sides and collars at the end, and a head is made to fit into the lower end. The core, a wooden or iron cylinder, upon which the composition is cast, is held in the centre of the bore by means of a star, through the radii of which the composition flows. For balls are required a concave mirror of about half an inch cavity, and a board of the same size and of a quarter of an inch convexity. A kettle for melting and mixing the composition is also required. This is made double like a glue-pot, fitting exceedingly close, and with a small orifice for the escape of the steam from the hot water between the two; and the inner vessel should have a large lip. The recipes for making the composition vary, and this appears to arise from the different circumstances under which it is made. The ingredients are but three, and these easily purchaseable, viz., fine glue, treacle (not that procured from the sugar-bakers, which is adulterated, but the best from the sugar-refiners), and a small quantity of carbonate of barytes, called in commerce Paris white, or of carbonate of soda. The first two ingredients are quite sufficient with a little skill. The following are good recipes:—

1. Two pounds of glue to one pound of treacle.
2. Two pounds of glue to three pounds of treacle.
3. One pound of glue to three pounds of treacle and a quarter of a pound of Paris white.

(Sugar is sometimes used in lieu of treacle, and is said to make the composition firmer.)

Soak the glue in water until it is soft; then place it in the inner vessel, and boil quickly, until the glue is thoroughly dissolved; add the treacle, mixing it well, and let it boil for an hour or more; then sift in the Paris white, but do not stir it violently, or the mixture will be full of air-bubbles, which are destructive to the roller or ball. Rub the mould slightly with a rag dipped in thin oil, taking care that no globules and streaks remain upon the surface. When the mixture is ready, pour it gently between the radii of the star, so that no air be detained within the cylinder, until the mould be filled; allow it to set, and then take it from the mould, cutting off the superfluous portion with a string. When the roller has been hung up twenty-four hours it will be fit for use. Owing to the rapidity of the printing-machines recently introduced, the ordinary rollers have proved inadequate to the work; but improvements have been introduced into the manufacture which remedy the defect. The excellence of the new rollers is said to depend entirely on skilful manipulation. The ingredients are the same, but great experience is required in the choice of the glue, the proportion of the ingredients, the mixture, and the heat applied. In making balls, having oiled the mirror, pour the composition upon the centre, and having allowed it to spread itself, lay over it a piece of coarse canvas, place the board upon it, and lay weights upon it to press it down; it will consequently be found that the composition face of the ball will be slightly thicker in the centre than at the edges, which, besides being a convenience in the working, will allow it to be *knocked up* with much facility, which is done in the ordinary manner. These balls and rollers are very easily kept in order: if they are too soft, cold water will harden them; if too hard, warm water will soften them. When not in use they should be covered with refuse ink, and hung up in a room of even temperature, and carefully scraped with a palette-knife before use. They should not be cleaned with spirits of turpentine, as that will give them a hard surface. These rollers will be fit for use for a long while if attention be paid to them; and when spoiled, the composition may be repeatedly melted down, and, with an addition of new materials, will make as good rollers as before. When the proper apparatus is wanting, small balls for woodcuts or single pages may be made upon an earthen palette, or even upon a smooth dinner-plate.

A new process has recently been patented by Messrs Harrild for the manufacture of composition rollers, which enables them to resist the friction of the fastest machines even in the warmest weather, and to continue in working order for a much longer period than those at present in use. They are also but slightly affected by atmospheric changes. These are great advantages for the fast newspaper machines, and for country printers who have not the same facilities as the printers in the metropolis for changing their rollers when out of order. The principal difference in the new process is, that the glue is liquified without any admixture of moisture, the condensed steam which floats on the surface of the glue being entirely drawn off by a syringe.

STEREOTYPING.

Stereotyping is a mode of making perfect fac-similes in type-metal of the face of pages composed of moveable types. Letterpress printing being a very expensive process, the price of books consequently high, and the heaviest expense consisting in the composition, the printers of the Continent very soon set up the entire of such small works as were in constant demand, and thus were enabled to sell them at little more than the cost of paper and press-work. Some works of very great extent, especially Bibles and prayer-books, were kept standing by the privileged printers. This, however, was exceedingly expensive, as the cost of the type would be very great; the forms would occupy much space in storing, and be liable to continual damage from the dropping out of letters, from batters, and other accidents to which they would be unavoidably exposed. Some method, therefore, by which all or some of these disadvantages might be remedied, became desirable. About the beginning of the eighteenth century, Van der Mey, in Holland, sought to avoid this liability to accidents, by immersing the bottom of his pages in melted lead or solder, and thus rendering them solid masses: "c'est une réunion des caractères ordinaires par le pied, avec de la matière fondue, de l'épaisseur d'environ trois mains de papier à écrire;" therefore the mass together would be somewhat less than the height of our type. It is not very easy to imagine how they contrived to make the backs of these blocks of such evenness as to produce anything like a good impression; but Dibdin says that *the book* is very handsome. The same process was followed by a Jew of Amsterdam, in printing an English Bible; but he was utterly ruined by his speculation.

Some time before the year 1735 there is sufficient evidence that the French used casts of the calendars placed at the commencement of church books. These plates are thus described by Camus: "It (one of the plates) is formed of copper, and is three inches and a half long by two inches broad and one-seventh of an inch thick. From the roughness of the casting, it has evidently been made in a mould formed of sand or clay." After the plate had been cast, the back of it had been dressed with a file, in order that it might bear equally upon a block of wood to which it had been attached.

Who really invented the art of stereotyping as at present practised (and after all, he who finds out the efficient *modus operandi* is the inventor of the art, though he may not be of the principle) is, like the inventor of the parent art, a matter of some controversy, which has been carried on with more vigour than the subject merited. It seems however most probable, when all assertions are weighed, that William Ged, a goldsmith of Edinburgh, deserves the credit. According to his statement, being in 1725 in company with a printer, they lamented the want of a good letter-founder in Scotland; and the printer asked him whether he could do anything to remedy the inconvenience. He immediately answered, that it would be more easy to cast plates from pages when composed in moveable type; and he undertook to produce, and very shortly did so, a specimen cast on his new plan, and not long afterwards made arrangements with a capitalist for the advance of the requisite funds. The latter failing to perform his part of the engagement, Ged made a similar contract with a London stationer, in conjunction with whom he made many attempts; but being repeatedly thwarted in perfecting his plans, he separated from his partner, and made proposals to the universities and the king's printers for the stereotyping of Bibles and prayer-books. These all entered into the scheme with eagerness, and some works were produced from plates quite equal to the ordinary printing of the day. Nevertheless, so much ignorance and prejudice prevailed amongst the workmen and other interested persons that Ged was obliged to abandon the undertaking. He entered into several subsequent arrangements, in which he was equally unsuccessful; a type-founder, in particular, causing so much opposition that the invention made no progress. Ged died before he had met with much encouragement; and his son was equally unsuccessful, although, as the practicability was made more manifest, the very parties who had rejected his plans subsequently made extensive use of his plates. What was Ged's method of stereotyping is unknown, as he kept it private; nor did he fully communicate the secret to his partners.

Fifty years afterwards Mr Tilloch made a similar invention; but from private circumstances the design was laid aside, not, however, before several volumes had been printed from his stereotype plates at the press of Mr Foulis.

Some years after this, Lord Stanhope engaged an ingenious London printer, Mr Wilson, to prosecute the invention; and after many trials, the noble lord's ingenuity succeeded in bringing the invention to practical use.

When a work is expressly intended to be stereotyped, the spaces, quadrats, and leads generally used are somewhat different from those commonly employed, being cast of the same height as the stem of the letter, in order that the base of the plate may be more solid and of uniform thickness. When low spaces, &c., are used, plaster is poured upon the face of the type to fill up the interstices, and just before it sets the superfluous plaster above the stem of the letter is removed by a brush, which damages the face of the type not a little. The page is composed in the ordinary manner, and very carefully corrected; it is then imposed in a small chase with metal furniture, and the whole is placed within a moulding-frame, somewhat less than half an inch higher than the type. The surface of the type is then rubbed with a soft brush holding a small quantity of very thin oil.

The plaster of Paris (gypsum) of which the mould is formed is of the finest quality, and may be purchased ready prepared. Having been carefully mixed with water to the thickness of cream, a small portion is gently poured upon the surface of the page, and softly worked in with a brush, care being taken that every part is fully covered, and that no air-bubbles remain. Then a larger quantity is poured on, and spread over the previous layer without disturbing it; a straight-edge is then passed over the moulding-frame, clearing away the superfluous plaster, and leaving that within the frame of uniform thickness. It is then left to set. When sufficiently dry, the moulding-frame is raised, and the mould with it, from off the face of the page; the mould is then dressed, and placed in a heated oven until it be perfectly dry, and raised to an adequate temperature for the casting. The oil with which the page is rubbed prevents the plaster from adhering to the type.

The melting-pot is a square vessel of iron about two inches and a half deep, having a separate lid, of which the four corners are cut off, the inner face being turned true, but the outer face hollow towards the centre. A floating plate, of which the upper surface is turned, is placed at the bottom of the pot. Over the melting-pit is a crane with a rack, upon which a pair of nippers are made to run. These lay hold of ears upon the melting-pot, closing with its weight, and opening when relieved. The metal does not differ from type-metal, and must be sufficiently fluxed to flow easily, but not made too hot, or it will prove brittle. The melting-pot having been heated in the same oven with the mould, and consequently to the same temperature, the latter is placed within it, the face being turned down upon the floating-plate. A bar or other piece of iron is screwed down upon that part of the lid which is turned hollow; and the whole being suspended by the rack and crane, is swung over the melting-pit, and gradually let down into the metal, which flows gently into the pot through the openings left at the corners. The metal flowing slowly in gradually expels all the air; the mould immediately rises to the inner surface of the lid; the floating-plate, being specifically lighter than the metal, rises also to the edge of the mould; consequently the metal which has run in between is of the exact thickness of the depth of the mould, the upper surface being the field upon which are the casts of the type, the under surface the smooth face of the floating-plate, and the rest of the melting-pot being filled with metal. The pot is allowed to remain immersed ten minutes or a quarter of an hour, that is, until the air is supposed to be perfectly expelled. It is then drawn up, and swung to a board resting upon a trough of water, and there allowed to cool. The cooling is a process requiring much care and attention. It is obvious that unless the whole mass cool equally, the plate will be warped, and consequently spoiled; it is equally clear that the heat will more readily radiate at the corners, and consequently that the centre will remain fluid after the other parts are set, and that the contraction must be unequal. This is provided against by the lid having been turned hollow in the centre, and it will therefore allow the metal under it to cool more rapidly. The mass having been turned out from the pot, the metal under the plate is separated by a smart blow or two of the mallet; the floating-plate will be readily disengaged, and the mould be removed from the cast. Some defects will invariably be found in the new plate; but these are removed by the picker, who goes carefully over it, clearing away the picks from the face of the letter, and deepening the larger white lines with a graver, that they may not blacken in working at press; for it must be remembered that the quadrats and spaces used in stereotyping are higher than those in moveable-type printing. If the face of the plate has cooled evenly, and it is in other respects a successful cast, it is placed, the face inwards, in a turning-lathe or planing-machine, and the back rendered a plane parallel to the face; the margins are then squared, and the edges flanched. The plate is now ready for use. If any errors or batters occur in the plates, they are cut out, and the corrections made with moveable type let in and soldered at the back.

A great improvement in the stereotype art was a number of years ago introduced by Mr Thomas Allan, printer in Edinburgh, into his establishment, by which a number of plates are cast at once, whilst the risk of broken casts is considerably lessened. This is effected by means of a pot sufficiently deep to contain moulds placed in a perpendicular position. The pot is an oblong square cast-iron box, widening towards the mouth, and having placed inside, at each end, a wedge-like block, of which one face is parallel to the side, while the other is perfectly vertical. On the vertical side are perpendicular grooves, at distances rather greater than the thickness of the stereotype moulds. Into these grooves are inserted plates of malleable iron, by which the interior of the box or pot is partitioned into spaces sufficiently wide to admit with ease the plaster moulds. The moulds, when baked, being inserted into these spaces, a cross bar of metal is placed over the top, instead of a cover, which serves to prevent the moulds from being raised by the liquid metal flowing beneath them; and it is then suspended upon the crane, and dipt into the metal-pit in the usual way. By this method not only are the moulds saved from all risk of breaking by being placed horizontally and pressed between the two broad surfaces of a float-block and cover, as in the method of single-page casting, but a number of plates are produced at one cast, and thus additional celerity is combined with greater certainty of sound plates. The plates of the *Encyclopædia Britannica*, which is the most extensive work ever stereotyped, have been for the most part produced by this process, in pots containing each five moulds; and it is especially advantageous for large plates, the risk of breakage by the old method increasing in a greater ratio than the increase in the size of the page.

The plates are sometimes screwed down at the corners upon blocks of wood, the height of which is the difference between the thickness of the plate and the height of the type. This answers very well for jobs and standing advertisements; but for ordinary book-work it is usual to have the blocks formed of several separate pieces of mahogany furnished on one side and at one end with brass or iron catches (let in and screwed to the blocks), the upper part of which is turned over so as to take hold of the flange of the plate. But as wood is liable to warp and to other accidents, a plan has recently been devised of making hollow blocks of type-metal of the requisite height and of different sizes, by means of which pages may be easily composed to any required size, the plates being fastened on by brass holders. At a small expense, once incurred, the stereotype printer may furnish himself with blocks capable of being made up to suit works of any measure.

There are many smaller instruments requisite, which it is unnecessary to mention. The founder requires some practical skill, which, however, it is not difficult to acquire; and the excellence of the casts will depend upon his personal knack and observation. The best metal for stereotyping is composed of new metal and old type in moieties. The price of prepared metal is about 28s. per cwt. The following, however, are proportions which may be used when the prepared metal cannot be procured:—

1. From five to eight parts lead, one of regulus, one fiftieth of block-tin.
2. One seventh of pure regulus, six sevenths of lead. The best lead is that which comes from China, in the lining of tea-chests.

The mixing of the metals is exceedingly injurious to the workman, and should be avoided wherever it is possible. The foundry should be thoroughly ventilated, as the fumes from the melting-pit, and the moisture and smell of the drying oven, are very noxious.

In some cases stereotyping is of great advantage; but chiefly in books of numbers, in which it is of the utmost importance that every figure should be correct. In this case the proofs must be read again and again, until the correctness is unquestionable; when once stereotyped, there is no fear of alteration from the error of compositors or carelessness of readers, but the book remains the same for ever. Such works also are most expensive in getting up, and the cost of composition very much exceeds that of stereotyping. Books of logarithms may be especially mentioned, tables of longitude, indexes to maps, and other works, which being once written, remain unchangeably the same, such as ready reckoners, interest tables, &c.; or when it is found expedient to have duplicates of the work where large numbers are required, and it is necessary for speed to work on double-sized paper, the cast and the moveable type are imposed together, and are worked side by side at the same moment, producing two copies instead of one. There is also another advantage, for the stereotype remains without further expense for another edition; again, where it is expedient to send duplicate plates to other countries to be worked.

Woodcuts may be stereotyped with great advantage; for a small cut which has cost several guineas to engrave may be multiplied indefinitely, and at a cost of only a few shillings.

No printer should stereotype by the common process who wishes his type to be a credit to his house. The wear of the type in casting is very great, especially when low spaces, &c., are used; the gypsum is at best a fine powder, and grinds away the edge and face of the letter when rubbed in with the brush, in a frightful manner. The letter can never be entirely freed from the plaster, and will present a very dirty appearance ever after. The wear of a fount of 1000 lb. weight, returned six times from the foundry, is greater than would occur in six years' constant fair usage; besides which, the high spaces, quadrats, and leads, are all extra expenses, for which the economical bookseller makes no remuneration whatever.

The plan of stereotyping Bibles and prayer-books has been nearly abandoned, and the entire sheets are kept standing in moveable type, at a great expense, by the Queen's printer, and the universities of Oxford and Cambridge. Before every edition, however, is worked, each sheet must undergo a careful reading, in order to guard against accidents which may have occurred since the last edition.

Such is the process of stereotyping at this time in common use, and which will probably continue in practice in provincial and colonial printing-offices, by reason of the readiness of the materials and the knowledge now acquired by the workmen.

A greatly improved method has, however, been recently introduced by Messrs Dellagana, by which all the inconveniences incident to the existing system are obviated. The page is composed with the ordinary spaces, leads, &c., and there is therefore no additional charge for composition; the destructive tampering with the face of the type is avoided; the plaster-mould is not required; and there is no necessity for re-imposition, as the new moulds can be taken from the pages as they are imposed in the chases; and the forms can be returned to the printer within an hour from the time of their being sent to the foundry. So great are the resources of this invention that the largest or the smallest pages can be cast with equal facility, and either plane or curved to suit the periphery of cylinder machines. The pages, for instance, of *The Times* newspaper are each cast in a single plate, in a curved form to fit the cylinders of the great machines used in that establishment. The following is a brief account of the process:—

A page of a newspaper or a sheet of bookwork (as imposed), carefully cleaned and perfectly dry, is laid on an iron chest previously filled with hot water. A fine brush, having the whole of its surface slightly anointed with olive oil, is rubbed over the face of the type to remove any picks or other impurities from the pages, which are then ready for moulding. A substance, in appearance resembling two or three sheets of wrapper-paper pasted together, of a soft and pulpy nature (the matrix), understood to be composed of an earthy material very finely ground, and afterwards felted together, and which is not affected by heat, in a damp state, is laid smoothly on the face of the type, and carefully beaten in with a brush until every letter is indented into this substance, and the matrix is thus formed. The type, with the matrix unremoved, is taken to a press and subjected to a steady pressure, continued for two or three minutes. The matrix is then removed from the type, which may now be returned to the printer. Not more than ten minutes is required for these operations. The matrix is next laid upon a plate heated to 200° or 300°, and covered with a piece of flannel (as a non-conductor of heat and an absorbent of the moisture generated in drying) upon which is placed a thin metal plate of the dimensions of the page or form, to keep the matrix flat. It remains on this hot plate about two minutes, and is then ready for casting. The matrix, with its face upwards, is now placed in a "register" flat or curved, as the plates are required to be plane or convex. The register is formed of two iron plates, the inner surfaces of which are accurately planed; these plates are joined together by hinges at the further end. The matrix is placed, face uppermost, on the lower of these plates, and is secured on three sides by an iron guage, which varies in height according to the intended thickness of the plate about to be cast. The upper plate is closed over, and the two, inclosing the matrix, are firmly clamped together by an iron bar which passes over, with a screw in the centre, which presses the two plates upon the guage. The register swings upon trunnions; and thus prepared, is turned into a vertical position, and the metal, at a temperature of 500°, is poured in through a mouth. In one minute the metal is set sufficiently hard to bear removal, the register is brought back to a horizontal position, the upper plate is thrown back, and the cast and matrix are taken out and placed (the matrix uppermost) on an iron table, which is flat or curved like the register, otherwise the cast in cooling would contract or spring, and its flatness or curvature would not be preserved. The matrix may now be carefully lifted off, and, if required, again placed in the register for another cast.

The curved casts for newspapers are fixed on the cooling-table by four screws, and the dressing is performed by a tool on the lever principle, which cuts off the flange or waste piece of metal at the top of the page, and bevels it at the same time. For book-work, the under surface of the cast is planed, as in the ordinary mode. A little chiselling is required to lower the white and break lines, to prevent their blacking the paper when worked. The casts obtained by this process are remarkably true, and require little "bringing up." The matrix is uninjured by the casting, and may be used again for any number of casts, or preserved for future use. The power of multiplying casts from the same matrix is of immense advantage where large numbers are required to be printed in a short space of time. As before stated, a matrix and the first cast may be obtained in less than a quarter of an hour, and several subsequent casts will not require more than five or six minutes each. In half an hour, therefore, several machines may be at work simultaneously.

It is of course not necessary that any cast should be taken from the matrix; and therefore when a second edition of a book is doubtful, the matrix only need be made, and may be kept until required, at a cost of not more than one-third of a casting; and when used, may be put by without inconvenience, and another cast taken when the first is worked out or injured.

In book-work also this process will be found of great advantage, as compared with the charge for re-composition. The matrices of a work of 500 pages would occupy no more space than a ream of demy, and not weigh more than 10 lb. They will remain unchanged for years if preserved free from damp or water.

The cost of casts by this process is about 10 per cent. less than by the ordinary mode; and the proportions of lead and regulus used in the composition of the metal are those given above in recipe No. 2.

The great excellence of the imperial Austrian printing establishment in the art of stereotyping should not escape mention. In the Exhibition of 1851 were some magnificent moulds taken from type by the electrotyping or galvano-plastic process. From these moulds other copies in relief were obtained by doubling the process, which are stated to produce beautiful work; or casts in type-metal could be taken of great perfection. A curious specimen was also exhibited, the work of the Rubeland ducal foundry, of a stereotype-plate of cast-iron.

OF POLYTYPAGE, AND OTHER METHODS OF PRODUCING PRINTING SURFACES ON METAL PLATES.

Many considerable improvements in stereotyping are to be ascribed to French artists; but stereotyping has never been a favourite with them, and they have rather exerted their inventive talents in a series of experiments which may be classed under the general name of *polytypage*.

In 1780 Hoffman, a German residing in France, not satisfied with his success in stereotyping, made many ingenious experiments in polytypage. Whilst he was thus engaged, a practical printer named Carez discovered a method which Hoffman afterwards pursued. The page, after being composed in the ordinary manner, was attached, with the face downwards, to the under side of a heavy block of wood, suspended from a long beam. Immediately under the page was an anvil, whereon was a tray of oiled paper into which the workmen poured a portion of type metal, attentively watching the cooling. When the metal was on the point of setting, the page, block, and beam, were brought down with a very smart blow, forcing the face of the type into the setting metal, and producing a very sharp matrix; which again was made to take the place of the type upon the block, was struck in a similar manner upon the fused metal, and thus produced a perfect and excellent polytype plate. This having been properly dressed at the edges and back, was affixed to the usual wooden raiser and made type height, and might be printed separately or in conjunction with moveable type. Several casts might be made from the same mould. This process was designated *cliché*.

Ign, a native of Alsace, who settled in Paris as a printer in 1784, availing himself of the discoveries made in the art of stereotyping, endeavoured to extend them by inventing logotypy, or the art of uniting several characters into a single type. He printed on solid plates several sheets of his *Journal Polytype*, and advertised Father Chenier's *Recherches sur les Maures*, 3 vols. 8vo, as a polytyped book; but being deprived of his printing-office in 1787 by a decree of the council, he was prevented from executing his design.

In 1791 M. Gegembre made considerable improvements in the art of polytyping in printing the fifty-sous notes of the Caisse Patriotique. He caused the whole print of the notes to be engraved in relief upon a plate of steel, and this engraving he pressed into a plate of copper, from which polytype casts were taken. Any number of these casts could be taken from the copper mould, and if by chance the copper mould became injured, a new one could be readily made from the steel engraving.

When the revolutionary government commenced issuing assignats, it became necessary to have an immense number of plates to work the enormous quantity required of these documents. A design having been approved of, artists were employed to engrave *three hundred* fac-similes. Of course, if three hundred so-called fac-similes could be engraved, other artists would find no difficulty in engraving another hundred, nor could even the bank-officers tell which document was printed from a forged fac-simile and which from the plates engraved by their authority. The consequence was an utter want of confidence in the government paper. To remedy this, the committee of assignats caused many experiments to be instituted for the production of plates which should be not only imitative and similar, but *pro re* identical. The plan adopted was the engraving a plate *in intaglio* on steel, from which copper matrices were obtained *in relief*. From these perfect fac-similes of the original engraving were struck and were worked by the roller-press in the manner of copperplates. But it was a great defect in this process, that the air compressed within the hollows of the letters frequently destroyed the form in the reproduction. Upon the suppression of assignats this establishment was broken up; but some of the plates and matrices are preserved in the public repositories of France.

Polytyping, as now practised in England, is confined to the production of casts from metal plates in intaglio and from woodcuts. Instead of the cumbrous machinery employed by Carez, a fly-press is used, the woodcut is fixed upon what may be called the platten, and a tray containing semi-fluid metal is placed upon the table of the press immediately under the cut to be matriced. By a slow motion the cut is impressed into the metal, and an intaglio matrix is produced. The matrix is then attached to a drop stamp to perform the *cliché* process, and by the rapid descent of the stamp with the matrix attached into a tray of molten metal, a polytype in relief is obtained. The type-founders have adopted this process for the production of casts of their ornamental designs; and Mr Bramston has practised this mode so successfully that he is able to take fac-simile polytype casts of the most elaborately-engraved woodcuts, without in the slightest degree injuring the original.

A method of producing raised surfaces for the purposes of printing has of late years been extensively used in Paris and London, chiefly for forming maps and rough designs

Polytypage

for the cheap illustrated press. The art is of French origin, but has been patented in England. In a patent granted in 1853 to Mr Vizetelly it is described for "improvements in producing plates for printing surfaces, by which the manipulatory process of engraving is superseded."

A plate of highly-polished zinc, copper, or steel is thoroughly rubbed over with very fine pounce powder moistened with water, and then with a soft dry piece of linen it is again rubbed until no greasy appearance remains on the surface, which is now in a fit state to receive the transfer.

Where the engraving has been recently printed, say within a month, the transfer is thus effected:—The print is soaked for five minutes in a flat dish containing a liquid composed of seven parts of water, one of azotic acid, and six drops of phosphoric acid. It is then taken out and placed between two sheets of blotting-paper, to absorb the superfluous moisture, after which it is laid on the prepared plate and covered with a sheet of soft paper, and subjected to the strong pressure of the lithographic press. When the transfer is thus effected, the plate is washed with a sponge moistened in a solution of gum arabic, slightly acidulated with nitric acid; this preparation having remained on the plate for five minutes, is sponged off with clean water. While the plate is still wet, a lithographic roller charged with ink composed of bitumen of Judæa, powdered very fine with a muller and mixed with linseed oil, is passed over it. The linseed oil must be of the purest quality, and be boiled for at least an hour, and afterwards filtered through a felt bag containing some animal black. For zinc plates, lithographic transfer-ink and melted virgin wax, well mixed and ground together, must be substituted. When the plate is well rolled over with this ink, it will be observed that the transfer only has taken up the ink, the parts of the plate where the lines of the print do not occur having no power to take it up. While the ink is still wet, some resin, ground to an impalpable powder, is distributed over the plate with a piece of cotton wool or a camel's hair brush, care being taken that it adheres to the inked transfer only, and not to the other parts of the plate. The plate is now placed over a spirit-lamp, and gradually heated until it becomes lukewarm, in which state it is allowed to remain undisturbed for at least two hours; if expedition is not required, it will be better not to disturb the plate for twelve hours, as the resin and ink will then have thoroughly combined, and more completely protect the portions of the plate covered by the transfer from the corroding action of the acid, by which the surface in relief is produced. Before the plate is subjected to this "biting" process, it is necessary to cover its back with a varnish or other substance, to protect it from the action of the acid. When this is done, it is placed in a slanting position, and a liquid composed of nitric acid, diluted to about 4° Reaumur for zinc and steel plates, and to about 12° for coppers, to which is added a table-spoonful of spirits of wine to every half-pint of acidulated water, is applied with a clean sponge to the surface of the plate. This bathing is continued for a quarter of an hour, and pure water is then poured over the plate until the acid is entirely washed off. The plate is then again sponged over with the slightly-acidulated gum-water, re-inked, submitted to the action of the acidulated water, and washed with pure water as above described; and these operations are repeated four or five times, until the exposed portions of the plate are so much bitten away by the acid as to leave the transfer sufficiently in relief to be printed from.

The "whites,"—*i.e.*, the blank spaces in the engraving,—must be lowered or removed to prevent their receiving the ink in process of printing, and blacking the paper. This is effected by covering the surface of the raised lines of the transfer, and the sides also where practicable, with engraver's varnish, which is composed of bitumen of Judæa dissolved in essence of turpentine, with the addition of lamp-black to make it of a proper consistency, and allowed to stand two hours before it is used. The plate is then bathed with the solution of acidulated water and spirits of wine, and washed as before described; but in this operation a stronger solution is used, being 8° instead of 4°. Where the whites are very large, essence of spikenard (aspic) is substituted for essence of turpentine, or they may be lowered by scrapers or gouges, or cut out with a fine saw. Great care must be taken that the bitumen is entirely dissolved, and that the varnish is made of the proper consistency.

Printing for the Blind.

A raised printing surface being now produced, the plate is cleaned with turpentine and well rubbed over with charcoal, after which it may be mounted on raisers to type height, and used as a stereotype cast.

When an *old* print is to be transferred, it is treated in the manner commonly employed by lithographic printers prior to making a transfer, and which has been described in the article LITHOGRAPHY.

Anastatic printing is a process by which a print, whether from type or a copperplate, may be reproduced without drawing or engraving. The print is saturated with a strong solution of nitric acid; it is then placed between sheets of blotting-paper, and the superfluous fluid absorbed; after which it is laid, face downwards, upon a polished plate of zinc, and another placed over it. The plates are then passed between iron rollers, and subjected to great pressure. The nitric acid is thus squeezed out upon the zinc, except in those parts which are protected by the ink of the old print. The acid bites away the zinc, and a rough surface is produced, the protected parts continuing bright and unaffected. The plate is then wetted with a solution of gum in water. The corroded surfaces retain the fluid, while the unaffected portions remain dry. A roller charged with the ink used by copperplate printers is then rolled over the plate; the ink covering the dry and being repelled by the wet surfaces. This is repeated until the lines of the print are well covered with the ink,—a process which is rapidly effected if the ink of the original print is fresh, and has parted with a portion of its oil under the pressure of the rollers. Impressions may now be readily taken in the same manner as lithographic prints.

PRINTING FOR THE BLIND.

The invention of printing for the blind forms a new era in the history of literature. In European countries, one individual in every 1200 or 1400 of the entire population is blind, and in America one in every 2000. To open up to this large and unfortunate class such a source of profit and pleasure as reading could afford was long considered very desirable, and also very doubtful; but while, of late years, embossed books have very rapidly increased, it is exceedingly gratifying to find that blind readers have far more rapidly multiplied. The credit of this invention belongs to France. In 1784 Valentine Haüy printed the first book at Paris with raised letters, and proved to the world that those for whom such books were intended could easily be taught to read with their fingers. He seems to have caught the hint from a blind pianist of Vienna, who distinguished the keys of her instrument by the sense of touch. After many experiments as to the form of his raised letters, he at last chose a character a little approaching the Italic. A new institution was at once established,—*Institution Royale des Jeunes Aveugles*,—and Haüy was placed at the head of it. Twenty-four of his pupils exhibited their attainments in reading, writing, arithmetic, music, and geography, before the king and the royal family at Versailles on the 26th December 1786, to the very great delight of those high personages. In 1814, when Haüy was pen-

Printing for the Blind.

sioned off, Dr Guillié was chosen in his stead. This enterprising *directeur-général* modified Haüy's letters, and prosecuted the publication of embossed books with renewed vigour. Still, however, very little progress was made towards the extension of Haüy's system; and their books could only be read by those possessing a very delicate touch. In 1806 M. Haüy established schools for the blind in Germany and St Petersburg, but they have made very slow progress. It was in Scotland and the United States that improvements were first made in embossed typography. To Mr James Gall of Edinburgh belongs the merit of reviving and improving this very useful art. After canvassing every form of letter, he at last adopted his angular alphabet. Before 1826, when Mr Gall began his experiments, not a single blind person using the English language could read by embossed printing. On the 28th September 1827 he published *A First Book for Teaching the Art of Reading to the Blind*, the first book printed for the blind in the English language. In October 1834 this zealous individual published in a perfected alphabet *The Gospel by St John, for the Blind.* The text, which was embossed, and, unlike his former effort, printed not with wooden but with metallic types, consisted of 141 pages, with 27 lines on a page of 70 square inches. This book was counted a great improvement, but it was objected that the types were too angular. He afterwards printed a number of books with serrated edges. It is unquestionably to Mr Gall, more than to any other man, that the interest in the education of the blind was awakened throughout Great Britain and America. While Mr Gall was engaged in perfecting his plan in this country, Dr S. G. Howe, of the Perkins Institution, Boston, United States, was busily engaged in developing his system. In 1833 Dr Howe began, like Gall, by taking Haüy's invention as the basis of his system, and soon effected those improvements upon it which have given so wide a fame to the Boston press. He chose the common Roman letter of the lower-case, reducing it by cutting off the flourishes, &c., until it occupied but a space and a half instead of three. This alphabet remains unchanged. So rapid was his progress, that in 1836 he printed in relief the whole of the New Testament for the first time in any language, in 4 small quarto volumes, comprising 624 pages, for four dollars. More than twelve times this amount has now been printed, and seventeen of the American States have adopted Dr Howe's method.

The Society of Arts in Edinburgh awarded a medal, on the 31st of May 1837, to Dr Fry of London for the *invention* of an alphabet, which seems, however, to have been in use in Philadelphia since 1833. Mr Alston of Glasgow improved upon Fry's alphabet, by reducing the size of the letters, and sharpening the embossing. In 1840 Mr Alston published the entire Old Testament in 15 quarto volumes, of 2535 pages, and 37 lines to a page, in double pica type. Alston, in his just pride, designated this "the first Bible ever printed for the blind;" in which he was wrong, however, for Boston had claimed the honour years before. Some 70 distinct volumes have been printed by the Glasgow press; but since the death of Alston, on the 20th of August 1846, it has almost ceased to work. Since 1837 it has supplied England, Ireland, and Scotland with embossed books in Roman type. The best of all the arbitrary systems is that of T. M. Lucas of Bristol, who set it on foot about 1835, and which "The London Society for Teaching the Blind to Read" has been gradually improving since its establishment in 1839. In May 1838 "The London and Blackheath Association for Embossing the Scriptures" adopted the phonetic method of James Hartley Frere. A cheap plan of embossing or stereotyping was devised by Mr Frere in 1839. His books read from left to right, and back, after the ancient Greek βουστροφηδόν writing. Mr Moon, of the Brighton Blind Asylum, has slightly improved on Mr Frere's method. Dr Howe's typography is judged, however, to be superior to the British both in cheapness and in size. There are at present no less than five different systems of typography in use in Great Britain.

The following table shows the results of the six systems of printing for the blind used in the English language, taking the New Testament as a standard of comparison:—

Systems.	No. of Vols.	Size.	No. of Pages.	No. of Lines in a Page.	No. of Square Inches in a Page.	Price.
The New Testament:—						L. s. d.
Howe's.....	2	4to.	430	...	117	0 16 0
Alston's ...	4	„	623	42	90	2 0 0
Gall's......	8	„	...	28	70	2 0 0
Lucas's....	9	„	841	27	70	2 0 0
Frere's.....	8	Ob. 4to.	723	...	110	2 10 0
Moon's.....	9	„	...	25	110	4 10 0

(For an interesting account of the different systems of printing for the blind, see the *Reports of the Juries of the Exhibition* for 1851.)

Other Processes.

OTHER PROCESSES.

To the magnificent establishment of the imperial printing-office at Vienna we owe the introduction of several processes, which, though not founded on the use of type, belong to the art of printing. The description of these new arts is derived from the Reports of Jurors of the Exhibition of 1851.

Galvano-plastic Process.—The Austrian department contained some extraordinary prints of fossil fishes, which were produced by the following process:—By means of successive layers of gutta percha applied to the stone inclosing the petrified fish a mould is obtained, which being afterwards submitted to the action of a galvanic battery, is quickly covered with coatings of copper, forming a plate upon which all the marks of the fish are reproduced in relief, and which, when printed at the common press, gives a result upon the paper identical with the object itself.

Galvanography.—The artist covers a plate of silvered copper with several coats of a paint composed of any oxide,—such as that of iron, burnt terra sienna, or black-lead,—ground with linseed oil. The substance of these coats is thick or thin according to the intensity to be given to the lights or shades. The plate is then submitted to the action of the galvanic battery, from which another plate is obtained reproducing an intaglio copy, with all the unevenness of the original painting. This is an actual copperplate resembling an aquatint engraving. It may be touched up by the engraving-tool. This process has been improved upon by outlines etched in the usual manner, and the tones laid on with a roulette. A galvano-plastic copy of this sunk plate is obtained. On this second raised plate the artist completes his picture by means of chalks and Indian ink, and puts in the lights and shades; from this a second galvano-plastic copy is produced. This second copy or sunk plate, the third in the order of procedure, serves, after being touched up, for printing from in the copperplate press.

Galvanoglyphy.—Upon a plate of zinc coated with varnish a drawing is etched: then ink or varnish is rolled over. The ink adheres only to the parts it touches, every application when dry raising the coating and consequently deepening the etched lines,—a galvanic battery produces a plate in relief, which is printed at the common press.

Chemitypy.—A polished zinc plate is covered with an etching-ground. The etching is bitten in with diluted aquafortis. Remove the etching-ground, and carefully wash out the aquafortis. Heat the plate thus cleansed over a

Nature Printing.

spirit-lamp, after covering with filings of a fusible metal, until fusible metal has filled all the lines of the engraving. When cold, scrape down to level of zinc plate until none of the metal remains but what has entered into the engraving. Place compound plate in solution of muriatic acid; and as of the two metals one is positive the other negative, the zinc alone is eaten away by the acid, and the fusible metal which had filled the lines of the engraving is left in relief, and may be printed by the common press.

Paneiconography.—On a polished plate of zinc draw with lithographic crayon or ink, or transfer impressions from lithography, wood engraving, or copperplates. The thickness of the drawn lines is increased by repeated rollings or powdered resin. For relief-block, place plate in trough of very dilute sulphuric or hydrochloric acid. The acid eats away the unprotected parts of the plate, and leaves raised lines of the protected parts.

NATURE-PRINTING.

Mr Henry Bradbury, who has had a principal share in introducing this beautiful process into England, describes it as a method of producing impressions of plants and other natural objects, in a manner so truthful that only a close inspection reveals the fact of their being copies. So deeply sensible to the touch are the impressions, that it is difficult to persuade those who are unacquainted with the manipulation that they are the production of the printing-press. The process, in its application to the reproduction of botanical subjects, represents the size, form, and colour of the plant, and all its most minute details, even to the smallest fibres of the roots. The distinguishing feature of the process, compared with other modes of producing engraved surfaces for printing purposes, consists, firstly, in imprinting natural objects—such as plants, mosses, sea-weeds, feathers, and embroideries—into plates of metal, causing, as it were, the objects to engrave themselves by pressure; and, secondly, in being able to take such casts or copies of the impressed plates as can be printed from at the ordinary copperplate-press.

The art is by no means new in idea, many persons having attempted something analogous to the present process, and produced results which were imperfect, merely because science had not yet discovered an art necessary to its practical development. It is to the discovery of electrotyping that the existing art of nature-printing is due.

The progress of the art, and the persons to whose ingenuity the steps were severally due, are stated by Mr Bradbury thus:—

Professor Kniphof of Erfurt took impressions from leaves, &c., which had been coloured with lamp-black, printers' ink, &c., 1728–57.

Kyhl, a goldsmith of Copenhagen, took copies of natural objects in plates of metal between two steel rollers. These were not for the purposes of printing, but for reproduction of embossing and ornamentation in metal. 1833.

In 1851 Dr Ferguson Branson of Sheffield read a paper before the Society of Arts, in which he detailed some experiments in nature-printing. He had taken impressions from plants, &c., in gutta percha, for the purpose of having them printed. The experiment failed through the softness of the material. Dr Branson then bethought himself of the electrotype process; but appears to have found it too tedious and costly, and he abandoned the idea.

In 1849 Professor Leydolt of Vienna availed himself of the facilities afforded by the imperial printing-office to carry out experiments in the representation of flat objects of mineralogy,—such as agates, fossils, and petrifactions,—and obtained great results. Soon after, Haidinger and Abbate suggested, the former the reproduction of plants, &c., and the latter the representation by this means of different sorts of ornamental woods on woven fabrics, paper, and plain wood; and lastly, Andrew Worring, of the imperial printing-office, Vienna, perfected the application of these processes to printing, 1853.

These circumstances are dwelt upon at some length, because nature-printing is yet in its infancy, and appears capable of development to a degree at which it will be an impressorial art of greater importance than any which has been invented since the art of printing itself. Worring's services were so highly estimated that the emperor rewarded him with a munificent gift, and with the Order of Merit.

The plant, perfectly dry, or any other suitable subject, is placed on a plate of fine rolled lead, the surface of which has been polished by planing. The plate and subject are then passed between rollers, by the pressure of which the subject is forced into the surface of the lead. The leaden plate is then subjected to a moderate heat, by the action of which the subject is loosened from its bed and easily removed. This mould is then subjected to the galvanoplastic process, the second cast being a perfect fac-simile of the leaden mould. When the subject to be printed is of one colour only, that pigment is rubbed in, and any superfluity removed; but when it is of two or more colours, the process is simple, but, it is believed, perfectly novel in any process of printing heretofore practised. In the case, for instance, of flowering plants, having stems, roots, leaves, and flowers, the plan adopted in the inking of the plate is to apply the darkest colour, which generally happens to be that of the roots, first; the superfluous colour is cleaned off; the next darkest colour, such, perhaps, as that of the stems, is then applied, the superfluous colour of which is also cleaned off; this mode is continued until every part of the plant in the copperplate has received the right tint. In this state, before the plate is printed, the colour in the different parts of the copper looks as if the plant were embedded in the metal. The plate thus charged, with the paper laid over it, is placed upon a copperplate-press, the upper roller of which is covered with five or six layers of blanket of compact fine texture. The effect of the pressure is, that all the colours are printed by one impression; for when the paper is removed the plant is seen quite perfect, highly embossed, with the roots, stems, and other parts, each of its proper tint.

The great national work which the Austrian establishment has produced as the exemplar of the new art is truly imperial. The *Physiotypia Plantarum Austriacarum* consists of 5 volumes large folio, containing 500 plates (about 600 plants), with a quarto volume of plates and text. The first production of the English press, though it will bear no comparison in extent with the imperial magnificence of the Austrian work, fully equals it in beauty of execution. It is *The Ferns of Great Britain and Ireland*, by Thomas Moore, edited by Dr Lindley, imperial folio, with 51 plates. It is printed by Mr Bradbury. (See notices of meetings of the Royal Institution of Great Britain, part v., 1855; and the printed Lecture delivered at the same Institution, May 11, 1855.)

Printing in Colours.

PRINTING IN COLOURS.

One of the most beautiful aids to typography, the art of printing in colours, has been unduly neglected in this country; at least as far as relates to the embellishing works of ordinary excellence with vignettes, capitals, tail-pieces, and other devices of fancy, in beautiful tints, in the manner of the early typographers. It is true that some very beautiful works, illustrated with remarkable richness of design and colour, have been produced; but these have been executed rather as examples of the beautiful in art than as books,—the work of the artist has been the principal object, and the work of the author the occasion and vehicle.

In other works, chiefly ecclesiastical, the object has been to reproduce in *fac-simile* the rich illuminations of the monkish scribes. But as regards the average printing—the literature of the day—the art of printing in colours has been very much neglected. This may very easily be accounted for. To print in two colours occupies more than twice the time necessary to print in one; and it also requires more skill and ingenuity. These unfortunately must be paid for; and this pecuniary consideration is sufficient to banish from our pages this lovely art. So did not our forefathers; *they* took pride in choosing the most tasteful designs, the most harmonious colours, to illuminate their productions, and beguile the reader into study by the illusive charms of gold, and blue, and crimson. Fortunately, either time was of little value, or the exclusive possession of the market enabled them to demand remunerating prices for the time thus well bestowed; but in the bustle and competition of our more mercantile days, time is money, and blue and gold, scarlet and green, give way to the equally useful but infinitely less beautiful uniformity of unredeemed black. To a country printer, however, some knowledge of colour-printing would be of advantage, because, as his founts of type are more limited, he can create unlimited variety by a judicious use of colours in job-work: moreover, as he has usually much more time upon his hands, his ingenuity would have ample scope for the production of small works of *vertù*, in a taste which cannot be indulged by the denizens of a busy metropolis.

Except in the execution of works of a very high order, and the imitation of intricate and delicate patterns, printing in colours requires no addition to the ordinary accomplishment of printing, other than considerable ingenuity and a little practice in preparing the colours. The latter may, it is true, be purchased of the ink-maker, prepared for use; but the charge for them is enormous, and they require constant replacement, whilst it is not possible to have on hand every variety of tint. By the purchase of the most simple materials from the oil-shop, the ingenious printer has at his hand every colour that fancy can require, at the most moderate cost, without waste or delay. The appliances are few and cheap: a muller, a marble slab, and a palette-knife; the materials, a can of printers' varnish, to be purchased of the ink-maker, which will keep any length of time, and the raw colours hereafter given, which may be purchased from time to time; care, however, being taken that they are of the best quality, or they will fade and turn rusty in a short time, and be a deformity instead of an ornament to the work.

Useful tints of *red* may be prepared of orange lead, vermilion, burnt sienna, Venetian red, Indian red, and lake. Vermilion is the most brilliant of these reds; but its beauty depends very much upon the particular parcel used. The pale vermilion is best for a bright tint, as the dark, when mixed with the varnish, produces a dull red. Orange lead and vermilion ground together produce a very bright tint, which is more permanent than vermilion alone.

Yellows are prepared with yellow ochre, gamboge, and chromate of lead. Of these, the brightest is the chrome; yellow ochre, when mixed with the varnish, produces a very dull tint.

Blues are made from indigo, Prussian blue, and Antwerp blue. Of these, indigo is exceedingly dark, and not very easily lightened. Prussian blue is a very useful colour; Antwerp blue is very light.

Greens may be produced from a mixture of any of the blues and yellows, as gamboge and Prussian blue, chromate of lead and Prussian blue. These may be mixed in any proportions until the required tint is produced; but it must be remembered that the varnish has a considerable yellow tinge, and will produce a decided effect upon the mixture. With a slight portion of Antwerp blue it will, without the mixture of any of the yellows, produce a decidedly greenish tinge.

Purples of any degree of richness are made by judiciously mixing reds and blues.

Sæpia produces a nice brown tint, burnt umber a very hot brown, raw umber a much lighter brown, bistre a brighter still. Neutral tints may be obtained by mixing Prussian blue, lake, and gamboge. In fact, every pigment that painters use can also be used in printing, avoiding, as much as possible, all heavy colours. In truth, if the printer is desirous of imitating any particular colour, or of producing any particular tint, he cannot do better than consult the nearest artist in oil or water colours (oil in preference), or in default of that, the neighbouring house-painter.

The necessary colours having been procured, the method of preparing them is very simple. Each must first be well ground by the muller upon the slab, even although they may have been purchased well powdered. The colour should then be well mixed with the palette-knife with the varnish, until the pigment has attained the required consistency, which will vary with the quality of the work to be executed; for if it be a posting-bill or coarse job, the ink should be very thin, and consequently a much larger proportion of varnish should be used. If, however, the work be a wood-cut, or in small type, the pigment should be made as thick as possible. If the colour required be a compound, the predominant tint should be first mixed with the varnish, and the lighter tint added in small quantities, until the exact shade required be produced. Thus, if the colour be a dark green, the blue should be mixed up first, and the yellow added; but if it be a very light green, then the yellow should be first applied, and the blue added. If the tint desired be exceedingly light, it will be found that the quantity of raw material to be employed will not make the mixture sufficiently thick to be applied to the type or wood-block: in this case whitening is added to thin colours, and dry white lead to the heavier, in considerable quantities, which must be adjusted in the course of mixing. To insure thorough combination, the mixture should be scraped into a corner of the slab, and a very small portion of it spread with the palette-knife, and well ground with the muller until no specks or lumps appear, then scraped up and placed in another corner. This should especially be done when white lead is used, as it will be found that every little lump when crushed will produce a white streak upon the slab. If this be not carefully done, independently of its tendency to clog the type, it will very materially alter the tint. When the pigment seems sufficiently mixed, it is better to bray it out with the muller instead of the usual brayer, and grind again each particular portion immediately before it is used. Colours may be worked either with a ball or a roller. If the job be large and coarse, and the ink consequently thin, the roller will answer every purpose; but if it be small, and requiring much nicety in the manipulation, decidedly with a ball; but in either case the ink should be well distributed, and the form well beaten or rolled. When two or more colours are employed, they must be worked at as many different times. In this case extreme nicety in the register and justification is required, in order that every colour may fall in its just place, without overlaying any other tint employed in the print. This would be a great dis-sight in any case, but most especially where the combination of colours would produce a third; as, for instance, if any part of a blue line should unfortunately fall upon a yellow, a green outline would be the result. The simplest way to guard against this is to have the wood-blocks all cut to precisely the same size, with the print in the proper place upon each; when, therefore, the first colour has been worked, the form is unlocked, the block taken out, and the second block inserted; it then falls at once into

Printing in Colours.

its proper position. If the form consist of type, each line should be carefully composed in its proper body; that is, if three colours be employed for as many different lines in *pica, small pica*, and *long primer*, the one to be first worked should be composed in pica *letters*, the other lines in small pica and long primer *quadrats*. When the second line is to be worked, its quadrats should be taken out and letters inserted, while the type of the first line should be removed and quadrats substituted; and so of the third line. The points on the tympan must never be moved. It is clear, therefore, that if the paper be placed upon the same point-holes as before, and if the form has never been moved, the new line cannot fail to fall into its proper place. The illustrative Plate III. has been worked upon this plan; the black, being the largest body, was first printed, as it afforded the best guide for subsequent working. The blue was next worked, because it was much easier to adjust it to the black, than to adjust the red so exactly that the blue should precisely surround it and yet not infringe upon or retreat from the black, while there would be no difficulty in making the other red portions fall in their proper places. In these cases the paper must never be suffered to dry; indeed the sooner each colour succeeds the other the better. If it be covered with a wet blanket, and the edges well sprinkled, the danger will be little; but if it should dry and shrink in the slightest degree, it will be impossible to obtain register. For printing *red-letter days* in almanacs and the rubrics in prayer-books (an almost extinct practice), an especial type is used called rubrical; it is cast about an m higher than ordinary type. The black is first worked, quadrats having been inserted in the places of the red letter, which are subsequently withdrawn, and the rubrical type inserted. But as, in so small an insertion in so large a body this process does not attain any very good register, and is expensive withal, the red-letter days have been abandoned, and some other distinguishing type (generally old English or black) has been substituted, which sufficiently indicates the day. It would not be possible here to give sufficient instructions to enable a printer to execute landscapes, portraits, and other delicate subjects, in various colours and shades. The difference between this and other colour-printing consists mainly in the superior individual skill and ingenuity of the artist, the excellence and truth of his engravings, and the superiority of his appliances. In truth, before the printer can produce any great effect, he must be excellently qualified as a painter, which it is not the province of an article on printing to teach. It will be sufficient to state that the lighter and more extensive tints, and especially those in which transparent colours are used, are worked first; that the colour is gradually deepened by successive blocks until the required effects are produced; and that the outline is printed last, which has the effect of giving sharpness and finish to the design.

The curious reader is referred to Mr Savage's beautiful book on Decorative Printing, and to the many admirable productions of Mr Baxter and Mr Vizetelly. Nor should the accurate work and beautiful colours of Mr Delarue's playing-cards be passed over without notice. To Mr Delarue, indeed, the revival of colour-printing as a practical art is greatly due.

The lottery system and the stamp duties gave extensive employment to the colour-printer, and also gave occasion to a process which is denominated "compound plate-printing." The effects are produced by an ingenious system of mechanism, by which several plates are made to separate for the purpose of receiving the colours, and to combine with perfect accuracy, for the purpose of transferring these colours to the paper by a single impression. This process is in daily use at the stamp and excise offices, and the most familiar examples are to be seen in the intricate patterns printed on the labels of reams of paper, or those of patent medicines. The printing is effected by the cylinder printing-machine with the greatest rapidity.

There is no difficulty in printing in gold; it is within the power of any typographer. The type is composed and made ready at press in the usual manner. Take the best printer's varnish, grind it to a thick consistency with burnt sienna or brown umber; reduce this with gold-size, the same as that used by gilders and japanners. The first admixture is necessary because it has been found that the number will not combine with the size. The type is then rolled with this compound in the same manner that ordinary ink is applied, and the impression is taken upon the paper. Leaf-gold is then laid over it with a piece of cotton wool, and pressed lightly upon it. When the varnish has had time to set, a piece of cotton-wool is rubbed steadily over the part printed, and the superfluous leaf is thereby removed, leaving the gold adhering to the varnish. The print should then be passed between steel rollers, or hot-pressed,—care being taken in the latter process that the plates be not too hot, or a dull drossy surface will be produced. The sharpness of the print will vary with the judgment of the printer in the quantity of sizing applied to the type; for if the press-work be bad, the print will be bad also. For inferior gold-printing bronze-powder is extensively used. For this the varnish is made very much thicker than for gold: the method of printing is the same. After the impression has been given, the powder is brushed over the print, and adheres thereto, whilst the superfluity is easily removed. In printing the golden "Coronation Sun" with this powder, a very distressing disease arose,—the hair became perfectly green, and the men were very seriously affected; great care should therefore be taken that particles of the powder be not allowed to fly about the room. Dutch gold cannot be used as a substitute for gold-leaf. When all these appliances cannot readily be obtained, very fair gold-printing may be produced by the following process:—Let the surface of the type be heated by any convenient means—as by laying upon it for a space a heated metal plate—and then cover it carefully with leaf-gold by a ball of cotton-wool. Having carefully sifted dry white-of-egg or resin, finely pulverized, over the surface of the paper, place it on the tympan, and bring it gently down upon the type. Dwell upon the pull. The leaf-gold will be found perfectly adherent to the impression on the paper, and the superfluous part may be brushed off. The sheet, after drying, should then be hot-pressed. Some observation is required to ascertain the proper heat to be given to the type: if it be insufficient, the gold transfer will be imperfect and the tint light; if too great (of which there should be no danger) the colour will be dull.

Bank-Note Printing.

BANK-NOTE PRINTING.

The Bank of England notes were formerly printed from steel-plates; but in 1853 the Bank adopted the surface or letterpress mode of printing. The plates are produced by the electrotype process. An original is first engraved in metal *in relief*. This original is subjected to the galvano-plastic process, by which a matrix is obtained, and from this matrix a second cast is obtained in relief, a perfect *fac-simile* of the original engraved plate. From this plate the bank-notes are printed. The metal of which these plates are formed is exceedingly hard, frequently yielding nearly one million impressions without being worn out. The original engraving is never used for printing, but only for the production of matrices; consequently it always remains unimpaired, and thus perfect identity is maintained in the appearance of the notes.

Printing-Presses.

The notes are printed at platten-machines possessing great advantages over the ordinary printing-machines, more particularly in the distribution of the ink. Three machines are employed, two of which were manufactured by Messrs Napier & Sons, and the other by Messrs Hopkinson & Cope. A *tell-tale*, or register, is attached to each machine, which marks the number of impressions. These registers are set by a clerk before the printing commences, and are checked by him at the close of the day, when the printer must account for (either in bank-notes or "spoils"), the number of impressions registered by the dial. The notes are printed upon dry paper, a process which has been very greatly accelerated by the recent improvements introduced into the ink by Mr Winstone, who manufactures for the bank.

The numbers and dates of the bank-notes are added in an after-printing. This is effected at Messrs Napier & Sons' cylinder machines: a very ingenious mechanism being attached to these machines which makes it impossible to commit any fraud by printing two notes of the same number. The apparatus consists of a series of brass discs, of which the rim is divided by channels into projecting compartments, each containing a figure. The numbers 1 to 9 having been printed in the course of the revolution of the first disc, the second disc then presents the figure 1, which, by combining with the 0 of the first disc, the number 10 is formed. The second disc now remains stationary until, in the course of the revolution of the first disc, the numbers 1 to 19 have been printed, when it presents the figure 2, and does not again move until another revolution of the first disc completes the numbers 20 to 29. Thus the two discs proceed until 99 notes have been numbered, when the third disc comes into operation, and with the first two, produces 100, consequently the first disc performs one hundred revolutions to ten of the second and one of the third. The notes may be numbered indefinitely by this process, without the possibility of error, the machine, meanwhile, being its own check.

PRINTING-PRESSES.

In the description of the Stanhope press it has been stated that many other presses upon different principles have been since invented; most of these, however, contain some application of the Stanhope power. The most powerful and durable, but the most expensive, is the Columbian or Clymer Press (fig. 6). The power in this press is acquired by an extremely massive lever, moving on a pivot-bolt in the top of the near staple, and passing over the press to the further staple, at which end the power is applied, through the Stanhope coupling-bar, by a bar-handle working from the near side. The platten is attached to the centre of the lever by a square bar of iron, and its vertical descent is preserved by two projecting guides, one from each cheek; it is raised from the form, and the iron bar carried back, by two levers,—the one attached to and above the head, weighted with an eagle; and the other behind the press, attached to the arm to which the coupling-bar is fixed, and having a weight at the end. The great power of this press adapts it to the working of large and solid forms; but it is heavy and slow. It is, it should be remarked, too high for small premises.

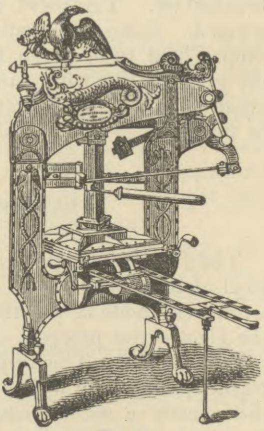

Fig. 6.

Printing-Machines.

The Albion Press (Fig. 7), manufactured by Hopkinson and Cope, is much esteemed for its exceeding lightness: it runs very easily, the pull is short, the power great, and the means whereby it is attained so simple, that there is little fear of the press getting out of order. It is very easily taken down for cleaning, and put up again. The power is gained by causing an inclined piece of steel to become perpendicular; in so doing the platten is forced down, and the impression takes place at the moment the piece of steel is brought into a vertical position. On the return of the bar, the platten is raised by a spiral spring fixed on the head of the press.

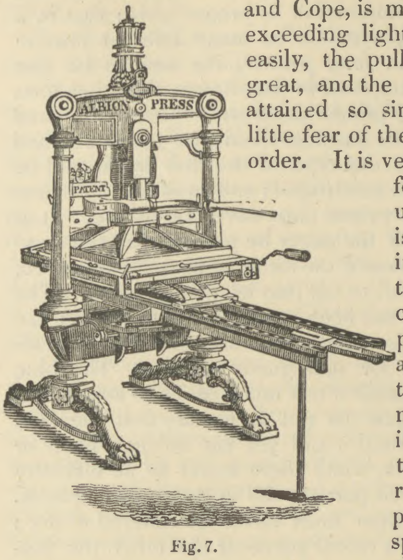

Fig. 7.

Cope and Sherwin's Imperial is another very excellent press, upon principles which do not greatly differ from the Albion.

In Harrild's Press the power is obtained by the straightening a knuckle or elbow-joint, in precisely the same manner as the bent arm is straightened.

PRINTING-MACHINES.

As long as the thirst for literature was confined to books and a few periodicals of limited sale and size, the ordinary printing-presses sufficed to supply the demand; nor was it discovered that any further speed was requisite, until the increased facility of conveyance, and the important events at the close of the last century, created a demand for news which the utmost exertions of the printers were unable to supply; for the attempt to increase the speed by the composition of two distinct forms of type would avail little, so long as the presses could turn out only 250 or 300 impressions each per hour. Accordingly for this branch of the art were the first machines projected. Many schemes were proposed for accelerating the movements of the press; but the first attempts at anything like the machine afterwards introduced were made by William Nicholson, a gentleman connected with periodical literature, who took out a patent about 1790 for a printing-machine, of which the chief points were the following:—The type being rubbed or scraped narrower towards the bottom, was to be fixed upon a cylinder, in order, as it were, to radiate from the centre of it. This cylinder, with its type, was to revolve in gear with another cylinder covered with soft leather (the impression-cylinder); and the type received its ink from another cylinder, to which inking apparatus was applied. The paper was impressed by passing between the type and impression cylinders. Most of these plans were, when modified, adopted by after-constructors. This machine was never brought into use.

König, an ingenious German, was the next who undertook to construct a machine; and having made considerable advance in his plans, obtained a contract with Mr Walters, the proprietor of *The Times* newspaper, for manufacturing two for that journal. His machine was successful, and the number for the 28th November 1814 was worked by it at the rate of 1100 impressions per hour. In this Nicholson's plan was so far altered, that the ordinary type was used and laid upon a flat surface, and the impression was given by the form passing under a cylinder of great size. König afterwards invented a machine in which the sheet was printed on both sides before it left the machine; but his arrangements for the equal distribution of the ink were so complicated and clumsy (consisting of not less than forty wheels), and the works of every part of the machine so intricate, that it never came into practical use.

The first really useful machine was constructed by Messrs Applegath and Cowper, being an extensive modification of that of König; its principal improvement consisting in the application of two drums between the impression-cylinders, one of which reverses the sheet, and the other secures the register, by retaining it, after the impression of the first form, just so long that it may pass on to the second cylinder in exact time to be impressed thereby upon the second form; and of the distribution of the ink upon a plane surface, instead of by a number of rollers, by which König's complicated machinery was got rid of. These machines, with numerous modifications, according to the plans of different makers, are now in general use.

For newspapers, machines are generally made to work but one side at a time. It is manifest that a machine will work a much greater number (more than double) of one form than of two, and that the machinery will be lighter and less expensive, and of course require less motive power. One form, therefore, of a newspaper, containing advertisements and the less important matter, is worked at leisure; and the second form, containing the leading article, important news, and other matter of consequence, is reserved until the last moment, and is then thrown off with immense rapidity. For the usual description of book-work, machines (perfecting-machines) are constructed to work both forms at a time. In these, perfect register, and the exact and even distribution of the ink, are of the greatest consequence, and such immense rapidity is not necessary. These machines, therefore, differ very much in construction, though not in principle, from those used for newspapers.

The subjoined engraving (fig. 8) is a representation of Middleton's admirable perfecting-machine, which is the same in principle as Applegath and Cowper's, but with some improvements. An explanation of this machine will enable the reader to comprehend the construction of all the cylinder machines, the same principle pervading all of them. Upon friction-rollers placed within the frame which supports the whole apparatus, traverses a carriage which conveys the two forms of type, and attached to both ends of which are tables for the distribution of the ink. A reciprocating motion is given to this carriage by means of a pinion, which works alternately upon the upper and under surface of a rack. In gear with this carriage, and, supposing the paper to be omitted, in immediate contact with the type, revolve two cylinders of large dimensions, covered with blankets, by which the impression is given; these cylinders are separated by two drums, but are kept in uniform and steady motion by two large wheels (seen at the back of the engraving), the teeth of which work within each other. The ink is distributed over the forms by an apparatus attached to each end of the frame, consisting of a trough which contains the ink, in contact with the edge of which, or very nearly so, a metal roller called the *ductor* is made to revolve slowly by means of a catgut, which passes over a pulley attached to the axis of the impression-cylinder. A composition-roller is made to rise into contact with the ductor, and receive a portion of ink, with which it descends, and communicates it to the inking-table as that passes underneath it at the extremity of the traverse. Two composition-rollers are placed somewhat diagonally across the frame, and their spindles being of extra length, as the table passes under them they are caused to revolve and also to travel slightly across it, thus evenly distributing the ink all over the surface of the inking-table, the cross motion removing any accidental accumulation of ink. The table now traverses under four other composition-rollers, supplying them with an even quantity of ink, which they in turn distribute over the type as it passes under them in going and returning, the form being thus rolled no less than eight times. These rollers are merely dropped into notches in the frame, their own weight sufficing to retain them in their places, and to bear sufficiently hard upon the type to impart the necessary quantity of ink. For the purpose of carrying the paper round the different cylinders there are two distinct series of endless tapes, one of which, coming in contact with the left surface of a small roller,[1] passes from thence to the right surface of the first cylinder, and underneath it; thence *over* the first and *under* the second drum, which reverses the sheet, and has an apparatus attached to it for making register; thence to the left surface of and under

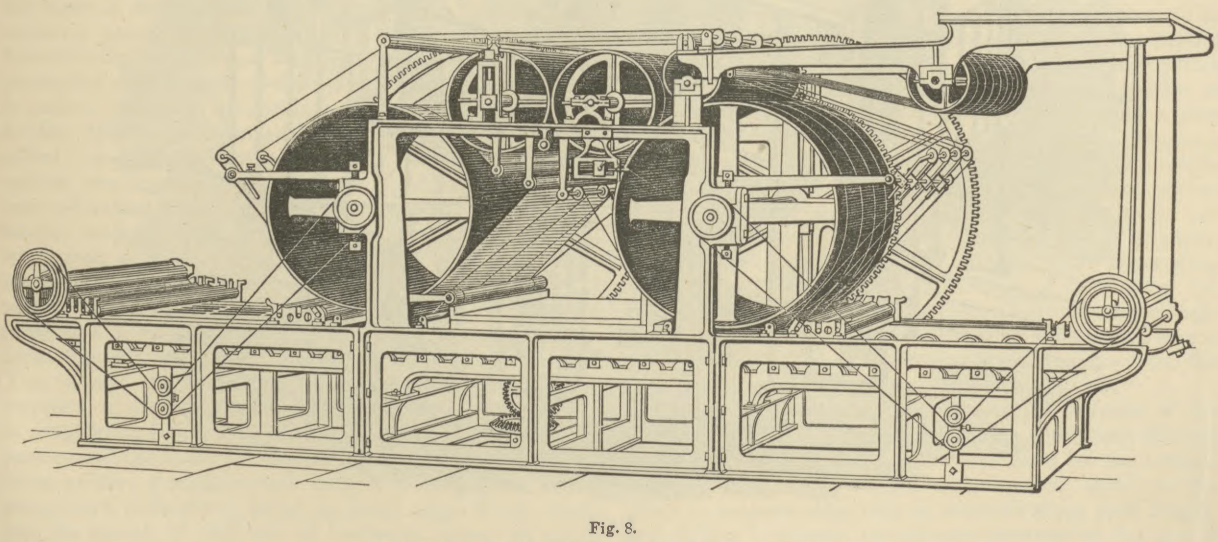

Fig. 8.

Applegath and Cowper's Perfecting Machine, by Middleton.

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[1] The description commences with that portion of the machine where the paper first enters the machinery, for *endless* tapes can of course have no *beginning*; the words *first*, *second*, and *third*, &c., must therefore be understood to refer to the position as respects the *right hand* of the reader.

the second cylinder; from this it passes to the right, until it arrives at the roller first mentioned. The course of the second series of tapes is different; for, following the course of the first series, and in contact with it (supposing the paper withdrawn) until it has passed with it under the second cylinder, it then takes a different direction, and, turning to the left, passes over the machine until it arrives at the roller from which we have commenced the description. Both series of tapes are kept tightly stretched by means of various small rollers revolving in different parts of their course. The paper being laid upon other tapes from a table at the right of the machine, is moved forward until it comes in contact with the endless tapes, and being received between them, it is passed under the first cylinder, and the first side is then printed; thence passing over and under the drums on to the second cylinder, it receives the impression upon the other side; thence it passes onward to the point where the tapes take different directions, when it is shot out printed on both sides, upon a board between the cylinders and under the drums. The whole machine is put in motion by means of a strap which passes over a wheel under the frame, and *may* be worked by the power of men, but is mostly worked by steam. It is capable of doing very fair work at the rate of from 2000 to 2400 impressions, or from 1000 to 1200 perfect sheets per hour: it requires only two boys, one to lay on and the other to take off the sheets.

The machine constructed by Messrs Applegath and Cowper in 1827 for *The Times*, two of which are still used for printing the supplements and advertising pages, differ considerably from that just described. It has four impression-cylinders, which are so arranged that two are in contact with the type as the table passes to the right, and two as it passes to the left. As this machine prints the paper on one side only, the systems of tapes are single. It will print from 4000 to 5000 impressions per hour.

One of the principal impediments to great speed in this form of printing-machines is the necessity for a reciprocating motion in the type, table, and inking-table,—a great weight, the *vis motus* of which has to be neutralized, and then the *vis inertiæ* overcome, at each end of the traverse. This not only occasions a great waste of motive power, but also causes breakages and serious accidents. Mr Applegath, finding these and other difficulties insuperable, abandoned the principle of placing the type on a plane table and the reciprocating motion, and constructed a machine in which the type is placed on the surface of a cylinder of large dimensions, which revolves on a vertical axis, with a continuous rotatory motion. *The Times* has the credit of being first in adopting this great improvement in newspaper printing.

The following is a careful description of this vast and complicated piece of machinery:—

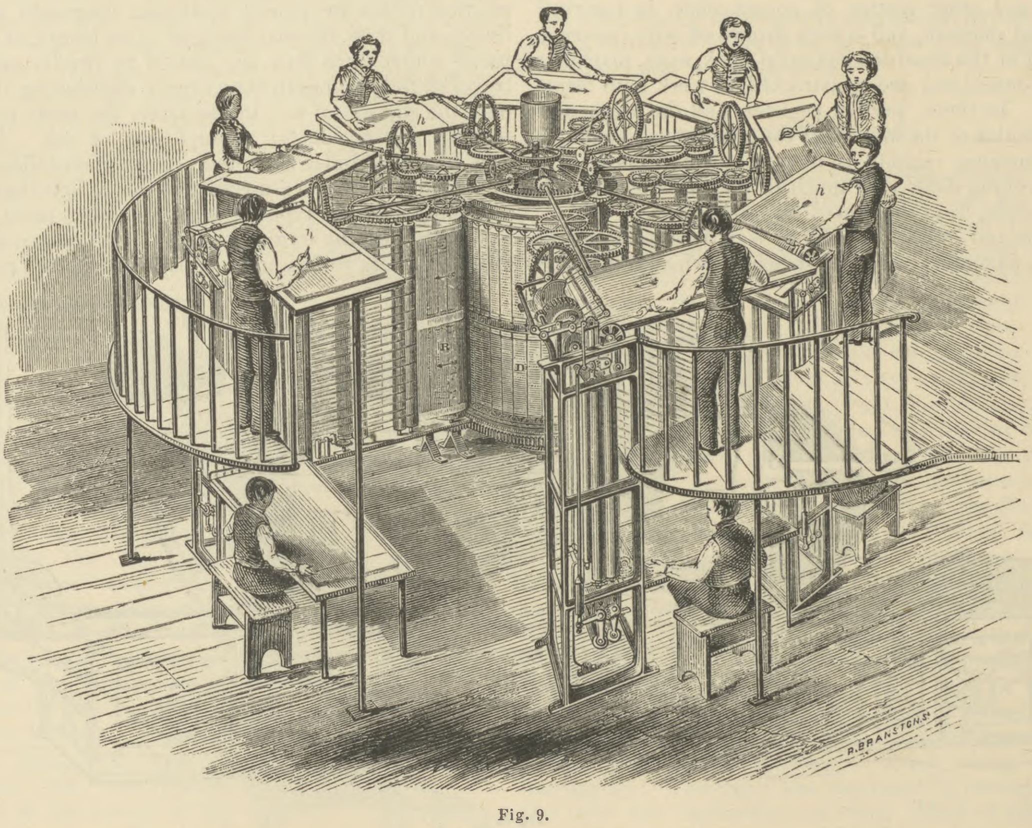

Fig. 9.
Applegath's Vertical Machine.

In the centre of the machine (Fig. 9) is a vertical cylinder or drum, 5 feet 4 inches in diameter. In contact with it, and revolving each on its own vertical axis, are eight impression cylinders, 13 inches in diameter, each of which has a set of inking-rollers working in advance of it. The cylinders move with the same velocity as the surface of the drum. The columns of type are placed in a kind of iron galley, or *turtle*, curved to fit the surface of the drum. The outer surface of these galleys is not formed into a segment of a circle, but into facets, each the width of a column; the wedge-shaped interval, which is left between the top and bottom of the types of every two adjoining columns, is compensated by column-rules, made thicker at the top than at the bottom in the same proportion. The middle column-rule is fixed. The columns are locked-up in the galleys by means of screws, and the column-rules press the types together like key-stones in an arch. The fixed rule in the centre prevents the types from rising. The galleys are then screwed on to the drum, the columns vertical. The outer face of the forms is now, it must be remembered, a series of facets, sides as it were of a polygon; the surfaces of the impression-cylinders are made to conform to these facets, with sufficient accuracy, by paper overlays. When stereotype plates are used, they are cast by Dellagana's process, in accurate segments of a circle, and the overlaying is unnecessary. The forms of types do not, of course, occupy the whole circumference of the central drum: a large part of the remainder is made the inking-table. The ink-box, which is also vertical, supplies ink to a ductor-roller, which works between two straight edges. As the drum revolves, a portion of ink is taken from the ductor by two vibrating rollers, and distributed on to the inking-table. The inking-table precedes the type-forms, and as it passes the inking-rollers attached to each impression-cylinder come into contact with it, and receive ink from its surface. The type-forms, following next, come into contact with these inking-rollers, and take from them the ink they have just received. The inking-table passes under the impression-cylinders without touching them; but the type is brought into contact with the paper upon them, and the impression is given. Therefore, at every revolution of the drum, the type is inked eight times, comes into contact with eight impression-cylinders, and prints eight sheets of paper.

It is most difficult to convey, by any verbal description, the singularly ingenious mechanism by which the sheets of paper are conveyed to and round the impression-cylinders. It must be remembered that the sheets are necessarily laid on the feeding-table *horizontally*, and that they pass round the cylinder *vertically*. The task will be rendered somewhat simpler by reminding the reader that each impression-cylinder is a complete machine within itself, acting with the drum, but independent of the other cylinders; and that, as each has its own system of inking-rollers, so each has its own system of feeding-drums and tapes. By looking closely at the apparatus on the right front of the drawing, he may be able to follow the description. The white paper is laid on the feeding-table at the top; each sheet is placed by the layer-on to the centre of a feeding-drum. At the right moment, the sheet is advanced by finger-rollers until its forward edge is brought between two small rollers, each connected with a series of endless tapes, between which it is passed vertically downwards. At the right moment its further progress is arrested by two vertical slips of wood called "stoppers," which start forward and press the sheet against two fixed stoppers; and, at the same moment, the two rollers and their tapes separate, and leave the sheet extended vertically between the two pairs of stoppers. Observe that, up to this moment, the travel of the sheet has been vertically downwards, and that its plane surface is part of a radius from the axis of the central drum. The problem now to be solved is, to give it a horizontal movement towards the centre, preserving its vertical position. The instant the sheet is arrested vertically between the stoppers, its top edge is caught by two pairs of small finger or suspending rollers; at the same instant the stoppers separate, and the sheet is suspended for a moment between these rollers; a slight inward motion is then given to the suspenders, sufficient to bring the inner edge of the sheet into the mouth of two sets of horizontal tapes, by which it is carried round the impression-cylinder and printed. As the sheet, after being printed, issues from the horizontal tapes, it is delivered to other sets, by which it is conveyed outwards, under the laying-on board; arrived at the proper point, it is again caught at the top edge between suspending rollers, the tapes separate, and it hangs for a moment; when the taker-off, who sits below the layer-on, releases it by a slight jerk, and lays it on his board.

No description can give any adequate idea of the scene presented by one of these machines in full work,—the maze of wheels and rollers, the intricate lines of swift-moving tapes, the flight of sheets, and the din of machinery. The central drum moves at the rate of 6 feet per second, or one revolution in 3 seconds; the impression-cylinders make 5 revolutions in the same time. The layer-on delivers 2 sheets every 5 seconds, consequently, 16 sheets are printed in that brief space. The diameter of an eight-feeder, including the galleries for the layers-on, is 25 feet. *The Times* employs two of these eight-cylinder machines, each of which averages 12,000 impressions per hour; and one nine-cylinder, which prints 16,000.

These vast machines, however, are only useful when the necessity of working a very large number with the utmost rapidity overrides all consideration of cost and space. An excellent machine, in which considerable speed is obtained with comparative economy of expense and room, the invention of Messrs Hoe of New York, has been lately used for newspapers and periodicals of long numbers. In principle, it does not differ from Applegath's vertical, inasmuch as that the type is fixed upon a central cylinder or drum, which has a continuous rotatory motion, in contact with impression-cylinders set around it. The chief difference is, that the drum and impression-cylinders are not vertical, but horizontal. The machines are manufactured of different sizes, according to the number of impression-cylinders required. Those more generally made have six cylinders, some have eight, and *The Times* has recently constructed one with ten. This last machine is calculated to produce 20,000 impressions per hour. The following is a representation of a six-cylinder machine (fig. 10):—

A horizontal central cylinder is mounted on a shaft with appropriate bearings, and around it, arrayed at proper distances, are six horizontal impression-cylinders. The moveable types or stereo-casts are secured on a portion of the central cylinder, about a quarter of its circumference, and compensated by a balance-weight on the opposite side; the remainder of the cylinder is used as the distributing-table for the ink. This portion of the cylinder is lower than the face of the type, in order that it may pass under the impression-cylinders without being touched by them. The ink is contained in an ink-box placed beneath the central cylinder, and supplies the ink to the ductor-roller, from which it is transferred by a vibrating distributing-roller to the distributing-table. The ductor-roller receives a slow and continuous rotary motion, so that it always presents a uniform line of ink to the vibrating roller. The machine being put in motion, the form of type on the central cylinder is brought into contact with each of the six impression-cylinders in succession; and six sheets of paper, which have been introduced, one to each impression-cylinder, are printed in one revolution of the central cylinder. For each impression-cylinder there are two inking-rollers, which roll over the distributing surface and take a supply of ink; at the proper time they rise, pass over the type, and then fall on to the distributing surface.

Each page is locked up upon a detached segment of the large cylinder called a "turtle," which constitutes the bed and chase. The column-rules, like those for the vertical machine, are wedge-shaped, and are held down to the turtle by tongues projecting at intervals along their length, and sliding in rebated grooves cut crosswise in the face of the turtle, the space in the grooves between the column-rules being filled with sliding blocks of metal, accurately fitted, the outer surface level with the surface of the turtle, the ends next the column-rules being cut away underneath to receive a projection in the sides of the tongues. The head and cross rules are segments of a circle of the same curvature as the turtle. The types are secured by screws and wedges.

Six persons, one to each impression-cylinder, are required to supply the paper,—three on each side of the machine. The paper is conveyed from the laying-on board to the impression-cylinders by gripers. The sheets when printed are carried by tapes to six self-acting fly-frames, which lay them regularly in piles.

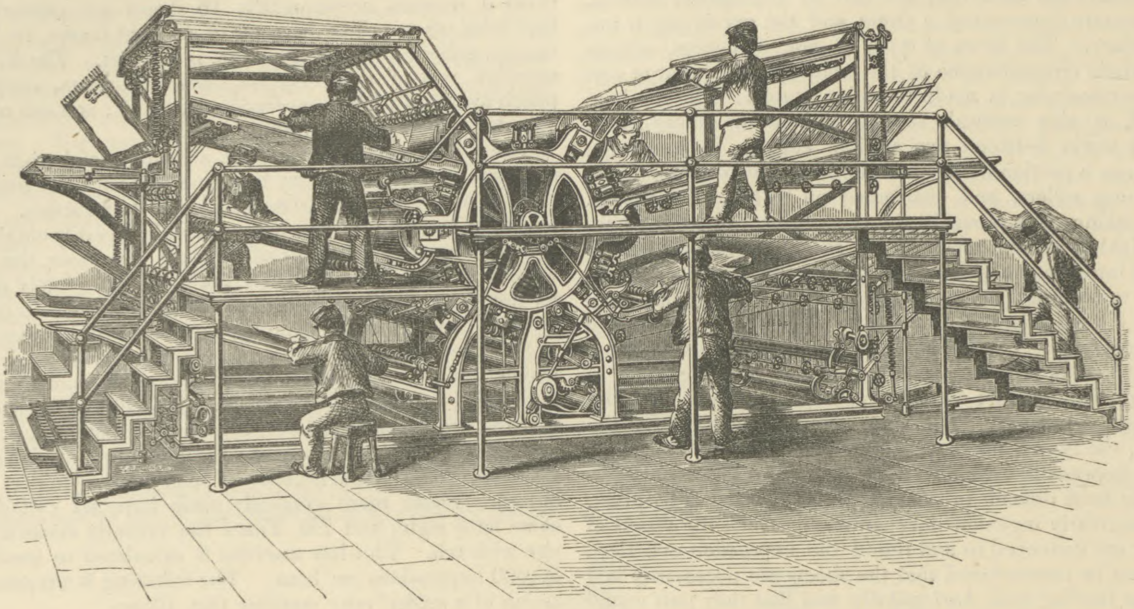

Fig. 10.
Hoe's Printing-Machine.

Another American, M. S. Beach, has improved upon Hoe's machine, by converting it into a perfecting-machine. His improvement consists in placing the second form upon the central type-drum, superseding the necessity for the balance-weight: the sheet, after being printed on one side, is immediately drawn back and printed on the other side from the second form, without checking or changing the uniform revolution of the cylinder; and thus the work done by it is doubled. The diameter of the type-drum in this machine, which is calculated for 8 impression-cylinders, is only 4 feet; the type has therefore to travel a less distance in one revolution of the drum; and the consequence is, that in travelling the same distance in this machine, and at the same speed, 22,000 *double* impressions would be produced in an hour. This account is taken from the *New York Sun*, the machine itself not having as yet found its way across the Atlantic.

A horizontal cylinder-machine, on the same system as Hoe's, made by Middleton, capable of printing 20,000 impressions per hour, is now used for printing *The Morning Herald*. The type is secured on the central cylinder, 2½ feet in diameter, in the same way as in *The Times* vertical machine; the ink is supplied from a ductor below the type-cylinder, and distributed upon an inking-table attached to the type-cylinder, to which a slight lateral motion is communicated by two straps, one on each side of the machine. There are five impression-cylinders at equal distances round the central cylinder, to which the paper is supplied from ten feeders, on the same principle as in the other horizontal machines, four on one end of the machine and six on the other; the printed sheets are delivered on to five taking-off boards, one to each two feeders, and received by five lads. The machine is 26½ feet long, 5 feet wide, and 17½ high.

The machines of Mr Napier, intended for book-work, are in good repute. They have the advantage of being easily worked by two men, thus rendering steam-power unnecessary. They stand in a very small compass, and do beautiful work. As far as regards motion and impression, they do not greatly vary from the cylinder machine already described; but in the method of conveying the paper, obtaining register, and inking, they are altogether different. The paper is laid to a certain gauge, when, in the revolution of the cylinder, gripers are made to compress the edge of the paper upon it, very much in the manner in which the fore-finger closes on the thumb. It is by these means conveyed with it during one revolution, in the course of which it is printed on one side. At the commencement of the second revolution these gripers open at the precise moment, when the gripers attached to the second cylinder close, and thus convey the sheet over the second form. Tapes pass under the second cylinder, *between* the blanket and the paper, and over a pulley upon a bar, by the mere friction of which the sheet is thrown out upon a board. These gripers are made to act with such perfect certainty that the best possible register is obtained. The inking apparatus consists of a trough with a ductor and vibrating roller, which communicates the ink to composition-rollers, by the revolution of which in contact with each other the ink is perfectly distributed, and from these to the type. A cross motion is communicated to the distributing-roller by means of a worm in the elongated spindle. As but one impression is given during the traverse of the table in each direction, the cylinder which does not at the moment hold the paper would be in contact with the type, had not Mr Napier added a beautiful adjustment, whereby the cylinders rise and fall alternately, so that the one not in use passes over the form intact. This machine will work from 1000 to 1200 perfect sheets per hour, and requires but two boys. Mr Napier has constructed several other machines of great merit, one of which, for newspapers, will perfect 2000 sheets per hour by the labour of two men.

Messrs Hopkinson and Cope have also produced a double-cylinder perfecting griper machine adapted for book-work or newspapers. The peculiarity of this machine is, that it is supplied with a set-off sheet apparatus, by which a "set-off sheet" is fed in with each sheet to be printed, which it meets as the latter enters on the second cylinder, and, passing round with it, prevents the ink on the printed side of the paper setting off on the blanket of the cylinder, and being thence transferred to the following sheet. This apparatus can be easily dispensed with when ordinary work is being printed. They have also made a single cylinder griper machine called a "Desideratum." It is supplied with a pointing apparatus, which renders it available for book-work.

Before the invention of cylinder machines, the desire to obtain increased speed led to many ingenious contrivances for accelerating the action and economising the expense of the ordinary printing-press; all of which, however, either failed, or were superseded by the steam machine. There are now in general use, for book-work of a quality superior to that produced by the cylinder, several machine-presses which are in every respect satisfactory. They generally consist of two tables, on each of which a form is laid; these pass alternately under a self-acting platten: while one form is receiving the impression, the other is delivering its printed sheet to the taker-off, and receiving its white sheet from the layer-on. This double operation is effected at the same time, by the frisket being attached to the tympan at the bottom (not at the top as in the common press). When the tympan opens, it falls back inwards; the white paper is laid on the frisket, the tympan closes upon it, it is printed; but when the tympan opens, the printed sheet is made to rise with it, and is taken off while the layer-on is placing another sheet on the frisket. The ink is conveyed to the type by a similar apparatus to that used in cylinder machines. These machine-presses do excellent work at the rate of 600 or 700 impressions per hour, and are made by the same firms as supply cylinder-machines.

The "Scandinavian" machine-press differs from all others in respect that the form of type is stationary, and that the tympan and inking-roller are passed between the form and the platten. As the power required to set this press in motion is much less than that required where the form and table travel, manual labour is sufficient; but only one form can be worked at a time.

These are by no means all the machines that have been devised or brought into use. They are, however, all that it is necessary to mention, as the same principle is common to all. Every maker is at liberty to manufacture almost all of them, with such modifications as his own talents may suggest, the patents, where any were taken out, having, with few exceptions, expired.

(For the Reader's marks of correction, see the article CORRECTION.) (T. C. H.)

PRINTS. See ENGRAVING.

PRIOR, the superior of a convent of monks, or the next under the abbot. *Grand Prior* is the superior of a large abbey, where several heads are required.

PRIOR, MATTHEW, one of the most correct of our English poets, was born at Winburn in Dorsetshire, on July 21, 1664. He was willing to leave his birth and his birthplace unsettled. On his father's death, his uncle, who was a vintner near Charing Cross, took charge of him, and sent him for some time to Dr Busby at Westminster. The Earl of Dorset having found him reading Horace, was so pleased with his proficiency that he undertook the care and cost of his education. He accordingly, in his eighteenth year, entered St John's College, Cambridge. where he distinguished himself by writing a poem on the *Deity*, addressed to the Earl of Exeter, in acknowledgment of a benefaction enjoyed by his college from the bounty of the Earl's ancestor. He published, in conjunction with Montague, *The City Mouse and Country Mouse*, in 1687, in ridicule of *The Hind and Panther* of John Dryden, which gained for both speedy preferment. Prior took his bachelor's degree in 1686, and his master's by mandate in 1700. In 1691 he was sent as secretary to the embassy of the Hague, where he conducted himself so well that he was appointed, on his return, a gentleman of King William's bed-chamber. On the death of Queen Mary in 1695, he added a long ode to the heaps of elegy which already mourned her loss. He was secretary to the embassy at the treaty of Ryswick in 1697, and next year he met with great distinction at the court of France. On his return he was made commissioner of trade. He exhausted all his powers of celebration in the *Carmen Seculare*, published in 1700. King William was the subject; and gratitude dictated what his reason did not refuse. Prior was chosen representative of East Grimstead in 1701, when he seems to have changed his party.

In the succeeding reign war took the place of negotiation, and left Prior to polish his verses. He published soon after a volume of poems, with a high panegyric upon his deceased patron, the Earl of Dorset. In 1706 he was excited, by the victory of Ramillies, to another effort of poetry. The Tories being then in power, and anxious to end the war, employed Prior, in 1711, on the peace negotiations at Utrecht, and he was subsequently induced to go privately to Paris with pacific propositions. He accordingly attended Bolingbroke to the French capital in the capacity of ambassador without the public distinction, and continued to act without a title until the return from Paris of the Duke of Shrewsbury, who "refused to be associated with a man so meanly born," when Prior assumed the style and dignity of ambassador. He was cheated, somehow, of his ambassadorial plate; and in a heroic poem addressed to her Majesty Queen Anne, he makes some magnificent allusions to the loss he had sustained. On the 1st August 1714 he was recalled, and returned as soon as his debts would let him. He was welcomed by a warrant for treason as soon as he had set foot on shore, and was confined to his own house, where he relieved the tedium by writing his *Alma*. On regaining his liberty he was in danger of penury, when his friends adopted the expedient of encouraging him to publish his poems by subscription. The enterprise succeeded; and he now enjoyed the privilege of contemplative tranquillity. He died at Wimpole, a seat of the Earl of Oxford, on the 18th of September 1721, and was buried in the Poets' Corner in Westminster Abbey. Prior's works comprise tales, love verses, occasional poems, *Alma* and *Solomon*. In the opinion of Mr Thackeray, Prior's are "amongst the easiest, the richest, the most charmingly humorous of English lyrical poems." Some of his tales, however, are, to say the least, not over decent.

PRISCIANUS, one of the most celebrated of the ancient grammarians, was surnamed *Cæsariensis*, either because he was born at Cæsarea, or had received his education there. He flourished in the reign of Justin about the middle of the fifth century, and taught grammar at Constantinople, where he received a salary from the court, which makes it probable that he was a Christian. He has left *Commentariorum Grammaticorum libri xviii. ad Julianum*, besides eleven smaller pieces. His grammatical works have been published by Krehl, Leipsic, 1819, in 2 vols.; and his smaller essays by Lindemann, Leyden, 1817.

PRISCILLIANISTS, a theosophic sect, who arose in the Spanish church towards the close of the fourth century, and who professed tenets closely related to Gnosticism and Manichæism. Their founder Priscillian, a respectable and wealthy Spaniard, seems to have received the germ of his doctrines from one Marcus, who travelled thither from Memphis. (See Neander's *History of the Church*, vol. iv.)

PRISM. See GEOMETRY, part ii. § 2.

PRISON: PRISON DISCIPLINE.

This is a department of jurisprudence and administrative science which in later times has totally changed its character, and requires a new method of treatment. From being matter of mere speculation, it has become matter of practice and of induction from observed facts. In earlier editions of the *Encyclopædia* it was treated by one of those accomplished and sagacious inquirers, whose able exposure of existing defects produced the many experiments and improvements which supply the materials of this exposition. Mr Mill found no system of prison discipline acknowledged and acted on, although Howard, Beccaria, and Bentham had preceded him in endeavouring to establish such a system. Hence he thought it necessary to go back to the first principles of punishment, and realize them into rules of practice for the future guidance of mankind. Such a method any man who earnestly threw himself into the subject and felt himself capable of handling it was then quite entitled to adopt, because the practices he had to censure were not caused by false doctrines about prison discipline, but by a general neglect among mankind to search for such doctrines at all, and a consequent dereliction of the whole practice of punishment to accident, routine, or the interests and passions of those invested with power.

But of late years the efforts of the leaders of civilization have borne with practical effect on this branch of the science of government. However they may be open to criticism as more or less excellent or imperfect, the various methods of punishment have been carefully and conscientiously studied. And this study has not been merely theoretical, but has been a continuous commentary on practice and its results, those having most to do with the actual administration of punishment having been the fullest expounders of its rules, through parliamentary reports and other published statements. Hence it would be unbecoming, were it profitable, at this time to embark in pure theories of prison discipline. It is apprehended that it will be more acceptable to tell what has been done by the leaders of prison reform, and to give an account of the results of their efforts, so far as these can be ascertained.

It is proper, in the first place, briefly to note the extent of the field now occupied by the term *prison discipline.* It has been ever widening, and now nearly occupies every department of punishment in this country and throughout civilized Europe. Such other corporal punishments as are now inflicted are additions to the punishment of imprisonment. Where the law can be satisfied by a forfeiture of money or property, imprisonment is still the alternative by which it is extorted. Where, as in the case of the soldier, chastisement is spoken of as a degrading punishment which it is desirable to supersede, imprisonment appears as the only available alternative. Forced labour of any kind is but a form of imprisonment. Simple banishment is now almost unknown. With transportation imprisonment was always closely co-operative, as the means of detention until the convict was removed, and as the sanction for keeping him in order in the penal colony. Since transportation has been virtually abolished as a punishment, imprisonment has received a corresponding enlargement. The penal serf is a prisoner, although in certain stages of his long punishment he is permitted to spend a portion of each day in the open air. Nay further, reformation having become a distinct object of penal discipline, has suggested the establishment for the young of institutions in which the reformatory prevails far above the penal element; but these are at the same time institutions of restraint or imprisonment. There is no broad line of distinction between reformatories and prisons, and the nature and management of both come naturally under the head of "Prison Discipline." There remains only capital punishment, now fortunately so rare. Here, too, the prison is necessarily brought into use, since the criminal must be kept there until he is put to death. But prison discipline has a far more important connection with capital punishment. It is admitted on all hands that the infliction of death is to be avoided wherever other means can be found of punishing with equal effect. It is to the resources of the science of prison discipline that we must look for such effective punishment; and thus it is one of the services of this science to reduce, if it should not even some day be able to supersede, a method of punishment so inimical to civilization.

Ancient practice.

The prison, as we now know it, is as entirely an institution of modern Europe as the church, the school, and the poor-house. Words occur, connected with events and customs in the ancient world, which we can only translate into modern language or thought by the use of the word "prison;" but the thing, as we now know it in the shape of the county jail or the convict prison, was then neither known nor anticipated. People were put in chains, or even locked for a time within stone walls; but systematic committal to prison as a specific punishment, in the way in which a vagrant is sentenced to thirty days, or a thief to twelve months, is a thing of which it may safely be said that no trace can be found in the practices of ancient nations which have come down to us. We are told how "the princes were wroth with Jeremiah, and smote him, and put him in prison in the house of Jonathan the scribe, for they had made that the prison." (Jer. xxxvii. 15.) This is one of the many instances occurring in Scripture where a temporary prison was found in any large house where a person could be conveniently restrained. Travellers in the East notice the same arrangement still. Systematic prisons are seldom known; but civil liberty is held cheap, and any one who is strong enough may detain a casual prisoner. Our representatives at eastern courts, finding it extremely inconvenient that they cannot get culprits of their own nation punished according to the British practice in public prisons, are accommodated with prisons of their own as a part of the ambassadorial establishment, in pursuance of the policy of orientals, which allows foreigners sojourning among them the practice of their own institutions. Though there are some instances in Scripture where the prison is spoken of as a punishment in itself, yet its proper use was that of mere temporary custody, that the prisoner might be forthcoming for ulterior purposes; and imprisonment is not laid down as a specific punishment in Leviticus or elsewhere. The imprisonment of Joseph in the king's prison until judgment should be passed on him, has been sometimes mentioned in illustration of the high civilization and just laws of the Egyptian empire. Instead of being summarily punished by the high officer whom he was charged with injuring, he was committed for trial, like a British culprit of the present day.

Greece.

That the Greeks were far from having an established system of imprisonment is shown by this, that there are several words in the language which may be translated by the word prison, but which each possesses several other meanings. Anything resembling an actual prison seems chiefly to have been employed among them in detaining citizens until they paid penalties or debts to the state. They had methods of public exposure in bondage, like the stocks or pillory. Slave labour in rowing galleys, a frequent punishment in later times, seems to have been in use among them, and a people so maritime in their habits would have an abundant demand for such labour. But where the privileges of citizenship were so important, afflictive punishments among free men were rare, loss of caste and position being a formidable penalty. Hence banishment was a favourite punishment. That peculiar form of it called *ostracism* is well known, and though so generally deemed odious, has been ingeniously defended as a mild remedy by which the state got rid in good time of any ambitious citizen, whose growing power, if permitted to culminate, might end in revolution and outrage.

Rome.

The student in the Roman law cannot help remarking the extreme meagreness of its penal department, whether he compare it with the vast and magnificent organization of the Justinian law of civil rights and obligation, or with the elaborate provisions of modern penal systems. In the Justinian law, indeed, the chief attention given to crimes is for the purpose of expounding the civil rights of action and possession arising out of them. Questions how far crimes and punishments may affect property and rights of succession are matters of elaborate inquiry, while the cursory and fragmentary manner in which the law relating to criminals and their treatment is set forth, shows how small were the claims which this portion of the administration of justice held on the attention of those great masters of jurisprudence, who, in the other departments of law, dictated the fundamental principles of legislation to all the nations of modern Europe. The department of the code which treats of punishments (lib. ix., tit. 47) consists of a few paragraphs, which read more like casual notices of peculiar provincial practices, than an official announcement of the laws of an empire. Nor is the enlarged statement of the law of punishment contained in the digest much more satisfactory (lib. xlii., tit. 19). The analytical spirit which ever pervades the Roman jurisprudence here develops itself in artificial classifications and arrangements. But these are entirely arbitrary, referring to the nomenclature of the punishments, and the classes of persons who may respectively be subjected to them; while the proper objects of punishment so sedulously kept in view at the present day leave scarcely a trace of their having influenced the penal lawyers of the empire. Perhaps the only instance in which the demoralizing influence of a punishment was seriously considered in dealing with it, is to be found in the rule, that women were not to be put in prison or committed to the custody of troops.

A powerful instrument of punishment towards the free citizen was available in the three grades of *capitis minutio*, or loss of caste. The first was the loss of *familia*, or of the privilege of membership of the family; and if the criminal were the *pater familias*, or head of the family, he thus lost his authority not only over the minor members, but over the herd of *familiares*, or slaves, more or less numerous according to the wealth of the *familia*. The next *minutio* was the loss of citizenship; the third was the loss of liberty;—and at this point, the man becoming a slave and a mere chattel, the state was no longer troubled with his disposal, unless he committed some atrocious crime. The Romans not only banished out of any particular part of the empire, but they also transported criminals to some spot where, like our own convicts, they were forced to remain. *Relegatio in insulam*, or transportation to an island, was a favourite form of this punishment. They had several forms of penal labour, in which the convicts might be fettered or unfettered,—a distinction which was always counted very material, though it seems to have depended more on the rank of the convict than the character of the offence. Some of the establishments for penal labour were connected with the great water-works of the Romans. A far larger number, however, were in the mines, the condemnation to the *metella* being a standing form of punishment. Penal labour was sometimes carried out also in quarries; and in Cicero's charge against Verres we have a powerful description of the *latomiæ*, or prison quarries of Syracuse, whence the stones were taken to build the town and harbourworks: they seem to have resembled, in external characteristics, the convict establishment of Portland, with its quarries and breakwater.

To how little an extent the prison, in the modern meaning of the term, was used by the Romans, is evident from the great historical importance attributed to the one remaining relic of a Roman prison in the subterranean chambers known to the present day as the Mamertine Caves. They consist of two vaults, an upper and an under. The former covers an area of 33 feet by 22, the other a semicircle at a radius of 22 feet. Supposing these to be very ancient, as Italian antiquaries maintain that they are, they coincide aptly enough to the descriptions of old writers, who speak of the caves as lightless, airless, and impregnated with deadly odours. In such a place no considerable number of prisoners could have been confined,—no one prisoner could have lived long. The prisoner committed to it was put there in fact not to be imprisoned, but to undergo the punishment of death. Often he was merely detained there while the preparation for his execution went on outside; in other instances the place itself was left to do the work of death, accomplished partly by starvation, partly by smothering in foul air. We are told by Livy, that Ancus Martius, an account of the growing wickedness and audacity of the citizens, built a prison overhanging the Forum. If the upper vault was a part or the whole of this prison, the lower is attributed to Servius Tullius, after whom the prison was called the Tullian. Above these vaults was raised a lofty erection called the Robur, which seems to have been a gigantic tower or scaffolding of oak, from the top of which criminals were precipitated, as others were from the Tarpeian rock. It was in the Tullian that Jugurtha was starved to death. Lentulus and the other abettors of Cateline were strangled, according to Sallust, in the prison called the Tullian, as you ascend to the right, where there is a depression of the ground,—a place terrible for its darkness and evil odours. There is yet another stage in the celebrity of these rude caverns. The apostle Paul, who tells us that he lived in Rome in his own hired house, in charge of a centurion, is held by the traditions of the early church to have been afterwards put in prison along with St Peter. This belief having been once established, there was no other place which could be assigned as their prison but the old Tullian. Hence the caverns are consecrated ground, and have received the visits of many devout pilgrims.

A set of very significant buildings, scattered over the Roman empire, called *ergastula*, must sometimes have had considerable resemblance to very bad modern prisons. They were used for the punishment of criminal and refractory slaves, but also, and probably to a far greater extent, as places of safe custody for newly-acquired slaves, or for those who were too much in excess of the free population of the district to be safely allowed freedom of motion. When we remember the large bodies of men, taken often from the higher ranks of society, endowed with great daring, and expert in the use of arms, who were drafted into the ever-accumulating mass of the Roman slaves, we must suppose that these *ergastula* were often buildings of great strength and well guarded. But like the property they contained, they were of course chiefly in the hands of persons who administered them according to their own private will and judgment. It is indeed in this great offensive feature of Roman society that we shall find the reason why the penal department of the law could even with bare safety be so lightly passed over. The institution of slavery threw into private hands the performance of by far the greater part of this department of work, and to a corresponding extent relieved the state. The administrators of the imperial law had little further trouble with the offender who had reached the condition of slavery. To be committed to slavery for a fixed period, as offenders are now committed to prison, was, were it practicable, never thought of. Hence there was no measure of the punishment to the offence, and no distribution of separate punishments for separate offences. The slave was permanently doomed to his fate. The criminal slaves thus became a class into which men were drafted rather for their general character and conduct, than to be punished for specific offences. Personal influence or clientage would do far more to save from such a fate than innocence. It becomes at once clear that when there were such opportunities for removing criminals beyond the management of the state, there was little inducement to the state to trouble itself, as it now does, with the discussion of niceties of prison discipline. An arrangement which professes to put the bad part of the population into the hands of the good as their owners and masters, has always fascinated by its simplicity and its apparent efficiency. It caused the late master of positive philosophy, August Comte, to maintain that the institution of slavery was the greatest single step in the progress of human civilization, since it superseded a great amount of slaughter, with or without cannibalism. The same spirit influenced the English vagrancy laws of the reign of Henry and Elizabeth, and we shall see how deeply it tainted the earlier stages of the transportation system. Nay, its history and tendency are rendered worthy of attention, through efforts partially to revive it in our own country at the present day, by projects for abandoning to some extent the strict just principle of English jurisprudence, which always finds an offence committed before a punishment is awarded, and for subjecting all persons of bad character and habits to a partial slavery to the police authorities.

The manner in which this absolute slavery of the Romans was pressed out by the modified serfdom of feudalism, which in its own turn gradually merged into the freedom now enjoyed by a large portion of Europe, is an interesting historical problem, having so far reference to the present matter that it is intimately connected with the origin of prisons. It will be seen, indeed, that these institutions, now among the most important objects of politics and jurisprudence, arose quite fortuitously in the hands of men who never dreamed either of repressive or reformatory discipline, and scarcely ever formed to themselves the rudest notions of afflictive punishment. We shall find that thus modern Europe was covered with prisons long before it occurred to any one to think that there was some determinate object to which they should be applied. This is a fact remarkable and important, because, although it is upon the prison—either in a pure or modified shape—that the eyes of all penal reformers ever rest as the means by which repression and reformation are to be carried out, yet few remember that it has not been by any process of induction, or from a general examination of all known or possible methods of repression and reformation, that the prison thus exclusively occupies the field, but because some fortuitous events in feudal history brought the building so named into existence as a feature of the social system of Europe.

This feature did not make its appearance until long after the fall of Rome. In the properly dark age—the period of transition—edifices built for safe custody were probably still more scanty than in ancient Rome. The temporary and fragile structure of the houses of that period, and the character even of the fortifications, which were only similar houses surrounded by ditches and mounds or low ramparts, were not consistent with the existence of strong stone chambers.

Feudal origin of prisons.

That great movement throughout Europe in the tenth and eleventh centuries, sometimes called the migration of the Normans, created the baronial or feudal system, and at the same time established prisons. It was then that the castle became a distinctive feature in the social system, and it is the peculiarity of the castle that it is in combination a house, a fortress, and a prison. In the Roman empire the institution of slavery was, as it now is in America, a vital matter, ever affecting the safety of the mighty machinery of the empire, and demanding the utmost vigilance and energy of the executive to keep the upper hand, and prevent the slaves from entering on a death-struggle for mastery. Hence the slave-owner had the whole force of the executive at his back to support his power over his slaves. But the feudal lord was in a great measure left to himself, both for protecting the lands of which he was the feudatory, and for coercing his vassals; and for both purposes the prison castle was to him a useful institution. Under the earliest Norman kings England was covered with castles, and the invasions of their successors scattered them over Wales, Scotland, and Ireland. All of these edifices had a more or less amount of prison accommodation; and we take the term dungeon, generally employed towards a prison as a term of censure, from the *donjon*, or principal tower of a Norman fortress. As there were castles of all sizes, from those of an independent monarch or a reigning duke downwards, so were there prisons; and even in the humblest square tower, built by the petty landowner who had two or three over-lords between him and the crown, the dungeon or prison-vault was an indispensable feature. In the ruins of old castles on the Rhine and elsewhere the dungeons are ever a well-known feature, interesting from the romance naturally attached to them. Perhaps the most remarkable remains of the kind are those under the new palace of the dukes of Baden at Baden-Baden. They form a series of vaults in the rock far below the ground, smoothly cut, and dry; and they have this remarkable feature, which makes them terrible almost to the visitor going through them with a guide, that the door of each is a mass of solid stone swinging smoothly on a pivot, and closing so as scarcely to leave a perceptible trace of its outline.

In the later stages of the feudal system, the existence of any asserted right of imprisonment was, like many other prerogatives, the object of contention between the greater and lesser feudatories. It was jealously guarded, by those who could hold it, as a material symbol of power. It was largely exercised by the church, and was stoutly arrogated by the municipal corporations as a privilege belonging to their station in the feudal hierarchy. Even in this country at the present day traces might be found of the arbitrary distribution thus made of places of punishment through their feudal origin. The actual vaults in which the abbot or the baron of the sixteenth century confined his victims would not now be tolerated as places of punishment; yet, almost down to the present generation, the feudal castles were the actual prisons in such places as Oxford, Cambridge, Norwich, Lincoln, Lancaster, Worcester, and Caermarthen. In Scotland there was, until lately, a crowd of little prisons, which, although existing in towns, were the appendages of some feudal estate, holding rank as a barony or regality. Their dungeons, like other portions of their fortresses, sometimes excited the fastidious attention of the princes and nobles of the middle ages; and the chief object of this attention was to bring their potency for cruel infliction up to the highest possible point. There were many eccentric inventions directed towards this end, such as the kind of iron cage in which Louis XI. shut Cardinal Balue and the son of the Duke of Alençon. In such dens, too, if the ordinary sources of history are to be credited, Edward I. shut up the sister of Robert

Bruce, and that Countess of Buchan who had assisted at the Scottish king's coronation. Of receptacles like these few vestiges of course are preserved; but the dungeons which remain, built of solid stone or cut into the living rock, are often of a character to make those who have any respect for the promulgated laws of vitality question that human life could have found support in them. Such are the *pozzi* or wells in the ducal palace of Venice, described by Sir John Hobhouse in his notes to *Childe Harold*. In these, and such as these, however, pits in solid masonry or the solid rock, with no circulation of air, it seems certain that many a captive dragged out a protracted existence. There were other smaller pits, which have been called *oubliettes*, generally bottle-shaped, with narrow mouths, broadening downwards, in which it is certain that the victims could not live, and into which, indeed, they must have been dropped to die by suffocation. These were favourites with the church as a means of death without bloodshed, and received the name indicative of their deadly purpose—*vade in pace*. The next and more humane stage was, building the victim into a niche in a wall, where suffocation would be much more speedy.

British and continental practice.

It would obviously be a vain task to estimate the amount of cruelty and injustice executed through the edifices constructed for oppression thus thickly scattered over Europe. The instances revealed in general and local history, and in criminal trials, only suggest the existence of a far larger crowd of victims, whose unknown fate will remain so until all secrets are laid bare. It is one of the many instances of that marvellous sagacity with which the liberty of the subject has ever been guarded, and its lurking enemies detected, in this country, that the earliest proceedings of a constitutional character seek to provide remedies against arbitrary and illegal imprisonments. The protection of the subject from imprisonment, otherwise than in due course of law, is one of the requisitions of the great charters, and the object was pursued with ceaseless vigilance through the passing of the Habeas Corpus Act in the reign of Charles II., down to the almost perfect system of protection possessed at the present day. Our familiarity with this system lessens its importance in our eyes, and we are apt to forget that it is a national peculiarity. It consists of two distinct parts. One is the rule, that no person can be committed to a prison unless a warrant for his imprisonment has been granted by a magistrate. An accused person is liable to detention by the officer of justice who apprehends him, but he is in the personal custody of the officer, even should he use a strong-room or lock-up to assist him in the detention. It is the policy of the law to offer such a custodier few facilities for long detention, that he may the sooner bring his captive before a magistrate, and especially he cannot place him within the walls of an actual prison until such a warrant is obtained. The next security is the habeas corpus, or right to demand a trial, and have the advantage of innocence, or be subject to the fixed legal punishment of guilt, as the result may be. In no other country do such safeguards appear to have presented themselves, though occasional attempts have been made to imitate them. Where there are such constitutional protections, the proper registers of admissions and liberations, with every particular necessary for the identification of each prisoner, and his enjoyment of his legal rights, cannot be neglected without great peril. In countries where there are no such constitutional safeguards of liberty, the best devised systems of official routine will sometimes go wrong or be neglected, and acts of injustice will be unwittingly committed; but in despotic countries it has often been matter of state policy that all means of identifying persons immured in prison should be erased, so that from the moment of their apprehension they cease to belong to the living world, and their actual death is no event to any human being but the prison officers surrounding them. One man thus mysteriously isolated came from incidental circumstances to be an object of much interest—"the man with the iron mask;" and several books have been written, in the vain attempt to discover who he was. This prisoner was confined in the Bastile, which, with the *lettres de cachet*, or royal warrants by which prisoners were received into it, became as the type and representative of arbitrary imprisonment, odious both in France and Britain. Yet in this great state fortress the registers seem to have been preserved with more than usual care, and it was less likely than many others to be the living tomb of men committed to oblivion. These registers were found when the Bastile was destroyed, and much instructive matter was derived from them. Nor was severity always the rule in this dreaded fortress,—it was the scene often of luxury, gaiety, and dissipation. What chiefly excited indignation towards it was the reckless, easy manner in which the fatal *lettres de cachet* were granted, to gratify the ambition of mistresses, or to further personal malignity or caprice.

There are traces at early periods in French history of attempts to obtain judicial checks on the power of imprisonment. In the reign of Louis XIV. a promise was extorted by the Parliament that the case of every prisoner should be brought under judicial cognisance within twenty-four hours after his committal. The first revolution was inaugurated with strong resolutions against arbitrary and indefinite imprisonments, which produced no better practical result than the release of the sufferers then in bondage. France has never possessed any such thoroughly practical a protection as our habeas corpus. There, as well as in the other great European states, there are doubtless enlightened regulations emanating from central authority for obviating any sufferings from the enmity or the carelessness of the inferior officers of justice. But there are no checks on the central power itself; and this is still the only country where there is in the law a power separate from the executive which can open the door of every prison. Through these means the liberty of the subject has among us from time immemorial been zealously guarded by constitutional checks on the power of imprisonment.

Defects in English system.

The next stage is the protection of the prisoner from neglect and cruelty after he is legally within the walls of a prison; and there is reason to fear that in this department we were long behind those governments where everything is managed by official routine, springing from a central authority. At all events, from the mere want of responsibility and control, it is certain that there have been scenes of lawless violence and of cruelty in British prisons, which have been as pregnant with suffering to the victims as any enforcement of the decrees of a tyrannical autocracy in a secret dungeon could ever be. In the reign of George I. a rumour spread in which the keepers of the chief prisons of London were charged with cruelty. Colonel Oglethorpe brought it before the House of Commons, and obtained a committee of inquiry. The committee went straight to the prisons themselves to make their examination. Hogarth has a picture representing them in a grated dungeon of the Fleet: they are seated, some of them in court dress, at a table hastily adjusted for the transaction of business. Some hideous instruments of torture are lying on it. A half-naked prisoner, with one of these instruments on his head, is under examination; and the keeper Bambridge stands before them as a detected criminal, angry and terrified. Bambridge was a man of a savage and grasping nature, who, on whatever condition of life he had been cast, would have never permitted humanity to interfere with his interests. He bought the office of warden of the Fleet, and wanted to make the most of his bargain. His chief victims were among the debtors who had anything to part with; and if they resisted his rapacity, as many of them did, he used the power unfortunately in his possession to carry on with them a war of extermination. But it was not the rapacity and cruelty of one man that created the abuses of these London prisons, but a general absence of control, and the like cruelties were practised in them throughout. The committee stated it to have become a general practice of the keepers "unlawfully to assume to themselves pretended authority as magistrates, and not only to judge and decree punishments arbitrarily, but also to execute the same unmercifully." Among these unmerciful exercises of an illegal power, the following may be taken as a specimen from the committee's report:—A general attempt had been made to escape from the Marshalsea, and those implicated in it were taken to the marshal's lodge for examination and punishment. "One of them was seen to go in perfectly well, and when he came out again he was in the greatest disorder; his thumbs were much swollen and very sore; and he declared that his being in that condition was that the keeper, in order to extort from him a confession of the names of those who had assisted him and others in their attempt to escape, had screwed certain instruments of iron upon his thumbs so close that they had forced the blood out of them with exquisite pain. After this he was carried into the strong-room, where, besides the other irons which he had on, they fixed on his neck and hands an iron instrument called a collar, like a pair of tongs; and he being a large lusty man, when they screwed the said instrument close, his eyes were ready to start out of his head, the blood gushed out of his ears and nose, he foamed at the mouth, the slabber went down, and he made several motions to speak, but could not. After these tortures he was confined in the strong-room for many days with a very heavy pair of irons, called sheers, on his legs." (*Parl. Hist.* viii. 740.) Such a narrative occurring in the report of a parliamentary committee after the accession of the House of Hanover, is at variance with popular notions of the progress made by England in humanity and civil liberty. The committee were deeply excited by the iniquities which they had to expose, and perhaps exaggerated them. But the instruments of torture—the thumb-screw, the collar "like a pair of tongs," and the "sheers"—existed, and had doubtless been made that they might be used. The committee, indeed, accused these keepers of still deeper acts of cruelty, and among others of a like kind, brought against them the following charge, which reads like an imitation of the classical model of Mezentius, who chained the living to the dead. "One particular instance of this sort of inhumanity was of a person whom the keepers confined in that part of the lower ward which was then separated from the rest, while there were there two dead bodies which had been there four days; yet was he kept there with them six days longer: in which time the vermin devoured the flesh from the faces, eat the eyes out of the heads of the carcases, which were bloated, putrid, and turned green during the poor debtor's dismal confinement with them." (*Parl. Hist.* viii. 741.) Bambridge and another keeper were tried for murder, and acquitted. The advisers of the crown naturally hesitated to bring the whole weight of a bad, neglected system on even the worst of the mere instruments who carried it out. The blood of the English people was up, however, and individual prosecutors pursued these men with relentless tenacity. They were subjected to the rare and peculiar action of "appeal for murder," and in the end narrowly escaped with their lives.

Progress of improvement.

It is probable that after this inquiry the keepers of prisons became cautious, and avoided illegal cruelties; but nothing was yet done to mitigate the ravages, physical and mental, of which the very structure of the prisons rendered them instruments, until the days of Howard, whose labours and their results are a historical epoch in prison discipline all over the world. (For an account of his mission we refer to the article Howard.) Perhaps the portion of his revelations which not the least astonished his countrymen was the superior cleanliness and order of those places of detention in continental despotisms, which our national pride could only think of as noisome dungeons, where the victims of tyranny groaned in their chains. His visit to the prisons of the Dutch was a real luxury to Howard. That thoughtful, industrious, and humane people had, without promulgating any great leading philosophy in prison discipline, gradually found their way in simple practice to institutions which in their features of industry, order, and cleanliness, bear a closer resemblance to the best prisons of the present day than any others have done.

But in England the reform, even after Howard's exposure, was so slow and partial that there are prisons around which some of the evils condemned by universal acclamation, when he exposed them in 1774, still linger. We have an account, more dreadful even than his, because more picturesque, from Mr Buxton, of the result of inquiries into the condition of English prisons, published in the year 1818. Along with a statement of corroborative facts seen by him in the various prisons, he gives the following description of the position of a person—guilty or innocent—whose misfortune it is to be committed for examination to a London prison:—"At night he is locked up in a narrow cell with perhaps half-a-dozen of the worst thieves in London, or as many vagrants, whose rags are alive and in actual motion with vermin. He may find himself in bed, and in bodily contact between a robber and a murderer; or between a man with a foul disease on one side, and one with an infectious disorder on the other. He may spend his days deprived of free air and wholesome exercise. He may be prohibited from following the handicraft on which the subsistence of his family depends. He may be half-starved for want of food and clothing and fuel. He may be compelled to live with the vilest of mankind, and, in self-defence, to adopt their habits, their language, and their sentiments. He may become a villain by actual compulsion. His health must be impaired, and may be ruined by filth and contagion; and as for his morals, purity itself could not continue pure, if exposed for any length of time to the society with which he must associate." (Buxton's *Inquiry*, p. 17.)

The renowned crusade of Mrs Fry at this time afforded the world an astounding glimpse into the condition of the London prisons. It was on the female department of Newgate that her energies were concentrated. There she found nearly three hundred women, tried and untried—some sentenced to death—in two rooms. "Here they saw their friends, and kept their multitudes of children; and they had no other place for cooking, washing, eating, and sleeping. They slept on the floor, at times one hundred and twenty in one ward, without so much as a mat for bedding; and many of them were very nearly naked. She saw them openly drinking spirits; and her ears were offended by the most terrible imprecations. Everything was filthy to excess, and the smell was quite disgusting. Every one, even the governor, was reluctant to go among them." (Buxton's *Inquiry*, p. 126.)

Mrs Fry's Christian efforts to instruct these poor creatures, and impart to them the consolations of religion, are well known. It was believed at the time that her personal risk was literally the same as if she had gone into a den of beasts of prey, and she is entitled to the full honours of the courage she displayed, although later experience of the prison world may render us less surprised at the thankfulness and docility with which she was received. Among criminals in a prison, with their many sources of anxiety and terror, their over-stretched nerves, and their hopeless feeling of dependence on the will of others, whoever appears with the character of authority and beneficence is likely to be welcomed with thankfulness and homage. When the danger was encountered, and the unexpected results were made public, it was a natural fallacy to suppose, that the impassioned penitence and eager craving for religious consolation represented a change of heart, and the simple way had at last been found for taking by storm the secret fortress of crime. When services such as Mrs Fry's, however, were more uniformly performed, their influence, though of eminent importance, was found to have its limit. That such meteoric efforts should have from time to time fed the public and the fashionable world with episodes of lively interest, is one of the saddest reproaches to our prison administration. What Mrs Fry did for these prisoners, with a great heroic effort, was what should be always quietly doing in every prison by those to whom it is a fixed duty.

Long after this period, from the indifference or self-willedness of the local managers, a large number of the English prisons remained almost unaltered. The prisons of the metropolis continued to be the most conspicuous for mismanagement. In their first report, issued in 1836, the inspectors of prisons said of Newgate:—"The association of prisoners of all ages and every shade of guilt in one indiscriminate mass, is a frightful feature in the system which prevails here; the first in magnitude, and the most pernicious in effect. In this prison we find that the young and the old, the inexperienced and the practical offender—the criminal who is smitten with a conviction of his guilt, and the hardened villain, whom scarcely any discipline can subdue—are congregated together with an utter disregard to all moral distinctions, the interests of the prisoners, or the welfare of the community." And nine years afterwards they say in their tenth report—"We are compelled by an imperative sense of duty to advert, in terms of decided condemnation, to the lamentable condition of the prisons of the city of London—Newgate, Gilt-spur Street Compter, and the City bridewell—in which the master-evil of goal association, and consequent contamination, still continues to operate directly to the encouragement of crime."

It is remarkable that in the present year (1859), it was officially announced to the world, that in the male department of the prison of Newgate arrangements were at last made for keeping the inmates apart from each other. The ordinary, in his first report after this resolution, to the lord mayor and aldermen, said,—"I find the result at present to be not only the entire suppression of the corrupt and demoralizing effect of indiscriminate association, but a peculiar seriousness of demeanour is produced by separate confinement, which, except in a few instances, I never witnessed before." It still remains to carry this improvement into the female department—the scene of Mrs Fry's labours.

The English prisons did not in the meantime remain free from the suspicion of abuses more positive in their character than the mere neglect to reduce them to proper discipline. In many instances it was said that the prison, by the known profusion and luxury prevailing in it, not only failed to terrify the criminal, but proved a disheartening and deteriorating example to the honest, frugal workman. In other cases it was maintained that prison officers, feeling the absence of strict control, indulged in violence and cruelty. So lately as the year 1853 the borough jail of Birmingham encountered formidable charges of this kind, and the difficulty of establishing the truth was a memorable illustration of the necessity of a powerful external control over the conduct of prison officers. In this instance the investigations of the visiting justices and of the inspector of prisons were alike ineffective, and at length a commission of inquiry brought out the facts. At an earlier period the governor of the prison was a man who had obtained eminence for promulgating principles of prison discipline which possessed many good features, but were supposed to require too confiding a reliance on the latent goodness of the criminal class. The visiting justices of Birmingham entertained a suspicion that their prison was made the experimental laboratory of an amiable enthusiast. A reaction took place, and they displaced their governor, appointing a man of different character. He was a navy officer, passionate and imperative, who carried to his duty the one ruling principle, that he was not to be contradicted or baffled, but that what he willed should be enforced, at whatever cost. Hence he endeavoured to break the resistance of obstinate prisoners by sheer cruelty. His conduct was investigated, and narrated at length by the commission of inquiry. One form of infliction described by them, carried out by means of stiff neck-stocks, may be taken as an example:—"They were of various sizes, but those which appeared to have been most commonly used were about 3½ inches deep at the deepest part in front, somewhat more than 13 inches long, and rather less than a quarter of an inch thick, made of leather perfectly rigid. Very speedily after their introduction into the prison, they appear to have been converted into ordinary implements of punishment for non-performance of prison labour or breaches of prison discipline; the prisoner being first muffled in the strait jacket, having his arms tied together on his breast, the leather stock fastened tightly round his neck, and being, moreover (when the punishment was inflicted by day), in almost every case strapped to the wall of his cell, in a standing position, by means of strong leather straps passed round the upper parts of the arms, and fastened to staples or hooks in the wall, so tightly as to draw back the arms into and keep them in a constrained and necessarily painful position, at the same time compressing them. . . . So strapped to the wall, prisoners—chiefly boys—were kept for periods of four, five, or six hours, and in some instances for a whole day, by way of punishment for the non-performance of the crank labour, and for other prison offences chiefly of a trivial character. This mode of punishment, which was of ordinary and indeed daily occurrence in the prison during the year 1852 and the early part of 1853, which was unquestionably altogether illegal, and was of a very cruel, painful, and irritating nature, was adopted and practised by the governor, Lieutenant Austin, entirely of his own authority, without the sanction of the visiting magistrates, and to a great extent without their knowledge."

Legislation as to prisons in England.

The first legislative step in prison reformation in England was taken in 1773, by the passing of two acts, the first-fruit of Howard's labours, one of them for abolishing prison fees, and the protracted confinement of prisoners till these were paid; the other for improving the sanitary condition of the jails. Five years afterwards, a still more decided step was ostensibly taken in the passing of an act (19 Geo. III., c. 74) for the establishment of a penitentiary. It was the joint production of Howard, Sir William Blackstone the commentator, and Mr Eden, a great authority of that period in all matters connected with crime and pauperism. The object, as emphatically laid down by Blackstone, was, "by sobriety, cleanliness, and medical assistance, by a regular series of labour, by solitary confinement during the intervals of work, and by due religious instruction, to preserve and amend the health of the unhappy offenders, to inure them to habits of industry, to guard them from pernicious company, to accustom them to serious reflection, and to teach them both the principles and practice of every Christian and moral duty." This act, however, remained dormant. Its immediate object was to meet, by a penitentiary system at home, the difficulties occasioned by the stoppage of transportation to America. The Australian system was, however, substituted in the manner stated farther on, and the project of a penitentiary was abandoned. The idea was afterwards taken up by

Bentham, and urged with untiring zeal in his *Panoptican Penitentiary-House* and other works. He had a great love and reverence for Howard, whose pupil he professed to be in matters of prison discipline. But his publications teem with original ideas and practical inventions of his own, and he grouped them together so as to present the world with every feature which such a building should possess, and every rule applicable to its discipline and working, down to the minutest particular. It is denied to the human intellect to possess the faculty of absolutely forecasting the results of experience, and proving, step by step, where they are to lead; and hence the systems of discipline to which the world has groped its way, through slow experiment, have in a great measure differed from Bentham's anticipations. But there is, at the same time, between them a sufficiency of coincidence to bestow on these a character of marvellous sagacity, and to make them profitable reading to the practical disciplinarian. Bentham offered to enter on a contract with government for the detention of 1000 convicts; and an act of Parliament was passed in 1794 to carry out the project, but again the act remained dormant. In the meantime there were many parliamentary inquiries into prisons and prison discipline. The building of the great penitentiary of Millbank, which now contains accommodation for 1300 prisoners, was begun in 1819. In 1822 a committee was appointed to revise the whole of the law as to jails in England and Wales, and the act 4 Geo. IV., c. 64, still the leading statute for the English local prisons, was passed. By that act a direct communication was opened between the secretary of state and the several administrators of prisons, over whom he has continued to exercise a limited control, and returns were periodically required to be made to him relative to the discipline and condition of the various prisons, which were laid before Parliament. An act was passed in 1835 (5 and 6 Will. IV., c. 38), giving a further central control over prisons. Among other provisions, it gave the secretary of state the power to revise and alter the rules of all prisons. It provided for the appointment by the crown of inspectors, authorized to inspect periodically and to report upon all places in which persons can legally be confined—one of the most important of the safeguards against irregularity or abuse which the legislature has hitherto created. Soon afterwards, the gradual decrease, and in the end the almost total abolition of transportation, rendered necessary the large convict establishments to be subsequently referred to. With great deliberation, and after much inquiry, the plans of the prison of Pentonville were adopted in 1842, as those of a model prison, calculated to meet all the requisites of prison discipline which the science of the age had devised. Parkhurst had been established in 1838 for young offenders; and to these were added the establishments of Portland and Portsmouth, Dartmouth, Chatham, and Brixton.

Hulks.

It is proper, as part of this brief history, to state that from an early period the deficiency of prison accommodation for convicts before their removal had rendered it necessary to find some other receptacle for them, and unfortunately none better suggested itself than the hulks of old abandoned war-ships. It was necessary subsequently not only to detain in them convicts awaiting their term of removal, but convicts for the shorter periods, such as seven years, during the whole period of their sentence. In the hulks numbers of the most hardened offenders were herded together for years, with such consequences as may be readily conceived. There is scarcely any defect in penal discipline of which these establishments were not flagrant and steady examples. A professed necessity kept them in existence during a long period of public condemnation, which was almost universal. They have only lately been abandoned, and their example is not likely to be again followed.

Scotland.

In the meantime, in Scotland, almost all the characteristic defects of the English jails flourished in an exaggerated shape. A parliamentary inquiry into the state of the Scottish prisons occurred in 1826, but the first legislative relief was accomplished in 1836, when the prisons were brought, like those of England, under the eye of a government inspector. Mr Frederic Hill, the first person appointed to that duty, summed up in the following terms the defects which he found:—"Want of the means of separating prisoner from prisoner, and of preventing intercourse from without; want of employment, and of provision for teaching the prisoners a trade or other occupation by which to earn an honest livelihood when restored to society; want of mental, moral, and religious instruction, insecurity, the luxurious diet, and the life of ease in some prisons when compared with the food and labour of the lowest class of honest and industrious people; great expense of many of the prisons; incompetency of many of the keepers; want of female officers; want of the means of inspection; want of cleanliness and ventilation; sloth and injury to health, induced by the long time the prisoners pass in bed, and want of a uniform system." Escapes were very frequent. From a national distaste at the infliction, as well as the endurance of restraint, there was a laxity about external communication, which would have seemed strange in England, even before the improvement of prison discipline there. The inspector in his second report, in reference to one of the northern prisons, after mentioning that a prisoner had been allowed to attend a public meeting, said,—"It is stated that prisoners were sometimes allowed to go to supper parties, and this with the key of the prison in their pockets, in order that they might return without disturbing the jailer. A gentleman whom I met sometime after leaving Dingwall told me, that happening to be at that town once on the market-day, and standing at the window of the inn opposite the jail, he was amazed to see a large fish apparently running up the wall of the prison. The fish having reached one of the upper windows, disappeared; and it then occurred to the astonished spectator, that the fish owed its ascent to the assistance of the inmates, and in this view he was confirmed by the sight of a cord with a hook at the end, which he saw descending from the prison window. A boy who was stationed below took hold of the hook when it got within reach, and, watching his opportunity when a fishwoman was looking another way, fastened it in the gills of one of her fish, which instantly rose in the air."

It was determined at last to make a sweeping reform of the Scottish prisons, and it was accomplished in 1839 by the act of 2 and 3 Vict., c. 42. The varied and multitudinous bodies, chiefly municipal, which had authority over the prisons were suppressed, and a local board was appointed for each county, to act along with, and to a certain extent under the direction of, a general board for the kingdom. The number of prisons, which amounted to about 170, was speedily reduced to about 70. New prisons were built suited to carry out the separate system, which is in force in every prison in Scotland, with the exception of casual and temporary instances, where sufficient room is not found for it. In strictness and completeness of control, the Scottish system is now nearly as far above as it was formerly below the English; and it may safely, for instance, be held, that in that part of the empire the abuses which were revealed in the jail of Birmingham in 1854 would not have been permitted to occur.

Ireland.

It will readily be supposed that the prisons of Ireland had not advanced beyond those of the other parts of the empire. Legislative improvements in that country generally follow the model set by England; and on this principle an act was passed in 1826 for regulating the prisons of Ireland, 7 Geo. IV., c. 74.

It will be easily seen from the preceding statements, and

Experiments in prison discipline.

is indeed well known to every one, that there are great diversities in the practice of prison discipline, and in the manner in which different prisons are managed, even in this country. It is not the object of this paper to lay down a canon of prison discipline, by setting forth that system which is to be held sound while all others are unsound. It is rather the object to trace the progress which the science has made through the suggestions and experiments of its masters, and to describe the practical character of the discipline which at the present day is sanctioned by the greatest amount of practical authority. We shall most conveniently find our way to the character of this modified system by glancing at some experiments in which extreme systems were tried and found wanting.

The solitary system.

The experiments which for several years have been abundantly made in prison discipline have dealt with three chief elements,—1st, Solitude; 2*d*, Silence; 3*d*, Labour. Other adjuncts, in themselves more important, such as education and the ministrations of religion, are not properly mere elements of discipline, however urgent it may be that the opportunity of captivity may be taken for endeavouring to impart them to those who otherwise are denied participation in such blessings. Solitude and silence have been experimented on separately and in combination. Solitude has, from accident or design, often of course been an aggravation of imprisonment before people thought of such experiments; but solitude, as an element in prison discipline, means solitude carried out towards whole classes of prisoners, however numerous, by arrangements which are costly and troublesome, and are intended to promote good ends. A prison on the solitary system must have a cell for each inmate. This system, which was carried to perfection in America, was also practised in the Gloucester penitentiary towards the end of the eighteenth century. Afterwards it was adopted in the bridewell of Glasgow, but in a modified shape, since the solitaries received moral and religious instruction in their cells. It was in Philadelphia that the system was emphatically developed. The Quaker population in that state succeeded in 1786 in their long struggle for abolishing the punishment of death. All punishments involving corporal violence, such as mutilation and the lash, were abolished at the same time; and in looking round for some passive infliction, which should go as far as possible to supply the place of these abrogated terrors, the enemies of bloodshed and violence fell on the practice of continued solitude without labour, books, or any means of occupation to mind or body. On this principle the Wallnut Street prison was first built with thirty cells. The idea being welcomed as the simple solution of all difficulties in prison discipline, was presently followed in Maryland, Massachusetts, Maine, New Jersey, and Virginia. Whatever imperfections appeared in it were attributed to the limited scale of the experiment, and the Pennsylvanians resolving to give it more scope, built the prisons of Pittsburg and Cherryhill. New York at the same time arranged to carry out the system on a great scale in the renowned penitentiary of Auburn, founded in 1816. It is clear that, however easy it may be, at sufficient cost, in such a place, to isolate the tenant of every cell, yet to render this solitude entire and uninterrupted from day to day, and month to month, is scarcely possible. Though machinery may be made to convey to the prisoner his food, and to remove what it is necessary to remove, it is scarcely possible but that, from some accident, the attendant warder may be for a moment seen or heard. The Americans, however, before allowing doubts to be thrown on their idea, pushed it to its utmost conclusions with a relentless rigour, which in this country would not be tolerated. One who had a favour for it in moderation says,—"A trial of solitary confinement, day and night, without labour, was made at Auburn in the year 1822, for ten months, upon eighty of the most hardened convicts. They were each confined in a cell only 7 feet long, 3½ feet wide, and 7 feet high. They were on no account to be permitted to leave the cell during that long period on any occasion. They had no means of obtaining any change of air, nor opportunities of taking exercise. The most disastrous consequences were naturally the result. Several persons became insane, health was impaired, and life endangered. The discipline of the prison at that period was one of unmixed severity. There was no moral nor religious instruction of any kind communicated within its walls, nor any consolation administered by which the convict was enabled to bear up against the cruelty of this treatment. Nor was a trial of the same description which took place in the state of Maine conducted under more advantageous circumstances. The night-rooms or cells at this prison are literally pits entered from the top by a ladder through an aperture about 2 feet square. The opening is secured by an iron grate used as a trap-door. The only other orifice is one at the bottom about an inch and a half in diameter, for the admission of warm air from underneath. The cells are 8 feet 9 inches long, 4 feet 6 inches wide, and 9 feet 8 inches high. Their gloom is indescribable. The diet during confinement was bread and water only. Thus immured, and without any occupation, it will excite no surprise that a man who had been sentenced to pass seventy days in one of these miserable pits hung himself after four days' imprisonment. Another condemned to sixty days also committed suicide on the twenty-fourth day. It became necessary to remove four others who were unable to endure this cruelty, from the cell to the hospital, repeatedly, before the expiration of their sentences." (Crawford's *Report on the Penitentiaries, United States*, p. 16.) In fact, it was a normal result of this system, that the over-tortured mind found refuge in insanity; and so it came to pass that a body of benevolent Quakers, seeking to abolish bloodshed and violence, had by one simple idea discovered a more efficient and protracted system of torture than the ingenuity of all the tyrants of the world had enabled them to devise.

The silent system.

The other great experiment—the silent system—was also devised by the Americans, who drove it to its utmost conclusions with characteristic zeal. It was adopted at Auburn as a resource against the destructive influence of the solitary system, and was afterwards brought to perfection in the no less renowned penitentiary of Sing-Sing. The principle of absolute solitude was still enforced while the prisoners were in their cells; but they were drafted out into large rooms, where they worked in common. In these, the characteristic feature of the discipline was carried out by their working in total silence, never looking to each other, or making any sign, and never even glancing at a prison officer or a stranger visitor. To see a hundred desperadoes thus pursuing their silent labours under the vigilant inspection of no more than five or six officers, gave the visitor an emphatic notion of the control which discipline is capable of achieving over those who are so little under their own control. If it did no other service, the silent system taught confidence to prison disciplinarians, and made them aware how futile all danger from their wayward subjects might be rendered by method and firmness. It has been maintained, and seems probable, that this system of relentless restraint was little less destructive to the intellect than the absolute solitude it superseded. But it was found accompanied by necessary conditions fatal to its success. The only method of carrying out the discipline was by giving the free use of the whip and the rod not only to the superiors of the prison, but to the humblest discipline officers. Messrs De Beaunont and De Toqueville, who were partial to the arrangement, say in their celebrated Report on the American Penitentiary System,—"At Sing-Sing, the only punishment for those who infringe the established order is that of the whip. The application of this disciplinary means is there very frequent, and the least fault is punished with its application. For various reasons, this punishment is preferred to all others. It effects the immediate submission of the delinquent; his labour is not interrupted a single instant; the chastisement is painful, but not injurious to health; finally, it is believed that no other punishment would produce the same effects." In a note to this passage, the authors say, that "no register is kept of disciplinary punishments." Mr Crawford states that a rule had existed prohibiting the infliction of more than thirty-nine lashes at a time, unless in the presence of an inspector; but the punishment was thus found to lose its prompt efficiency, and the restraint was removed. "The quantity of punishment is entirely dependent on the will of the overseer, against whose acts there is no appeal." The very principle of the establishment, indeed, precluded not only all appeal against it, but all knowledge of the fact that punishment had been inflicted, unless such as the officer inflicting it might think fit to reveal; for it was a crime for a prisoner to speak either to a stranger or an official visitor to the prison. There was thus established in the heart of a republic probably one of the most perfect models of irresponsible power by man over his fellow which the world had known. The nature of such a power may be best judged, not by the abuses charged against it, for no one can tell how much exaggeration there may be in such charges, but by an instance of its moderate and legitimate use. An assistant keeper was charged with cruelty to a pregnant female convict. There was no witness but himself and the convict; and his own statement of the case—a statement on which he was acquitted and retained in his office—was as follows:—"Mr Parks told me to flog her. I then took a cow-skin and went into a room, telling the two blacks to watch, and if she came at me with any dangerous weapon, to defend me. She then went and sat down upon the bed, appearing to me to be somewhat frightened, and told me if I whipped her to death she would not move. Her convict frock was open and large, so as to leave her shoulders bare, it being warm weather; and I struck her about three or four blows on the shoulder, and I think not more, and on the naked skin, and then stopped and admonished her as to her conduct." On receiving from her some abusive language, he says,—"I then gave her three or four strokes with the cow-skin. She sat firm, and seemed determined to brave it out, swearing that she would not submit. I ceased again; and observing that the blows left marks upon her shoulders, and fearing I might break the skin, and as she continued to rave, I struck her a few blows above her knees, and in front, as she sat." The woman's account of her chastisement was of course more formidable. She died, and it was certified on medical authority that the whipping had caused her death. The managers of the institution thought otherwise; and on the man's statemen of the way in which he had used it, retained him in his irresponsible power. They did so apparently for the purpose of maintaining some rigid principle, and the general tendency of the inquiry is to show that they had intentionally deprived themselves, by the rules they had adopted, of the means of ascertaining whether their officer was guilty or innocent. (Crawford's *Report*, 18, 19.)

It is questioned whether the silent system, when carried out with the highest skill and the most implacable rigidity, accomplished its purpose of precluding communications among the prisoners. All who are practically acquainted with prison discipline know that, under repression, the faculties left available—and there will always be some—attain an abnormal power and sensitiveness, as the remaining senses do for the service of those who are blind or deaf. It is almost impossible to anticipate what may be achieved in this way among hundreds of restless creatures all bent on one object. The keepers of prisons, where much more effective means than the silent system have been available for intercepting communications, have remarked, that it seemed as if some supernatural agency were at work in the rapidity with which prisoners make themselves acquainted with facts supposed to be beyond their possible knowledge, and communicate them among all their brethren. The inspectors of prisons on the silent system, approaching however noiselessly, and peeping through an inspection-hole covered with coloured glass into a workshop, would, by a certain flutter in the demeanour of the prisoners, see that their presence there was known; and discoveries were sometimes made which showed a thorough understanding of some concerted plot in the penitentiaries of America. It is understood that in that country the silent system is no longer observed in its integrity. It had its admirers in this country, who, however, had no opportunity of carrying it out with a like rigour. It was long avowedly the system of the Cold-Bath-Fields prison; but this building, containing 1400 prisoners on short sentences, ever coming and going, had in reality little in common with the sepulchral silence of Sing-Sing.

Labour.

This American experiment performed one eminent service. It gave the first emphatic practical testimony to the value of labour as an element in prison discipline. Perhaps the earliest work in which labour is spoken of not as a punishment, but rather as a corrective and resource, is in an Essay on *The Prisons of the Religious Orders*, by Mabillon, a work in which there is an amount of practical sagacity available even for the present day, which it is strange to owe to a Benedictine monk of the seventeenth century, whose chief studies lay in antiquities. (*Ouvrages Posthumes de Mabillon*, iii. 321.) Employment in productive industry stands prominent among the prison reforms both of Howard and Bentham, and it had been practised in the rasp-houses and spin-houses of Holland. Now that it has thoroughly established itself as a fundamental principle of prison discipline, and is in fact almost the only large operative principle about the value of which there are nowhere two opinions, it seems marvellous that the inhabitants of our jails should so long have been driven by forced idleness to spend their time in ribaldry, mendicancy, trickery, mutual corruption, and all available vices. Labour draws the prisoners off from mutual communication when they are associated, and is the best solace and safeguard to the mind against the ravages of solitude. It teaches the criminal, while he is in custody, that lesson of duty and service which he has not learned, or has not practised, in freedom; and if his captivity be long, it may even communicate to him the means of earning his bread by honest industry. Nor, while thus beneficent in its operation, does it tend sensibly to decrease the terrors of imprisonment; for, however much the criminal may feel the blessing of occupation after he is immured, it is not one of the characteristics of his class to look forward to labour as a boon. It is a further though secondary advantage of prison labour, that it economizes the expense of punishment. To make prisoners self-supporting is an object which has been frequently pursued of late, but without much success. It was accomplished, however, in the American penitentiaries under the silent system, and was one of the boasted advantages of assembling the prisoners together in large bodies, where they worked under the discipline of terror. In Belgium it was at one time the practice to farm the produce of prison labour to contractors, who were allowed to hold out inducements to the prisoners to work hard, and thus plied them with spirits and tobacco. When prisoners are kept in separate cells, and the discipline proper to their condition is deemed more important than the value of the work done by them, the produce of their labour never repays more than a small portion of the cost they occasion. This is to be understood of criminals kept within the walls of prisons. Convicts who are undergoing in this country a substitute for the transportation to Australia which used to be their lot, can be gregariously employed in labour of many very effective kinds; but it has hitherto been found most expedient to apply it to docks, harbours, and other public works.

Hard labour: tread-wheel, crank.

The efficiency of labour as an element of prison discipline has sometimes been estimated so highly that it has been deemed all-sufficient for the sole object in view. A criminal, as the case is sometimes put, has incurred a debt to society, which he is bound and should be entitled to work off by the results of his industry. Such a debt would fall upon the debtor with a weight very inadequate to its proper magnitude; for great criminals, who are often very clever men with extensive practical resources, could be rapidly reducing the debt against them, while their stupider and perhaps less guilty neighbours would find the effort entirely hopeless. The established systems of prison discipline in this country, far from admitting the principle, that the prisoner's labour is exacted as a material payment of his debt to society, sometimes exact unproductive labour where that debt is greatest. The application of "hard labour," or unproductive and purely afflictive exertion, is one of the least satisfactory problems in prison discipline. The shape in which it was first practised on a large scale was the tread-mill,—a great cylindrical wheel turned on its axis by the tread of a certain number of prisoners. To this form there was the objection, that it could not be modified to the strength of individual prisoners,—all must take step after step together upon the wheel as it revolves, and bear the infliction, great or little as it might be, of mounting a certain number of steps. A form of hard labour has been introduced in the military prisons, called the shot-drill, consisting in the piling, removal, and re-piling of pyramids of heavy shot. The standard form of hard labour, however, in the ordinary prisons is now the crank. It consists of a small flaked wheel, a little like the paddle-wheel of a steam-vessel, which, as the prisoner turns a handle outside, revolves within a box which is partly filled with gravel. The continuous shovelling up of the gravel, as a paddle-wheel tosses up the water, is the labour performed. The amount of strength necessary to each revolution can be regulated to the utmost nicety by the quantity of gravel raised. An external register records the number of revolutions made, and it is usual to place the register outside the prisoner's cell. Prisoners are not set to this hard labour at the discretion of the prison authorities; they are condemned to it as part of their sentence by the court which tries them. This kind of afflictive labour is not a beneficent element of prison discipline, and many are the plausible arguments launched against it. But it has the stern support of practical effectiveness. It was devised to increase the odiousness of the prison to the criminal, and stimulate his efforts to keep beyond its walls; and, by the testimony of practical men, it has had this good effect.

stablishent of the parate stem.

Founded on the experience of the great experiments just referred to, there came into practice, by a sort of general assent, an arrangement which has been called "the separate system," although in reality it is not so much a system promising positive results from itself, as a practical compromise, keeping clear, on the one hand, of blind negligence, and on the other, of those absolute principles, such as silence and solitude, which were found to be so destructive. The first object of this system is to keep the prisoners from contaminating and criminal communication with each other. From the old jails the youth who had just entered the borders of crime often went forth an accomplished depredator. While the experienced contaminated the young, they planned in the dissolute idleness of the prison-yard, new depredations. Altogether there could be no doubt that, whether or not the terrors of punishment restrained from crime, a residence in a prison generally made a man more vicious. To extinguish at once this cause of deterioration, the separate system provides a cell or room for each prisoner. The arrangement is costly, but its cost must be met by those who think its advantages worthy of being purchased. In his cell the prisoner is supplied with work and books. Since he is not to keep company with his fellows, and yet is not doomed to the horrors of solitude, arrangements must be made for furnishing him with a limited amount of improving society; and this also is costly. His most valuable visitor will be the prison chaplain or the clergyman of his own faith. If there be in the callous bosom of the reprobate any seeds of faith and goodness, the decorous repose of a well-ordered prison, and the judicious admonitions of a zealous minister, will give them their best opportunity for quickening. How much hypocrisy may often be developed on such occasions,—how many times the deceitful heart is reconciled to virtue only so long as the opportunities for vice are distant, are questions it is unprofitable to ask. The opportunity should be given liberally by a proper supply of able and zealous chaplains, though the results must remain in impenetrable secrecy; for to investigate the statistics of penitence and reward professions of reformation, would obviously lead to the grossest acts of deception and hypocrisy. The clergyman's efforts are aided by the teacher, who probably imparts even to the old offender the first rudiments of civilized knowledge. The visits of the physician come at intervals, and the discipline officers are instructed at stated times to enter each cell. More rarely his cell will be entered by the chief of the prison; and at longer intervals a government inspector or a director will visit him. Such are the usual provisions for removing the character of solitude from separate confinement. Besides its influence in obviating contamination, some have sought, in a very rigid rule of separation, so far to isolate prisoners that they shall not be aware of each other's presence under the same roof. It is desirable certainly, that if a man becomes penitent, the full amount of his iniquities should not be known to the companions who are likely to seduce him from reformation; and it is still of far greater moment that the fresh offender, who desires altogether to cancel his connection with the world of crime, should not be seen within the prison walls, and afterwards recognised by the hardened criminal. Whenever it is safe to dispense with this pedantry, as some call it, of the separate system, there are countervailing advantages to the discipline. A considerable quantity of vigorous daily exercise is essential to prisoners under long imprisonment. If they take this exercise wholly unseen by each other, it can only be in narrow yards, where they spend a listless hour; while, if paraded in common on a wider space, life and energy may be communicated to their motions. For worship, and sometimes for instruction, association without communication has many advantages over rigid separation. But these, indeed, are all matters at present under experiment and discussion, and it is difficult to get further, without crossing debateable land, than the general principle, that the old, free, corrupting communication among imprisoned criminals should be suppressed.

Secondary arrangements.

Among minor adjuncts, the cleanliness of modern prisons, though occasionally it may be laughed at, is never directly censured. It is essential to health, and its moral influence is beneficial. At the same time, it is no seductive luxury, for, much as well-conditioned gentlefolks would feel the blessing of a clean, well-ventilated modern cell as a substitute for the filthy dens of last century, the criminal classes are little susceptible to the privilege, and it may be questioned if the cleanness and comfort of the cell awaiting him in prison ever crossed the thoughts of a criminal to reconcile him to his actions. Ventilation, dryness, and an abundant supply of light, are adjuncts of a similar character. Nothing, indeed, is generally more surprising to one accustomed to associate safe custody with massive gloom, than the cheerful lightness of the galleries in a well-built modern prison, and the absence of those features of exaggerated architectural strength which belong to the traditional idea of the castle dungeon. Small prisons, where there is no systematic organization, still depend on their structural strength; but where there is a large staff and many prisoners, the chief reliance is on the discipline; and it is considered wholesome to let prisoners feel that they are not an object of terror, requiring very formidable precautions. The harsh, fierce manner which characterized the turnkey of old is now little known in any well-regulated prison. The officers, in exacting obedience to the daily routine of discipline, should be unimpassioned as fate; and the criminal feels himself all the more helplessly prostrate before the strength of the law, that he is an object neither of fear nor of wrath.

It is scarcely necessary to say that the material means of luxury, intemperance, or sensuality should be absolutely unattainable. To graduate the restraints upon the appetites, however, so as to render all sufferers in the same degree is impossible. The regulation food, for instance, cannot be rendered other than a luxury to some; and, as a general rule, prisoners, after a certain period, gain appetite, enjoy their meals, and improve in physical condition. It is impossible to avoid this unless the dangerous doctrine were admitted, that it is proper to deteriorate their physical condition. The prison dietary is, or should be, adjusted to the lowest quantity of plain food which will preserve the human being in his normal condition. The criminal at large deteriorates this condition by his vices, but within the walls of the prison he is not permitted to do so; and thus the world is sometimes invited to see the ludicrous contrast between a criminal fattening within a prison, while the honest workman, who is only a little careless and dissipated, is wasting under the influence of intemperance, filth, and unwholesome diet, just as the prisoner was before he was committed.

Such are some of the chief characteristics of a well-regulated prison, according to received modern notions. In estimating their efficiency, it must be kept in view that they are, so far as their effects are visible, elements of prison discipline only. They provide for the punishment and for the good conduct of the prisoner. In doing so, they save him from the contamination which he would have caught in a prison under the old system; but nothing is more dangerous than to assume that his conduct in prison is the outward sign of inward regeneration. The most orderly and pliant under good discipline may be, and often is, the most hardened villain within the walls. It is necessary to look this unpleasant truth in the face, and to see in it the proper boundaries of the function of prison discipline; but it is right to remember that close imprisonment is a punishment, among us at least, of comparatively short duration. It seldom reaches, and scarcely ever exceeds, two years. The careful scrutiny to which prisons are now subjected has suggested that the separate system in its most approved shape cannot be long enforced without the deterioration of the prisoner. As will be hereafter told, the greater criminals are now to be subjected to years of training instead of years of transportation, and it remains to be seen whether prison discipline, directed into this new channel, will accomplish new and enlarged effects.

Government of prisons.

Besides the adoption of a sound form of discipline as a standing rule, there are many safeguards and precautions necessary to the government of a prison. It is a place of restraint where men must to some extent be under the absolute authority of their fellow-men. The most elementary knowledge of human nature teaches that the kind of man has not yet been found in this world, who can be trusted with power absolute and uncontrolled over his fellow, and the history of prisons is an emphatic commentary on this text. On the amount and character of the control which shall best exact a due responsibility from prison officers, there have been as many differences of opinion as upon the various methods of discipline. Publicity, so valuable and so largely drawn upon in this country, naturally suggests itself; but there cannot be primary simple publicity in a prison. Though crowds might be admitted within the walls at certain times, they could not be always present, while the prisoner and his master are there at all times of the day and night. Confluences of miscellaneous visitors, indeed, while they woefully disturb the influence of a proper discipline, can see or know scarcely anything of what is really enacting within a prison. The old London prisons, in their worst days, and the prisons on the silent system in America, received visitors freely. The visits of strangers to a prison must of necessity be limited, and instead of a fallacious theory, that all the world are entitled to the privilege, it is better fundamentally to draw a line which shall limit it to the class of persons who are least likely to be enticed by idle curiosity, and most likely to use the opportunity for beneficial purposes.

The most important visitor, however, who can enter a prison is an official inspector who is independent of the rulers of the establishment, while he is entitled to investigate all their proceedings, reporting the results of his inquiries to the supreme government, through whom, in this country, they find their way to Parliament. A large portion of the prisons of the United Kingdom are governed by local bodies of a corporate character, who are under more or less responsibility to the government. The most important of the prisons, however,—those in which convicts are detained,—are, as we shall see directly, under official control. In a country where there is so much parliamentary responsibility, such official control is not considered constitutionally dangerous, and it has great advantages in its efficiency and systematic regularity. Still there are distinct appreciable advantages in a certain amount of prison management being vested in independent men of the country gentleman and retired citizen class, were it merely that they may check the extreme and intolerant development of official theories, and give discussion and ventilation to projects of prison discipline, both before and after they are brought into practice.

Imprisonment for debt.

The practice of imprisonment for debt must not be wholly overlooked in tracing the progress of prison discipline in this country, though the peculiarities which at one time communicated to it a too intense interest have become obsolete. It will be noticed that many of the grossest irregularities and worst cruelties in the British prisons were concentrated in this department. These irregularities and cruelties were characteristic of the early defects in our prison system; of the shyness of control and interference, and the consequent latitude to all persons to inflict or suffer to any extent, provided the infliction and the suffering were according to law. As affording scenes of tyranny, suffering, recklessness, profligacy, and villany, the debtor's prison has been a favourite with English writers of fiction; and those even of the present generation will hand down pictures from this favourite field of study which will doubtless excite the indignation and astonishment of posterity. A revolution has been almost noiselessly made in this department by the re-adjustment of the laws of debtor and creditor. Formerly the creditor was denied access by form of law to the debtor's estate, and he took vengeance on his person; hence the industrious man might be kept idle, separate from the means of supporting his family, or even paying his creditor; and on the other hand the man of fortune might live in jail, spending his money, and defying his creditors to touch his estate. The procedure for realizing and appropriating the property of the debtor has now, however, been rendered more complete and effective. At the same time, the honest and fair debtor can obtain a speedy discharge under one of the bankruptcy or insolvency statutes. It hence arises that those who are now long detained in prison for debt are in some measure criminals as well as debtors, having been guilty of fraud or culpable recklessness. There is thus less reluctance to subject them to the rigid discipline applicable to criminals, with its cleanliness, order, and abstinence. The prison tavern, a fixed characteristic of the old debtors' prison, if it now exists anywhere, must do so in defiance of authorized regulations against it.

iscellaneous unishments.

Having thus followed the practice of simple imprisonment down to the present day, it will be proper to glance at those other forms of punishment which have always been more or less connected with it, in order that we may see more distinctly the sources and character of the mixed form of penal discipline which has lately come into operation in this country. It is obvious that detention within the walls of a prison is a very costly punishment, which a cruel or penurious government will abandon for a readier and cheaper. Afflictive therefore as its practice has been in England, its extensive use there is yet a testimony to the national moderation and clemency. Nowhere else, unless perhaps in Holland, did its use preponderate so much over more violent methods of punishment. Although our criminal code was eminently sanguinary, actual executions were more rare than in most other countries. Excepting banishment and transportation, to which we shall presently come, almost the only other forms of punishment much in use in this country were the stocks and the pillory, which, in addition to a certain amount of painful restraint, subjected the victim to the brutality or spite of the miscellaneous public. The brutalizing tendency of the pillory, the proper sphere of which was generally some public market-place, is at once obvious; and, dependent on the immediate impulses of a mob, it sometimes elicited cruelties which ended in death, and at others was turned into an ovation which reversed the object of the punishment A popular publisher, in George III.'s reign, stood in the pillory with a laced footman on either side attending to his wants, and an obsequious crowd offering him homage. These forms of punishment, along with that of public whipping, have been long disused. Whipping has been lately restored in another form. It is, except in some special cases, only applicable to boys or very young men, and is administered privately in the presence of responsible officers.

The barbarous punishment of mutilation was not quite unknown in Britain, although the occasions for its legal infliction were peculiar and rare. Torture, which was largely used in other countries, was always very offensive to the national feeling, and never established itself as a fixed institution. By far its most extensive use was in examinations of persons charged with witchcraft. Whenever that word was employed, all concerned seemed to be driven by a panic of terror and hatred entirely out of the bounds of reason and humanity, and things were done by people of station and good repute which cannot be excelled by any cruelties on record. Apart from this one blot, it is ever a remembrance of proud satisfaction in this country that, careless as the administration of justice sometimes was, and afflictive in its carelessness, our ancestors would not attempt to perfect it by introducing the horrors of the "question," or probationary torture. The vindication of this infliction has ever been, that the object is to spare life by exciting through torture the certain evidence of a confession. But apart from the numberless instances in which the confession so extorted must have been false, the torture itself, which generally reduced the victim to utter helplessness, was a punishment far worse than death. We may form a notion of what it was, only too painfully distinct, in the celebrated cases of Urban Grandier and the Calas family. Slavery at home is a form of punishment which has ever been inimical to the constitution and habits of this country. Though we have now forced labour in the convict establishments, the form in which this punishment has been carried out among our neighbours, by the convicts working here and there in chains on streets, quays, or other public places, was nearly as offensive to our people as slavery. Among the continental governments, the mines have formed the easiest form of punishing by slavery and forced labour. This, as we have seen, was a method of punishment among the Romans, and it is possible that there are mines in central Europe which have never ceased from their time downwards to receive convicts. There is no kind of place of custody whence escape can be rendered so hopeless, and none so secure from stray inquiries after the fate of those who have been dropped into them, and left there to perish forgotten. The Russian empire has the reputation of possessing in its mines the most terrible places of punishment in the world.

The galleys *bagnes.*

A well-known form of punishment in some European states was the galleys. They were almost peculiar to countries bordering on the Mediterranean, being unsuited for more stormy seas. They were ill-shaped, narrow vessels, with benches for rowers. To these benches the galley-slaves were chained. Fixed to their benches day and night, the state of filth and brutality in which they existed is at once understood; and yet, with the free air around them, their condition was less to be deplored than that of victims of a higher rank, whose privilege it was to occupy dungeons. Galley slavery was introduced into France about the fourteenth century. Its head-quarters were at Marseilles, where there was a renowned fleet of these vessels. France sometimes engaged to take prisoners from other countries into her galleys, which had a high repute, and sometimes portions of the fleet were let for the service of some Mediterranean power. The neighbeuring states on the coast of Africa imitated the happy idea, and kept fleets of galleys manned by Christian captives. In 1748 the galleys were abolished, and the convicts were confined in *bagnes*, which were either buildings or old hulks. There they were, as formerly, chained to a bench; and though sometimes required to work, they were in general left in idleness. The natural taste of the French for ingenious efforts of handicraft was remarkably developed among these men, who made the bagnes of France famous for the quaint toys and *bijouterie* fabricated in them. After the first revolution, the *travaux forcés* were adopted, and the convicts were kept at systematic labour. The removal of the convicts to these depots was both offensive and dangerous. At any great prison, such as the Bicêtre, when a sufficient number of convicts had accumulated to make what was traditionally called a *chiourme*, they were rivetted to a long chain, and sent off to walk to their destination attended by guards: "Woe," says Vidocq, "to the females whom they met, or the shops which they came near. The women were assaulted in the grossest manner, the shops stripped in a twinkling." This method of transit was not abolished until 1836. The Memoirs of Vidocq, the celebrated secret agent of police, give a lively description of the scenes in the prisons of detention, in the passage of the chain, and in the bagnes. If his own attempts to vindicate himself may be discredited, there is no occasion to question the general fidelity of these accounts, which are equally characteristic and horrible. There is nothing too abominable for belief in places where 600 convicts were after their labours herded together in one great hall or apartment, with sentinels around to bar exit, but no attempt at order or discipline within. France subsequently produced many able expositors of prison discipline, and the bagnes were by degrees improved. They were abolished by the present imperial government in 1852; and the system of transportation was adopted in France just as it had virtually come to an end in this country. To those who were already condemned it was thought fair to make transportation an alternative at their choice. Books were opened for volunteers at the bagnes of Rochefort, Brest, and Toulon. The result was the converse of what was lately exhibited in this country when transportees were required to stay at home. A rush was made on the books, and 3000 names instantly adhibited. (Berenger, *De la Répressión Pénale*, i. 378.) It might have suggested itself as a question, whether a mode of punishment which convicts adopted for themselves so zealously would be likely to meet the legitimate purposes of punishment. The French convict settlement is in Guiana.

Origin of transportation from Britain.

Before the date of this experiment Britain was the only modern European power which systematically practised transportation. It was long viewed with distrust, as infringing on an old constitutional rule against inflicting punishments on British subjects beyond the realm,—a rule suggested by the continental possessions of the Plantagenets, and the opportunity which these afforded to the crown of evading the English laws for the protection of the liberty of the subject. An interval elapsed after this danger had passed away before the possession of colonies opened up the means of administering punishment abroad in places over which Parliament and the law had rather more control. Something like transportation is enacted in the celebrated vagrancy statute of 39 Elizabeth. It provides that where the said rogues "shall be dangerous to the inferior sort of people," or shall remain incorrigible "in their roguish kind of life;" after the discipline of the act has been applied to them, they may be committed to jail to await the quarter-sessions, where the justices may ordain that they "be banished out of this realm, and all other the dominions thereof," and "be conveyed into such parts beyond the seas as shall be at any time hereafter for that purpose assigned by the Privy Council unto her Majesty." The earliest known enforcement of this law is attested by a letter of King James I., written in 1619, and addressed to the treasurer and council, commanding them "to send a hundred dissolute persons to Virginia, whom the knight marshall shall deliver to them." (Chalmers' *Pol. An. of America*, p. 46.) The term "transportation" was first used in an act of a similar tenor passed early in the reign of Charles II. It was adapted more systematically to the purposes of punishment by an act of 1718, which authorized the criminal courts in clergyable offences, or those which were nominally but not really punished with death, to give over the offenders to contractors, who engaged to transport them to the American colonies. The contractors were vested with a property in the labour of the convicts, for seven or fourteen years, and this right they sold, generally by auction. These convicts became valuable to the planters in those warm southern states, where the unwillingness of the inhabitants to devote themselves to any kind of toil, and the consequent temptation to exact labour by force, have ever been inimical to the interests of freedom. Hence, before the greater attractions of Negro slave labour were felt, there was much competition for the convicts. Their value, indeed, led not only to stretches of the law, but to an organized system of kidnapping along the British coast. Young lads thus seized and carried off were passed through the ceremonial of an apprenticeship, but the planters were under no responsibility, and virtually these apprentices were white slaves. These practices were suppressed about the middle of the eighteenth century, but the legitimate traffic in convicts continued to be vigorously pursued until the American war of independence closed the market against it. Governor Philip, when employed to find a substitute for it, remarked that "the benefits of this regulation were various. The colonists received by it, at an easy rate, an assistance very necessary, and the mother-country was relieved from the burden of subjects which at home were not only useless but pernicious; besides which the mercantile returns, on this account alone, are reported to have risen in later times to a very considerable amount." This he estimated at L.40,000 a year, being the price of 2000 convicts sold at an average amount of L.20 a head.

America.

Africa.

In looking over the world to find a spot fitted to succeed the American colonies as the receptacle of convicts, the west coast of Africa was the first to attract attention, and a few criminals were actually sent thither. There were many reasons, however, against such a selection; among others, was the insalubrity of the district; and although there were people who thought it no objection to the place chosen for a criminal population that it was one where they might be short-lived, it was for the consideration of these, as well as of others who thought it improper to subject convicts to a form of punishment which might prove capital, that the penal stations were to become important colonies, and should be fitted for the permanent residence of free immigrants. The great island-continent of Australia, newly made known to the world by Captain Cook, was at length adopted for several reasons; among others, because it was remote, it was salubrious, and it was believed to possess undefined elements of wealth, among which a large prosperous community would arise capable of absorbing the criminality of Britain.

Australia.

There probably never was an occasion in which hopes were so fully entertained that the solution of the great difficulty had been found, and crime was on the eve of extermination, as the juncture of commencing transportation in this new shape. And as these hopes were the fruit of much earnest reflection and discussion, they were undoubtedly so far justified that the new system was a vast improvement on the old. When convicts were sent to settled colonies exercising a certain amount of free-will, the convenience and profit of the colonists could alone be consulted. Now the colony was to be made for the purposes of carrying out penal discipline, and the free emigrants who chose to go to it must take it as they found it, and make their convenience subservient to its primary objects. The chief feature in which this difference became at once distinct was that, while the transportees to America were handed absolutely over to individual owners, those sent to Australia were to be put into the hands of a responsible public officer —the governor of the colony.

The new system was officially organized by orders in council dated 6th December 1786, issued under the powers of an act which vested the selection of the proper place in the hands of the king and council. The first fleet, as it was termed, sailed in March 1787 from Plymouth, conveying 600 male and 250 female convicts. There was immediate evidence that, with whatever deliberation the quarter of the globe had been selected, the subsequent proceedings were rash and hasty; for so little preparation was made for the reception of the colony that it had actually to search along the coast for a proper site. It was supposed that Botany Bay, of the fertility of which there had been a glowing description, was to receive the new convict colony; but the governor, Captain Philip, found a better site within the heights of Port Jackson, where he founded the town of Sydney.

Early history.

It appeared to be supposed that, going to a fruitful country, the convicts would soon be able to provide for themselves. They were accompanied by a staff of agricultural superintendents, who were to direct them in the cropping and general management of the land, as if they were a body of agricultural labourers entering on possession of a few established farms at home. But it was found that the convicts could not do farm labour if it had been duly set to their hands; and that the agricultural superintendents could not have rendered Australian land available if their hands had been the best farm labourers in England. It was of course deemed necessary to provision the colonists until they could raise food for themselves; but so imperfectly was this accomplished, that a famine placed them, from the governor downwards, on starvation allowance, and only the prudent firmness of the governor kept them from extirpation until the arrival of a second fleet with convicts and stores brought temporary relief. A large portion of this second detachment died by the way; and it was said that this mortality, by lessening the number to be fed, saved so many lives on shore which must otherwise have yielded to privation. Of the general condition, moral and material, of the infant colony, the select committee on transportation in 1838 afford the following brief description:—"The community was composed of the very dregs of society,—of men proved by experience to be unfit to be at large in any society, and who were sent from the British jails, and turned loose to mix with one another in the desert, together with a few task-masters who were to set them to work in the open wilderness, and with the military who were to keep them from revolt. The consequences of this strange assemblage were vice, immorality, frightful disease, hunger, dreadful mortality among the settlers; the convicts were decimated by pestilence on the voyage, and again decimated by famine on their arrival; and the most hideous cruelty was practised towards the unfortunate natives. Such is the early history of New South Wales."

It was maintained at the time that this new form of transportation created a lively terror among the criminal population. Little was known about the actual fate of the ship-loads of convicts despatched from time to time, until Colonel Collins published his account of the colony in 1804, but the little that transpired was a history of calamity. No element as yet appeared in the arrangement attractive to the minds of criminals. The mysterious disappearance of their friends into a distant wilderness raised appalling prognostications, which were aggravated by an opinion current among the favourers of the scheme, that somehow or other it would be found that those who were sent out would never return, and that this indeed was the most hopeful feature of the scheme.

Encouragements to onvicts.

It was not intended, however, in the formation of the new colony, that the convicts should continue to be dropped on the barren shore of a wilderness. There was to be a mixed colony, of which the convicts were to be a portion; and in the further stages of the experiment we have to look to the position of the criminals, as affected by that of the free colonists. But while it was contemplated that the convicts should form merely one element in a miscellaneous settlement, all the primary preparations were made for them alone. The first step in free colonization was taken in the year 1791, when the governor made three grants of land to free settlers, giving at the same time one grant to an emancipated convict. For some years grants of land were given occasionally to free settlers or to emancipated convicts, or emancipists, as they were termed. There was no rule of preference, and the distribution appears to have depended on the immediate expediency, in the eyes of the governor for the time being, of making or withholding grants. The placing of the convict in a position in which he could hold property by emancipating him, was in the same arbitrary position,—depending on immediate circumstances and personal opinions or predelictions. Writers who have entered on the local politics of the colony have severely criticised the grounds or motives on which classes of the population or particular persons were encouraged or discouraged. Without entering into these discussions, it is sufficient to note them among other indications, that from the beginning there was no effort to mark distinctly the condition of the transported offenders. It became known that many of them had suffered hardships which rendered their sentence a cruel and protracted death; it was soon afterwards known that some of them were comfortable landed proprietors, and that others were making fortunes. In the year 1810 Governor Macquarie, who was charged with increasing the encouragement given by his predecessors to convicts, appointed an emancipist named Andrew Thomson to the magistracy. He vindicated this action on the ground that he intended in an emphatic manner to restore the man to respectability because he had earned it by his good conduct; but on the other hand, it has been maintained that the man was made a magistrate merely because he was active, clever, and successful.[1] Soon afterwards, three emancipists, backed by a recommendation from the governor, applied to the supreme court for license to act before it as attorneys. The application was strenuously resisted by Mr Bent, the head of the court, who was presently afterwards recalled by the home government. Thus, in the earlier stages of the system, the convict was either a captive in the hands of the government, who kept him in imprisonment, or at most allowed him the limited freedom of a bondsman employed in public works; or, when there was any relaxation of this condition, the convict might be in the way to make his fortune or to become eminent and influential.

The assignment system.

In the meantime, however, the influx of free settlers operated as a relief, by creating a middle stage, and rendering it no longer necessary that the convict should be either a prisoner or a landed proprietor. The system of the assignment of convicts to the free settlers commenced. At first it was necessary to bribe them with privileges to take convicts off the hands of government; but as the several Australian colonies increased, there came to be a competition for assigned convicts, rising in eagerness according to the order of their usefulness. This was a restoration of the American system, but with a large difference. The assignee held the convicts, not in his own right, but as representing the government, and under the conditions imposed by the government. Among these there was a restraint on corporal punishment, which could only be inflicted by a magistrate. The punishments for offences against discipline were severe, and were very readily inflicted by a magistrate on the master's statement; but often the distance from the magistracy nullified the right to punish, and the only hold on the convict was the risk of his being sent to one of the penal settlements, where the irreclaimable, or, more properly speaking, those who could not keep control over their vicious propensities, were kept under strict and severe discipline. The assignee, in fact, did not, like the American purchaser, obtain an actual property in the person of the convict, which he might dispose of by sale or let out on hire.

It happened that the peculiar nature of the Australian lands afforded, for a long time, facilities for advantageously working assignment as a medium of penal discipline, such as no other tract on the face of the globe, except perhaps some portions of Russia and Northern Germany, could have afforded. The available parts of the country were covered with a natural pasture, very thin, but valuable from its vast extent. It took five acres to feed a sheep; but countless millions of acres were obtainable. This gave the greatest facilities for slave labour—that is to say, it gave, to the utmost extent, those conditions in which a mere human being, existing and placed upon the spot, is of value, independently of his expending industry or ingenuity. Not only were many shepherds and neatherds required to take charge of the stock on these pastures, but a still humbler class, called hut-keepers, were employed in numbers, to keep watch in the remote grazing-grounds. The convicts assigned to this function lived far apart from each other, and at great distances from all resorts of man. Thus they could not be spreading contamination or concocting crime, unless they deserted and became bush-rangers. Their luxuries were tea and tobacco; of the great incentive under which most of them had become vicious, ardent liquors, they had none, from the difficulty of taking such a commodity so far inland. It is said that under no possible circumstances could liquor be conveyed to the distant stations, because, the carriers being convicts, and excessively addicted to drinking, no concealment could elude their vigilance, and no bribe or punishment would induce them to spare the liquor committed to their keeping. But as the colonies increased in population and affluence, other less beneficial sources of assignment opened. Among these was domestic service, almost the only means, indeed, which offered for the disposal of the female convicts. There arose by degrees considerable industrial establishments, engaged in building, mining, shipping, and curing the fat and skins produced in the grazing districts. In these it was of great moment to have skilled workmen, clerks, and book-keepers. The practice in the assignment of convicts was, that on a convict vessel being reported to the governor, they were removed respectively to the male barracks or a female penitentiary, where the superintendent of convicts classified them according to their several occupations and capabilities. They were then apportioned out according to the privileges, and, as far as these were consistent with each other, the wishes of the settlers. It was naturally a great prize to a man embarked in a difficult and lucrative business to find, as he sometimes might, a clever criminal trained to it. To the full services of such a person, when assigned to him, he was of course entitled; nor would he be bound to pay for these services more than rations, and other allowances settled by regulation. But there is no such thing as skilful and valuable labour extracted through pure slavery. Though nominally a slave, some of the rewards of this kind of labour must go to the worker before he will give it forth. The expert housebreaker, and the receiver of stolen goods who might have caused the criminality of hundreds of thoughtless young people—the forger, long steeped in guilt—could be very useful, and give valuable service, which did not go without its reward. The poacher, transported for assault—the workman, who, in hard times or under the tyranny of a strike, had yielded to temptation, suffered the hardships and privations of transportation, while he saw these greater criminals rolling in luxury. Worse still: the honest, hard-working mechanic, who had emigrated from inability to combat with the difficulties at home, sometimes found that his own lot was little improved by the change, but saw the country seat and the well-kept carriage of some great notorious offender, and wrote home to his friends an account of what he saw. In the curious autobiography of Hardy Vaux, a London thief of great ability, who had been twice transported to New South Wales, it appears that through his abilities and plausibility he made himself very comfortable there; and from his description of the state of society, it is clear that any clever and expert criminal, if able in some measure to restrain the indulgence of his vicious propensities, could convert his punishment into a means of enjoyment and success. The Parliamentary Report already cited, referring to frauds of an oppressive and cruel kind effected by wealthy emancipists, states that "the instruments were drawn up by convicts; for in those days amongst that class only could persons be found qualified to perform the duties of the legal profession." A state of society, in which emancipist capitalists transacted their business through convict lawyers, is perhaps sufficiently suggestive of triumphant vice; but there are plain broad statements as to the condition of the convict colonies in the same report, a specimen at least of which should be recorded. Thus, among the evils of the assignment system are enumerated—"*First*, The assignment of convicts to their wives or other relations that have followed them to the colony with the proceeds of the offences for which they were transported, and upon which they have set up a profitable business, have become wealthy, and thus have held out to their acquaintances in this country strong temptations to pursue a similar career of crime. *Second*, The employment of convicts as clerks to the various departments of government, where they have had means of acquiring knowledge, of which the most corrupt and dangerous use has been made. *Third*, The employment of convicts as clerks to attorneys, with free access to the gaols, which has given rise in the colony to an unparalleled system of bribery and connivance at crime: at one time even the clerk of the attorney-general was a convict, and performed all the legal business of his master. And *lastly*, The entrusting to convicts of the education of youth in the various public seminaries."

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[1] See the statements and quotations in Lang's *Hist. of New South Wales*, ch. v.

Discipline and punishments of the transportees.

Amid the evils spread by such a system among the free settlers, it is clear that little could be carried on in the shape either of the punishment or the reformation of the convicts. This is but one side, however, of the picture; the other represents the convict amenable to what must have been heavy punishment, if punishment can be entirely measured by the amount of pain, misery, and degradation caused by it. Of the convicts left with the government, or returned on their hands as useless or incorrigible, a large number were employed on public works, chiefly in the making of roads, the first public requisite of a colony. Generally desperate men in considerable bands, they were under strict military control. They were divided into two classes,—those who were in chain gangs, and those who were not. Of the former, the committee of 1838 say,—"They are locked up from sunset to sunrise in the caravans or boxes used for this description of persons, which hold from 20 to 28 men, but in which the whole number can neither stand upright nor sit down at the same time (except with their legs at right angles to their bodies), and which, in some instances, do not allow more than 18 inches in width for each individual to lie down upon on the bare boards; they are kept to work under a strict military guard during the day, and liable to suffer flagellation for trifling offences, such as an exhibition of obstinacy, insolence, and the like; being in chains, discipline is more easily preserved among them, and escape more easily prevented than among the road parties out of chains." If it were asked why a method of superintendence so barbarous and cruel was adopted, the answer would be found partly anticipated in the concluding clause of the quotation. In a community where all were so bad, those above the average in wickedness could not be kept under the necessary inspection and restraint unless by force and terror.

These chain bands, however, only consisted of what might be called, in relation to the whole tribe of convicts, the inferior class; there was a stage of penal discipline still further on for the criminals—for those who were to the convicts at large what these had been to the ordinary run of the home population. Their punishment was accomplished by a second transportation to what were called the penal settlements: one, for the less aggravated cases, was at Moreton Bay; another was the rocky and wooded island of Norfolk; a third, for the Van Diemen's Land convicts, was Port Arthur, a sterile peninsula, reached by a narrow strip of land, on either side of which were chained a row of ferocious dogs. All who were practically acquainted with them seem to have had difficulty in expressing what they felt of the horrors of these penal settlements. A convict quaintly said of them: "Let a man be what he will when he comes here, he is soon as bad as the rest: a man's heart is taken from him, and there is given to him the heart of a beast." The reckless despair that came over these men was shown in the fact, frequently attested, that they would commit murders on their keepers or their companions for no better motive than the excitement of the deed and the subsequent journey to the gallows, as a variation of the uniform misery of their lot, or for the simple purpose of earning release by the punishment of death. No force or vigilance could prevent them from making desperate efforts to escape. The Report of 1838 says of a return of the attempts to escape from Macquarie harbour, a penal station then abandoned: "From that return it appears that, of 116 who absconded, 75 are supposed to have perished in the woods; 1 was hanged for murdering and eating his companion; 2 were shot by the military; 8 are known to have been murdered, and 6 eaten by their companions; 24 escaped to the settled districts, 13 of whom were hanged for bush-ranging and 10 for murder;—making a total of 101 out of 114 who came to an untimely fate." At the end of the Report there is a narrative, taken from the survivor, of the escape and wanderings of one group of fugitives, describing with horrible minuteness the manner in which one after another was killed and eaten, until two remained watching each other with hungry and murderous eyes for days, until the opportunity came for one to strike his exhausted companion.

Demoralization.

But terrible as such a picture is, it does not exhaust—it does not even reach—the deepest shades of Australian convict brutality. There were found to have spread practices more dehumanizing than cannibalism itself. It was long obvious that, in communities where bands of men were herded together, no vigilance or coercion could prevent some dire results; and although those who were the first to face the difficulties of the question by an inquiry into facts, must beforehand have anticipated with certainty some revolting details, yet it may safely be said that they were, in the midst of their inquiry, appalled both by the systematic extent and application of the evil, and the depth to which it had driven its roots through the colonial community. Those who did face the difficulty were the committee of 1838 already referred to; and though they were necessarily brief in their statements, it is clear that the tenor of their recommendations was founded on the knowledge not only that transportation, according to the system then pursued, must be abolished, but that no statesman, aware of the facts known to them, would ever re-establish it, unless some new form in which it could be effected—a form radically free of these terrible evils—could be found. What rendered this, however, the less probable was, that although coercion drove the convicts to occasional violence, the crimes, which were the stamp of their deep degradation, prevailed, wherever the discipline was relaxed—wherever, in short, they were not rendered impracticable. It was during the attempt of a well-meaning man, who was permitted for a time to try "the law of kindness" on the conduct of the convicts in one of the penal settlements, that their degraded habits were most conspicuously developed: these were found to have been deepening and expanding under an external varnish of contentment and improvement. The tighter the hand of the law was held over the convict, the better he was.

icket-of-eave ystem.

To modify the licentiousness of the increasing band of emancipists, the ticket-of-leave system was invented. In place of an absolute pardon, the convict obtained a ticket or license to be at large under certain restrictions, and to work on his own account. It could be earned only by good behaviour, and was revocable for misconduct. It could be obtained after four years by a convict transported for seven; after six years where the sentence was for fourteen; and at the end of eight years when it was for life. Thus, in some measure, the government got rid of the heavy charge of the convicts during part of the long periods of their sentences, and the convicts themselves had advantages to look forward to and to realize; while, on the other hand, a wholesome restraint was kept over them for a long time after punishment had ceased. The conduct of the ticket-of-leave men was found to be good in comparison with that of the emancipists; but that the extent of coercion to which they were subjected made them so, was one of the disheartening features of transportation. In the Report of 1838 it is said,—"On the whole, it appears from the evidence taken before your committee, that assigned convicts conduct themselves better than ticket-of-leave men, and ticket-of-leave men than emancipists or expirees; and that, when transportation does produce orderly conduct, it does so by imposing restraint, and by the apprehension it produces of immediate and severe punishment. The orderliness of a convict increases, therefore, with the immediateness and severity of the punishment, and with the general restraint to which he is subjected, and at the same time decreases with the decrease of temptation. Thus a convict is best behaved while at the penal settlements, and his conduct deteriorates in proportion as he obtains more and more freedom, and is worst when he has obtained liberty by the expiration of his sentence."

Re-action against transportation.

These were conditions not conformable with the intended object of transportation. If it could only act through coercion and control, there was no occasion for seeking these agencies so far away from home. When the Australian transportation was expected to supply the place of the American on an increased scale and in an improved shape, it was believed that the criminals would be absorbed into the free colonial population. In reality the convict element predominated, and gave its mark to the condition of the Australian colonies; and that, although a larger free colonial population had arisen, from incidental causes, than the founders of the colony had contemplated. The convict connection—consisting of emancipists, ticket-of-leave holders, and emigrant families which had or formed connections with these classes—were strong enough to make a party, and sometimes strong enough to bear down the free settler interest. It was natural that principles not only loose but depraved should triumph with them. Those who had the immediate charge of the convicts—soldiers and civilians—almost became brutalized down to their level, and fit companions for them when they had earned their leave. In the families of decent emigrants there were horrible revelations of the corruption of the young from the employment of convict domestics. A local party at length arose whose bond of union was the extinction of transportation. It was joined by many wealthy colonists, and was gradually swollen by a large influx of middle-class emigrants. Another contemporary influx of a humbler class promised to buy out transportation, by rendering the convicts worthless as labourers. By the peculiar arrangements for disposing of the land in Australia, a portion of the considerable price paid for it was reserved as a fund for assisting working men to emigrate. Those obtained were not all well suited to their purpose: peasants of a docile, patient kind were wanted, where restless, clever, discontented mechanics were obtained; but on the whole they were more valuable than convicts. These ceased, from the rapid enlargement of the demand for labour, to be numerically important. It was announced in 1838 that the number of fresh labourers wanted was 10,000, and the number of convicts received in the ensuing year would be but 3000. Many of the squatters were still favourable to transportation, as a means of easily supplying them with the slave labour they desired. These, however, once the supreme aristocracy of the country, were declining in influence, from bad seasons and the preponderating influence of other interests.

A conviction in the meantime arose at home that transportation was a wasteful and ineffective punishment. The well-weighed Report of the select committee of the House of Commons, already referred to, repeating, on the foundation of a close inquiry, defects which Bentham had anticipated thirty years earlier, strengthened this conviction. The committee, after showing how this punishment might, from arbitrary accidents quite independent of the guilt of the convict, oscillate through every conceivable grade, from sufferings beyond the endurance of the human frame at one extremity, to affluent prosperity at the other, made the following suggestive remarks:—"Exile is least dreaded by the most numerous class of offenders,—by those who may be termed habitual criminals, and who compose what is properly called the criminal population of this country,—namely, regular thieves, pickpockets, burglars, and all persons who gain their livelihood by the repetition of offences, and who consequently have lost all feelings of moral aversion to crime, and can only be restrained by fear. The apprehension which this class of offenders feel for the punishment of exile amounts merely to an aversion to breaking off their criminal habits and connections in this country; on the other hand, to them the consequences of abstaining from a life of crime would be, that they must equally separate themselves from their friends and associates of the criminal class in this country, and lead a life of honest industry in a country where wages are low and the price of food is high. To such criminals this course of life must seem almost as disagreeable as, if not more disagreeable than, the chance of exile to Australia, where they understand that wages are high, and that their condition will be a comfortable one; that at all events they will obtain plenty of food and clothing, and that they will meet a number of ancient companions in crime, some of them in the most prosperous circumstances. Consequently among such individuals, especially among London thieves and the like, the threat of expatriation produces little or no motive to induce them to abstain from criminal acts."

Gradual abandonment of transportation.

In the year 1840 it was found expedient to suspend the transmission of convicts to New South Wales. The system of convict punishment was soon afterwards revised, with a view of bringing the number transported down to a proportion with the limited field for their absorption. It was resolved that the convicts, before being removed to a colony, should be subjected to preliminary discipline at home. When Pentonville prison was opened in 1842, the secretary of state, Sir James Graham, explained in a state paper that it was intended in that establishment to subject convicts to a system of penal discipline, which should not only be in itself a punishment in as far as it was a long imprisonment, but would train them so as to render them better fitted for their fate in a penal colony. They were to be detained eighteen months in Pentonville, and then drafted off to the penal colony most suitable to their disposition and condition. It was soon found, however, that the eighteen months' detention would not reduce the number of convicts so far as to enable the remainder to be absorbed by the transportation fields, which were yearly narrowing. Accordingly, it was resolved to give a second stage of the convict's sentence to labour in public works, and then to transfer him to the modified restraint of a penal colony. Such works were found at Gibraltar and Bermuda; and in 1846 it was resolved to create the great convict establishment connected with the Portland quarries and breakwater. Having first undergone a long imprisonment, and then a still longer discipline in the public works, the convict was to become an exile, subsisting on the fruit of his own labour in a penal colony, which he could not leave without rendering himself liable to the punishment of a returned convict. Events at the Antipodes, however, defeated even this modified use of the old transportation fields. The governor of Van Diemen's Land—the only convict colony which still remained open—informed the home government that the ticket-of-leave and conditional-pardon men were there competing with the free labourers for a scanty subsistence, and that the colony would be overrun with paupers, the greater portion of whom were also criminals. It was useless to send to such a place men whose chance of restoration to virtue depended on their finding ready and lucrative employment. Hence, from the beginning of the year 1848, the transmission of convicts to Van Diemen's Land ceased. Thus had the seemingly inexhaustible resources of the great Australian world for the absorption of our criminal population collapsed with an embarrassing degree of suddenness. Some further efforts were made ere it was entirely abandoned. A new settlement for convicts was projected and nominally established in Northern Australia, but for many sufficient reasons it was abandoned. In 1849 it was proposed to land some convicts, who had undergone their probation in prison and public works, in Australia. The squatting interest, having a lingering partiality for convict labour, would have welcomed their arrival, but the indignant remonstrances of the rest of the inhabitants were effectual to prevent a landing. The opening of the gold diggings immediately afterwards rendered the whole region the most unsuitable place in the world for the reception of convicts in any stage of their discipline. An attempt was made to use the settlements in Southern Africa as a convict station, but it was effectually resisted. The isolated colony of Western Australia continued to receive a small number of exiles, but it now became clear that, in the meantime at least, provision must be made for detaining our worst criminals at home. Besides women, the government had then about 6000 male convicts, ever increasing, on their hands, and the task of disposing of them was serious. The first difficulty was to meet the fact, that the sentences of this large number of persons ordained them to be conveyed beyond seas, a judgment which could not be carried out.

Penal servitude.

To provide against the further accumulation of such sentences, the first Penal Servitude Act was passed in 1853, substituting for the old sentences of transportation sentences to the new denomination of punishment for much shorter periods. This act was in itself a standing admission that the government, if it required the transportees to take out their sentences at home, must in good faith materially abbreviate them. Each transportee, when sentenced, knew that though the period of his bondage was nominally seven or ten or fifteen years, yet, if he conducted himself well, the greater portion of it would be spent in the comparative freedom of simple exile. The only practicable arrangement was to remit a large portion of the sentences. The reception of this adjustment afforded curious evidence of the charms of transportation to the criminal world. The men received it with sullen discontent and remonstrances about breach of faith. The effect of the disappointment among the female convicts at Millbank was, as the directors reported, to make them, "without reason or provocation, suddenly break into acts amounting to frenzy,—smashing their windows, tearing up their clothes, destroying every useful article within their reach; generally yelling, shouting, and singing as if they were maniacs."

Home tickets of leave.

In the arrangement for abbreviating those transportation sentences, it was deemed prudent that the government should not altogether relinquish the hold it had over the criminal through the original duration of his sentence. Accordingly it was resolved that the remission should be conditional on good behaviour. When the time for the convict's release came, he received, not a free pardon, but a license to be at large, from the secretary of state. The ticket, which he carried with him as a certificate of this license, informed him that it would be withdrawn, and he would be subjected to endure his original sentence, not merely if he lapsed into crime, but if he led a questionable dissolute life and kept low company. The men thus released, called ticket-of-leave men, created a renowned panic in the years 1854 and 1855. The public would not look at the fact, that the license was intended for their protection—that the men must have been releassd, since it was impossible to send them abroad in terms of their original sentences—and that the release was rendered conditional, that a control might be had over their motions. The public dwelt with morbid panic on every separate crime committed throughout the country, asserting that it was perpetrated by the hands of ticket-of-leave men, whom the government had designedly let loose upon the world. On one point the suspicions of the public had a plausible foundation. It was seen that the secretary of state was not in the practice of withdrawing the license when the convict had fallen into evil repute, unless he had actually been committing new crimes. In fact, the secretary of state felt, when he came to the practical exercise of the power vested in him, that it was questionable in a constitutional view, and disliked to take on himself the responsibility of visiting men with a heavy punishment on the ground of their mere repute, and of the opinion formed of them by police-officers.

Abolition of transportation sentences.

The result of this public clamour was a very valuable parliamentary inquiry into the whole condition of the convict question. People could not see that it was impracticable, over the whole face of the globe, to have a new convict colony, and it was well to exhaust that question by practical inquiry. It was exhausted. Every man who had a scheme to propose for the absorption of our convicts abroad was invited to explain it. The result was, that no one could point to a colony, or to any other foreign community, where the convicts could be absorbed into society as they used to be in America, and were to some extent in Australia. On the other hand, it was easy to find places suited for convict stations; that is to say, places where great prisons could be built, and convict labour carried on either within the prison or in the open air. But it was not necessary that establishments like these should be placed at the Antipodes. On the contrary, the nearer they were to the centre of government, the more strict would be the control over them, and the more effective their moral influence over the criminal population of the country, who would know them to be real places of punishment, cleared of the atmosphere of attractive dubiety which is apt to surround far-off penal settlements.

In consequence of this inquiry, the act of 1857 was passed, abolishing sentences of transportation, and substituting for it, in all cases, sentences of penal servitude. What penal servitude is has never been defined, unless it be a definition of it to say that the penal serf is a public slave in the hands of the secretary of state for the home department. It may be carried into effect either at home or abroad, and is capable at any time, shonld the means become available, of being rendered the same thing as transportation. It varies from periods of three years to the whole period of life.

Arrangements for home discipline.

It will be seen that, although transportation to the Australian colonies came to an abrupt and unexpected conclusion, yet a concourse of circumstances had been gradually diminishing its extent, and opportunity had been given for finding a proper substitute. Thus for some time those chiefly concerned have had before them the weighty problem, how far the progress of the science of prison discipline is possessed of resources to meet the new burden thrown upon it. The country was clearly in a better position to meet the difficulty than on the former occasion, when America was closed. The prospect of having to throw the convict population on the resources of our prisons, such as they were in those days, was appalling. But the progress which had been made was, as has been already stated, strictly in the discipline of persons sentenced to limited periods of close imprisonment, and it remained to be seen how much of the science thus acquired would be available for longer periods of detention.

In this view, the effect of the discipline in the model penitentiary at Pentonville was closely watched, and the conclusion adopted was, that the separate system, however suitable it might be for carrying out the usual fixed periods of imprisonment immediately followed by release, could not to any good purpose be continued for the established periods of transportation or penal servitude. Pentonville was at first peopled by prisoners selected for their health and strength, and at the healthiest age, who were kept there for a limited period until they should be sent abroad. But as the transportation fields narrowed, it was found necessary to open the prison to all classes of convicts, and they were kept there for considerable periods, uncertain as to their future fate, and apprehensive in many instances that they would have to endure the whole period of their sentences in monotonous isolation. They became visibly deteriorated both in body and mind, and the number who lapsed into insanity became alarming, not only for the sake of themselves, but from the indication so afforded that a much larger number, who had not reached the length of insanity, were likely to be more or less mentally deteriorated. The visiting physician, Dr Owen Rees, in his report for September 1850, having observed that five cases of mania and eight of mental delusion had occurred in nine months, said that "these numbers would appear to render it probable that some cause for the production and development of insanity is in operation in the prison which did not formerly exist. This consideration, induced by the statistics of the prison, would not, however, urge itself so forcibly on the attention were it not that, in my inspections of the men, made from time to time, I had observed an irritability and discontent indicative of a mental condition very different to that shown by prisoners in former years; and, in more cases than I ever recollect before, a despondency and want of mental tone requiring the attention and calling for the anxiety of the medical officer." Another question at the same time suggested itself,—How far the separate confinement fitted the prisoners to go back into society with improved chances of well-doing? and this too reached no satisfactory conclusion. The obedience, docility, and general conformity with the discipline of the prison, which entitled a prisoner to the approval of his officers, were no test of his capacity for self-control. It was even found that the ready compliance which made an inoffensive captive, made a thoughtless, facile member of society, liable to be immediately seduced into his old practices when he found his old associates. It was perceptible that, when convicts were taken immediately from a long course of separate confinement to be associated in public works, they had lost part of the activity and capacity of self-management which is possessed by the humblest class of free workmen, and must be exhibited by them when they have to co-operate with each other in labour. Increased attention to diet, free air, and exercise, in some degree modified these injurious influences. Some convicts at Pentonville were set to garden-work avowedly as a relief to the monotony of the cell. A more comprehensive and effectual remedy was found in active exercise by walking round a considerable area, an arrangement which of course was so far an infringement on the rule of strict separation. It was at last, however, resolved to limit the period during which convicts were to be kept separate. A year was at first the limit fixed, but in 1854 it was reduced to nine months for males; the deteriorating influences being observed not to commence their work on women so readily, it was considered safe to subject them to the otherwise wholesome system of separation for a year.

This limitation only affected the class usually called convicts, and criminals sentenced to imprisonment might have to endure their whole sentence of a year, or even two years, in separation. But it was held that the same deteriorating influence does not follow from the discipline when the whole punishment comes to an early conclusion, and that it was the prospect of a long continuance of punishment, uncertain in its nature and repressive of hopefulness, that made the separation tell so early on the convicts. It is proper to state that neither the policy of the limitation nor the sanitary opinions on which it has been founded have escaped dispute. No one questions that any system which deteriorates the prisoner either in body or mind is unjustifiable, but the deterioration has been questioned. In America it has been maintained that men who had been kept years in a cell without ever breathing the open air, as all prisoners confined for any considerable period in Britain do, had not deteriorated; and that, without associating them with each other, there are many sanitary influences available for the protection of their health. Those who thus believe it unnecessary, condemn the association as subversive of the good effects of previous separation, and a pernicious example to other prisoners, who know that the greater criminals nominally sentenced to higher punishments are in the enjoyment of privileges denied to themselves. Sir John Kincaid, after more than ten years' experience as a government inspector of prisons, says, when reporting on male convicts detained in the prison of Wakefield in Yorkshire, and on the female convicts of Scotland—"It appears to me that, so long as they are in separate confinement, and under the beneficial influences that are brought to bear upon them, they are generally contented, industrious, and, such of them as are endowed with minds capable of reflection, appear to be in a fair way of adopting an amended course of life; but when the time arrives for their being entitled to association, they are but a short time in it when they generally become more idly disposed, discontented, and excitable, showing that vices have been called into active operation which their previous separate confinement had tended to subdue or to eradicate. I am not prepared to say that prisoners sentenced to long periods of imprisonment may not require association; I am only showing the results of it after nine months' separate confinement. I am of opinion, in which I am supported by others well qualified to judge, that a prisoner in ordinary health will not break down on a two years' imprisonment in a suitable separate cell, provided he is allowed a fair amount of relaxation in air and exercise." The chairman of the English convict board, who is in a great measure the author of the new arrangements, says in his report for the same year—"It may, however, be doubted whether the period of nine months, to which the course of discipline is now restricted, is sufficient for deriving the full benefits which attend its enforcement for twelve or fifteen months, which were the usual periods some years ago. Though other causes have been more obvious in relation to the falling-off in point of good conduct which has been noticed during the last two or three years, I believe that the less due preparation for being brought into association has had its share. An important period for reflection and instruction has thus been lost, and I should be glad, when circumstances permit, to see twelve months *again established* as the average period of detention in separate confinement." There is no doubt that the true medium applicable to this branch of convict discipline will soon be indisputably adjusted through a series of cautiously-tried and carefully-watched experiments, remote alike from the cruel carelessness of the old practice or the audacious impiricism which succeeded it.

So far, then, the substitute in a system of discipline at home for the punishment of transportation to the antipodes has been supplied by the system of discipline applicable to the criminals punished by imprisonment at home. It is now necessary to give a general idea of those totally new arrangements which have been adopted for carrying out the remainder of the convicts' sentence. It will be unnecessary to state chronologically the changes made in these arrangements, because they were at first influenced by the supposition that a portion of the convicts' sentence was still to be passed in a penal colony. It was seen at last, however, that even the sole remaining convict settlement, Western Australia, was unlikely to find room for the 600 which it was estimated to receive; while the number of convicts sentenced in the United Kingdom in each year amounts to more than 3000. Hence it was necessary to adjust the stages of discipline so that they could all be carried into effect at home. To meet this great difficulty, a new method of administration was adopted for England, where the bulk of the British convicts are kept. The convict prisons of Millbank, Pentonville, and Parkhurst had been managed by separate boards, each consisting of several statesmen and other men of eminence acting gratuitously. These were abolished in 1850, and the whole administration of the convict department was vested in a board of three official commissioners, appointed by, and responsible to, the secretary of state for the home department. Colonel Sir Joshua Jebb, who had long acted as surveyor-general of the English prisons, was appointed chairman of the board. Thus it fell to his lot to have the chief influence in the organization of the new system, and by his official position, as well as his zeal and ability, he may be said to hold the leadership of the practice of prison discipline in this country.

It was considered that the period of separation allotted to the convict as the first stage of his sentence would serve a double purpose. It would be in itself a heavy punishment, deterrent to evil-doers, and it would render the untamed human being amenable to order and discipline, and more manageable during the subsequent stages. The object of these stages is, by mixing other elements with that of punishment, gradually to adapt the convict for the life of a useful and, if possible, a religious and moral citizen; and if this should not be even to any extent accomplished, then at all events, to keep him alike from doing mischief to society and from deteriorating under the influence of prison life. As in the separate system itself, the most material ameliorating engine in this operation is labour. The kinds of work which can be conducted in a separate cell are limited and not very productive. A great deal of the labour in separate confinement is, as we have seen, intended to be afflictive only, and entirely unproductive in the economic sense. The convicts' labours have the greatest practical amount of productiveness in view. Being no longer conducted in solitude, they have the economic advantage of division of process, and at the same time they fit the men better for the real industrial pursuits of life, by far the greater portion of all hand labour being conducted in combination, as in the instance of the mason, the carpenter, the plasterer, the worker in metals, and the manufacturer of most of the textile fabrics.

The country being prosperous, there was less than might have been expected of the outcry which such projects have usually to endure about the hardships to the honest workman, who has to encounter the competition of the felon. To the general economic influence of this objection there is the conclusive general answer, that were the felons behaving as all good men desire they should behave, they would themselves be honest, industrious workmen, competing with their brethren, and reducing their wages, were it true that the increase of the number of producers, and consequently of consumers, does decrease the rate of wages. There could be no such general answer to the specific objection, that government, bringing the large capital invested in convict management into the market, might unduly press on particular crafts, especially the smaller and less powerful. But it was easy, practically, to meet the objection by avoiding underselling, and by a discreet selection of classes of produce, and of markets, in which the trade driven by the convict establishments would be too trifling to be felt. At the same time, there were many obvious advantages in sending the great bulk of the convict labour into channels where it would cause no competition with free labour. In this view, convict labour has been devoted to the executing of public works, which, though eminently valuable to the country, might not have been undertaken but for the opportunity thus afforded; and waste land has been reclaimed, adding a certain average to the fertile soil of the country, which would not have been added to it as a remunerative speculation, and consequently would not have given employment to free labourers.

Public works.

The industrial disposal of convicts has been greatly aided by the works undertaken on Portland Isle, in consequence of the recommendation of a commission on harbours of refuge, "that a breakwater be constructed in Portland Bay, sheltering an area of 1200 acres." Subsequently fortifications were added to the breakwater and the harbour-works. The peninsula itself supplies the oolite rock so well known as Portland stone for these works. Hence a quantity of labour of various kinds has been concentrated within one narrow corner to an extent rarely exemplified. It is the nature of the oolite beds to require before the very fine grained, compact building-stone is excavated, the removal of masses of rough unequal stone. This, useless for other purposes, is dropped into the sea as the material of the great breakwater. There is thus a long gradation of labour, from the roughest and the hardest that is undergone by the most ignorant excavating navvy, up to the finest masonry, and the other operations necessary for the finishing of the fortifications and harbour-works. From the report for 1858 it appears that on the breakwater there had been executed work to the value of L.31,836, being at the rate of L.34 a man. On the fortifications the work was valued at L.3165, 11s., or L.31, 9s. per man. On the prison edifice masons and labourers did work set down at the rate of L.25, 12s. 8d. per man. Others working in-doors, as tailors, shoemakers, cooks, and bakers, were estimated to have done work worth L.21, 12s. 2d. each overhead. The greater part of this labour cannot undergo the market test; and it can only be taken for granted that the Convict Board have accurately estimated it according to the methods with which employers of constructive labour are familiar. It used to be estimated that the average value of the work of a convict in the hulks was about 2d. a day. That the labour, while increasing so much in efficiency, has also increased in its penal influence, may be inferred from the following remarks by Mr Dobie, the chaplain of the establishment:—"I think the working of the large quarries to provide stone for the breakwater meets the incorrigible offender by visiting him with very severe toil, and for such men scarcely anything could be more effectually deterring than this hard and incessant labour. The execration with which the idle have regarded this compulsory toil presents the Portland prison as an important agent of terror to repress crime. Many men, on leaving, do not hesitate to admit that before they committed the crime which brought them hither, they had no notion that they should be subjected to so severe a yoke; and they have often added that they should warn their old companions of their experience of some two or three painful years." Slave labour is naturally meagre in results; and that labour should be exacted, not only productive, but oppressive, at once suggests that some operative cause, other than pure force, must have been at work. Its nature will be explained further on. At Portsmouth there is another convict establishment where the labour is to some extent similar. According to the governor's report for 1858, it consists, "in the dockyard, of coaling and ballasting ships of war, unloading colliers, removing and stacking timber, attending ship-wrights, &c.; in the Royal Clarence victualling-yard, of loading and unloading vessels, stowing casks, cleaning tanks, &c.; and about Haslar hospital, principally in works of an ornamental character." In the navy department convicts were employed "in scraping shot and shell, and performing various useful services in the gun wharf." "Calculating the value of the labour performed by actual measurement, or where measurement has been impossible, then by approximation," he sets it down as L.28,392, or L.32, 8s. per convict. At Chatham a new prison, superseding the hulks, has been opened for above a thousand convicts; and it is stated that "their labour will be devoted to the extensive new docks, and other works which are proposed to the eastward of the present dockyard." It will readily be seen that these establishments afford a wide range of industrial occupation. The government, at the same time, hire vacant accommodation in county prisons, as at Leicester jail, and the house of correction at Wakefield in which there are usually about 400 convicts.

It is of course important that when a criminal has acquired any skilled occupation, it should not be wasted to the public, or deteriorated to himself, by his being set to the rough drudgery which the untrained can perform better. With the resources, however, at the command of the convict department, it will rarely happen that a man possesses mechanical skill which cannot be used. Overseers, clerks, and the few educated and professional men who find their way into the convict population, can to a considerable extent be set to appropriate occupation, chiefly in the details of the extensive businesses conducted by the convict department. In prisons where extensive works are conducted, there is the same economic advantage as in free workshops and manufactories, in the organization of the labour not being disturbed by the employment of the sick and aged, who may at the same time be fit for other and lighter work. The official staff who superintend the able-bodied convicts, cannot also do justice to the condition and claims of the disabled. Accordingly, the permanently diseased, the superannuated, and those overtaken by the premature old age brought on by the excesses, the privations, and the excitements of the felon's life, are provided for in separate prisons. One of these is the new prison of Working, which has been or is nearly completed: the inmates destined for it were removed from the hulks to a temporary prison at Lewes. The other establishment for this class of prisoners is on the breezy heights of Dartmoor, where they are to a great extent occupied in reclaiming waste land and in farming. The governor, in his last report, lamenting the death of an intelligent farm-bailiff, says, "this zealous and faithful public servant has, by his unceasing energy and great practical skill, produced inconceivable changes on this barren spot, rendering that which only a few years since presented a most sterile and forbidding character, now worthy of being compared with Devon's finest and most luxuriant farms." Convict boys are sent to the prison of Parkhurst, in the Isle of Wight. The chief occupation of the prisoners there is agriculture, but some are trained as masons, sawyers, carpenters, painters, tailors, shoemakers, and brickmakers. By a special statutory provision, the secretary of state sends boys sentenced to long imprisonment, as well as convicts, to this prison; and it is very suggestive, that the officers of the establishment, for the credit of their system of discipline, deem it necessary to draw a broad line of distinction between the conduct and general condition of the convicts whom they have for several years, and those whom, as undergoing sentence of imprisonment, they can operate on only for a period comparatively brief.

Inducements to exertion.

Such is a general view of the occupations of the male convicts in England. It will readily be felt that, if a healthy development of productive labour, accompanied by that good conduct which is its necessary attendant, has been brought about by mere force, the phenomenon is new in the moral history of mankind. The stimulus of reward, and the still stronger stimulus of hope, have, however, accompanied the coercion. The rewarding of malefactors, or the mitigation of their sufferings, as the return for good conduct in prison, is not a novelty. Difficulties, however, have always been felt in the method and extent of the application of the principle. If carried far, so as materially to affect the character and extent of a sentence, then it follows that the awarding of punishment, which is jealously restricted to judges bound by acts of Parliament, who pronounce their sentences under the highest responsibilities in the face of the public, would be shared by the administrators of prisons, whose functions are performed in privacy, and who would naturally act on such evidence or other operative inducement as might suit their own views and wishes. True, the rulers of the prison could only alter the sentence of the judge in the direction of mitigation; but even the discretionary possession of this power might indirectly be turned to the increase of severity, for the existence of such a power might be contemplated by the bench, and the prisoner might be sentenced to a punishment reducible by his future good conduct, while the reduction might be justly earned, and yet withheld. These considerations must always hamper the practical adoption of schemes, of which there are not a few, for adjusting the criminal's fate, to his conduct and the character he has acquired, after he has been convicted.

Wherever there is danger of discretionary power being abused, there is at least a partial corrective in a record of the circumstances which give a ground for the exercise of the power. A hasty or vindictive discipline officer, presuming him to be invested, without control, with the right of mitigating or increasing a criminal's punishment, would be checked in the unjust or cruel exercise of his power by the necessity of keeping a record of the events and circumstances which lead to its exercise. The merit of having invented such a record, in "the mark system," appears to be due to Captain Maconochie. This gentleman has suggested a bold and original scheme of prison discipline, of which, as it has not, save in one feature, met with practical acceptance, a criticism would, on the present occasion, be out of place. It may simply be remarked, that those connected with the practical application of discipline have, whether rightly or wrongly, felt that he proposes to appeal to motives, too refined and too closely resembling those by which only men of superior intellect and goodness are led, to be effective upon those coarse natures which have been led into crime by their signal deficiency in the very springs of action to which he appeals. His method, however, of recording the claims of prisoners by the mark system is now extensively applied. It can be carried out either by debiting the marks for misconduct, or by crediting them for good conduct. In either case, the character recorded to the prisoner is a fund on which he is entitled to draw. A certain number of marks gained within a fixed period entitle the convict to the privileges of a class or grade, which may be certified by a badge such as a sergeant's stripes. The rank so achieved is liable to be forfeited by misconduct.

It is the nature of criminals to be influenced by immediate results, and to be careless of remote consequences. In the loss of a step in a graduated scale, the consequences of misconduct are brought home with immediate emphasis. They are often brought home by immediate consequences; and this leads to the nature of the fund on which the convict's claims, as established by the mark system, enable him to draw. While he is in separation, the conditions under which he will be relieved from the dreary monotony of his confinement, to enjoy a limited converse with his fellows, may be made a powerful instrument of discipline; and so may the possibility of his losing this privilege after he has gained it. Other relaxations will follow. Pursuits giving interest and a modified excitement to the prison life may be to a certain extent introduced. Great influence may be exercised in adjusting the nature and the amount of labour required of him. Their food is generally an object of intense interest and anxiety to prisoners, and when they are actively employed, especially in the open air, they enjoy it with a relish to which they have been utter strangers in their outside life of dissipation. Even within a very limited gradation in the luxuriousness of their diet, and without the admission of any stimulants, a large range of reward and punishment can be reached. Another method of reward is the crediting of certain sums of money or gratuities, at stated intervals, forming a fund for the benefit of the convict on his release.

The most potent of all rewards, however, is release. It is the only one which, even at a distance, is strong enough to stimulate the prisoner in his immediate actions and conduct. But the largeness of the reward renders it one difficult to deal with. It has been seen already that an abbreviation of the sentences of certain convicts, rendered necessary by a concourse of circumstances, created great unpopularity under the name of the ticket-of-leave system, and was productive of considerable embarrassment. This occasion, however, afforded a valuable opportunity for testing, under close and skilful observation, the efficiency of the practice of abbreviating sentences as a means of influence and control over the convicts. After their first disappointment in the loss of the prospect of removal to Australia, the opportunity of earning a shortened sentence influenced their conduct, and gave an impulse to their industry. The act of 1853, which introduced sentences of penal servitude, made the duration of these much shorter than sentences of transportation, with the view of making the new punishment, which was to be endured at home, as nearly as possible equivalent to the removal abroad. It was determined at the same time by the executive authorities, that these shorter sentences should run their course, and that the punishment of the criminal, as pronounced from the bench, should not be subsequently altered except for some special cause. The proceedings of the Convict Board, and the reports made by their officers, show that they felt this rule materially to abridge their influence in training the men to good conduct and industry. In their last report, referring to the year 1855, when the numbers committed under the new form of sentence began to bear a considerable and noticeable proportion of the whole, they state that the change in the feeling and bearing of the men bore some resemblance to the old characteristics of the hulks, their object being to get through their time, and go away with "thank you for nothing," as they expressed it. In Portland prison it is stated that in the autumn of 1855, "a bad and insubordinate feeling was displayed by a number of men under the new sentence of penal servitude: these combined to strike work, assigning as a reason, that they were disappointed as to their periods of imprisonment; and stating that when tried, and in some instances since trial, they had been led to expect that, by good conduct, they would get part of their sentence remitted."

After the act of 1857, abolishing the name of transportation, and recasting the punishment of convicts in periods of penal servitude, the principle of remitting part of the sentence for good behaviour was re-adopted by the government. Care, however, was taken to leave no undue room for a discretionary exercise of the power. A scale of remissions was adjusted in proportion to the different lengths of the sentences, fixing the period to be deducted from each, in case of certified good conduct. For instance, the convict whose sentence was for five years, if he behaved well, was entitled to release after four years, and the convict sentenced to seven years after six. The scale of abbreviations, with an explanatory statement, was transmitted by the secretary of state to all the judges, who, in pronouncing their sentences, knew, and, if they thought proper, may have informed the convicts, that the sentence extended to a certain period, should their conduct while enduring it be pronounced bad, but that if they earned a good character it became a shorter sentence.

Female convicts.

These brief notices of convict organization refer to the establishments for male convicts; but the discipline of convict women has, with some differences, followed the same course. Criminal women are fewer than criminal men, but they are more difficult to deal with. They are inapt to follow the sombre routine of discipline, and where they are collected in considerable numbers there are always a few of them in chronic rebellion against the laws of the prison, to which male prisoners of the deepest dye of guilt are giving implicit obedience. Even while some opening in the Australian colonies seemed to remain for the male convicts there was none for the female, and it was necessary some years ago to look in the face the alternative of detaining them in this country. The mark system and appropriate stages of discipline have been applied to them, but it is difficult to give them an equivalent for what the organization of the male convicts derives from public works. To bring them a stage nearer to the condition of free persons than they can be brought in the prison, an establishment has been formed at Fulham for their reception, after they have passed through Millbank and the female prison of Brixton. It is called "The Refuge," and its chief peculiarity is, that its resemblance to an ordinary prison is as small as the necessary security admits of. The convicts being selected for their good behaviour, advanced to enjoyments which may be forfeited by misconduct, and approaching the conclusion of their sentences, require comparatively little restraint, and enjoy a corresponding freedom within the walls.

Scotland.

It is perhaps propitious to the progress of the important science of their discipline, that the convicts throughout the United Kingdom are not under one administration, but that opportunity may be given for testing the success of different methods of management, each conducted with a close observation of the others. The male convicts of Scotland are removed to England, but no women have been removed from Scotland since the summer of 1855, and those who have since accumulated have been under the management of the General Board of Prisons. They now amount to about 300. The system of advancement from stage to stage has been adopted towards them, so far as the limited accommodation at the disposal of the board has permitted; and new buildings, planned with a special view to their discipline, have just been completed as additions to the general prison at Perth.

Ireland.

In Ireland the convicts, both male and female, are under the administration of the directors of convict prisons there, a board established in 1854. They have several prisons,—Montjoy (with a male and female department), Phillipston, Grange-Gorman, and Spike Island where men are employed as at Portland, in fortification and harbour-works. They have made and put to use moveable iron prisons, which can be shifted to suit the occupation of the inmates in the improvement of land and public works. The arrangement resembles the old road gangs in Australia, and not least in the convicts sleeping in one apartment, an arrangement avoided in all other places of convict custody. The Irish system of convict discipline has followed the English in general, but has gone further in the direction of relaxation, bringing the convicts nearer to the condition of free citizens. They are entertained with lectures and other intellectual and educational relaxations. They are permitted, too, after an advanced stage and evidence of continued good conduct, to pursue occupations beyond the bounds of the prison establishments, and are entrusted with messages and commissions in which they have to account for pecuniary transactions. The directors are very confident in the success of their method, and it will no doubt be fairly tested. The nature and habits of the people are different from those of the British, and the same methods of discipline may not suit both. Indeed, the adaptation of discipline to local and social peculiarities opens some of the most difficult problems of the science. In the instructive book of M. Berenger these difficulties are illustrated with reference to the varied population of France, where the degraded thief, and the Corsican assassin who is yet a gentleman and looks upon his honour as unsullied, have to be imprisoned under the same roof.

Prospects from new arrangements.

Every one who has paid even small attention to the distribution of the penal population from twenty to thirty years ago, when one portion of them were kept at home in ill-managed prisons, and another portion were hustled off to the opposite side of the world, will at once perceive how great is the change operated by late arrangements. Of the improvements in simple prison discipline we have the experience of several years. That there have been advantages in the improvement admits of no doubt; but they do not fulfil in many respects, the hope of sanguine philanthropists. Whoever obtains the opinions of the most intelligent officers connected with criminal administration, will find in them a settled conviction that there is at least one class, forming a large proportion of the criminality of this country,—the hardened professional thieves,—on whom prison discipline has had scarcely any reformatory effect, however much its terrors may have restrained them. The system of long isolation under training, which has but recently begun, and is an entire novelty in penal practice, has to prove its own results, and it would be premature to come to a conclusion on its efficacy. But it is easy to believe that four, six, or ten years, or more if necessary, devoted to suitable training, may produce effects to which imprisonments for like numbers of months were totally inadequate. It will be curious to see the influence of habit on the thief or swindler who has been compelled, during a long period of years, to turn his hand to productive industry. If there be elements of change in himself, there will be perhaps as much in the conditions by which he is surrounded. The criminal classes are ephemeral, growing prematurely old, and dropping out of their social circle from various causes after a brief career; so that when the convict returns to society after a long detention, he will find a new generation at work, who have opened new departments of criminal business with which he is not immediately familiar.

Discharged convicts.

For such discharged convicts as are desirous to do well, the chances that they may find a clear path towards the means of living by honest industry form an anxious problem, not yet solved, to the authorities on prison discipline. There is a strong and natural dislike to them in the minds both of employers and fellow-workmen. Efforts to relieve them from the consequences of this feeling on the other hand are apt to incur the reproach of favouring the criminal above the honest labourer. In Ireland, it appears that convicts are not disliked as labourers, while the police look after them; but the habits of the rest of the empire revolt against this as a form of *espionage*, and the expirees specially looked after by the authorities would have less chance of employment than those left unwatched. The employment of expirees in establishments supported by the government has been spoken of, but rejected, as such assemblages of men, who at least *were* hardened offenders, would be a dangerous pressure on their resolutions to improve, and would afford them both the temptation and the means to relapse into crime. Among the French the system of patronage,—that is to say, of private persons who are wealthy and benevolent taking individual expirees in hand, and watchfully assisting them to gain an honest living,—has been recommended as the strongest available remedy for the evil in the meantime. A few societies having the same objects in view have sprung up in this country, such as the London Reformatory, the Elizabeth Fry, and the Discharged Prisoners' Aid Society. In some of these institutions the expirees are admitted for a time as to a place of refuge, whence they can look about and secure a safe retreat from destitution and crime at home or abroad; while others merely give council and pecuniary aid to enable them to commence their reformed life.

Reformatories for the young.

After the reformatory spirit in prison discipline had for years operated on the criminal population generally, and been to some measure wasted upon old offenders, it lately took a more hopeful direction by concentrating itself upon the young. When *a man* has been caught stealing, the chance is, that he is an irreclaimable thief; but *a boy* caught stealing may yet be trained to honesty. The usual material out of which the old confirmed thief is made, is the child trained in crime by the necessities of an abandoned infancy. Thrown upon the streets as orphans or the neglected offspring of dissolute parents, children find that they must live. Mendicancy and crime are the only means of achieving this object, and there are plenty to teach them these businesses. The more the child possesses industrial energy, the more actively and intelligently will he push his profession, and the more formidable a depredator will he become. It is in this way that the great family of crime is kept up. The parents are in prison or in the convict establishments while their children are learning their hereditary trade. Perhaps the parents may not have reached the sphere of systematic crime, but drunkenness, idleness, and general viciousness have gradually crept upon them, poisoning the sources of the domestic affections, and deadening the sense of duty; and so the next generation, entering early on professional crime, brings the race at last down to the grade of criminality. It has been shown by experience that such children, even if they have begun their career of vice, are not confirmed criminals; and if they are early enough taken in hand, the energies which they would have directed to plunder may be turned to productive industry.

If the adoption in different parts of the world of the same idea, without those who have started it receiving hints from each other, or knowing each other's proceedings, be evidence that the idea is true and just, the principle of juvenile reformatories has such a sanction. It has been adopted and carried out in many places, under the notion that it was quite original, though such institutions were flourishing elsewhere. How old they may be it would be now difficult to tell. The principle in some measure influenced the men who from time to time bequeathed fortunes to found great hospitals; but it is a sort of law of political economy, that what is thus vested to remain for perpetuity ceases to be available for destitution, whatever might be the founder's intention, and becomes a sort of property in the hands of the managers, who give its benefits to those having influence to obtain them. An institution for the really destitute must be under the watchful eye of those who contribute to or are taxed for it. The first reformatory proper, which has received much notice, was founded about the year 1813 by Johannes Falk, a native of Dantzic, whose heart is said to have been opened to the condition of the street children by the loss of four of his own within a few days. His establishment was avowedly a refuge for criminal children and the children of criminals. Several other small establishments of the same kind followed this in different parts of Germany, more than one "saving institution," as they were called, being promoted by Count Adalbert van der Recke-Vollmarstein. In 1824 a larger establishment, the "Society for the Education of Children Morally Neglected," was founded at Berlin. The Prussian government afterwards took the matter up, and several reformatories of different kinds, but all having more or less the training, support, and education of children of the destitute and criminal classes in view, were established under government auspices. In the meantime the principle had made great progress in the United States. In 1823 it was reported by the Society for the Prevention of Pauperism in New York, "that it is highly expedient that a house of refuge for juvenile delinquents should, as soon as practicable, be established in the immediate vicinity of New York;" and in 1826 the state legislature passed an act "for incorporating the Society for the Reformation of Juvenile Delinquents in the city of New York." This was followed by several others; and the Refuges became an important feature in the United States. They are not merely places of voluntary refuge, but children can be committed to them; a practice which was not adopted without considerable hesitation and objection, applied especially to the instances where children not charged with specific crimes were removed from their parents. (See Lieber's translation of De Beaumont and De Toqueville's *Penitentiary System.*) The French had for some time established a distinction between adult and juvenile offenders, those under sixteen being considered as unfit objects of punishment, from having acted without discretion. After various minor efforts in the same direction, the Reformatory of Metrai for criminal boys, was established in the year 1840, by M. Demetz, who has worthily earned a high reputation by the skilful organization and great success of the institution.

In Britain there was a peculiar call for institutions of this kind, because even the reforms in prison discipline pressed it harder on the young. The jail was improved, but it was improved for criminals. The old bridewells and houses of correction did perhaps little for the reformation of their inmates, but they were considered as distinct from the felon's jail,—as places rather for the disorderly and the mendicant than for thorough criminals,—and committal thither did not involve the same infamy as imprisonment within the walls which, now under improved and uniform management, inclose all classes of the committed. The reformatory system had a small and peculiar beginning. The earliest noticed symptoms of its commencement were a humble school in London, and a rather larger one in Aberdeen, where the destitute children of the streets were induced to take education by at the same time receiving food. The example spread and became fashionable, ragged schools, as they were at first termed, quickly following each other. It became soon a serious consideration what was to become of their inmates at the termination of their attendance, when they might go forth with perhaps a smattering of education, and good moral and religious principles, but destitute of the means of self-support. The English poor-law commissioners had observed that when an untrained pauper boy was, according to the old practice, apprenticed off with a fee to a common weaver or other unskilled workman, he usually came back on the parish as a pauper adult; and they promulgated, and to some extent practised, the principle, that a training in skilled labour is necessary to keep a destitute boy from pauperism. This principle was rigidly acted on in the united industrial school of Edinburgh, where it was held better that a small number should be returned productive members to society, than a larger number merely supported and occupied in unskilled pursuits; and the example has been extensively followed elsewhere.

The industrial schools saved from their fate the children who were likely to reach the prison through the commission of crime; the next step was to make them supersede the prison by receiving juvenile criminals. To accomplish this end, it was necessary to make them places of coercion, where the inmates could be legally detained for the proper period. The first step in reformatory school legislation was Mr Dunlop's act of 1854, authorizing magistrates in Scotland to commit vagrant children, whose parents do not find security for their good conduct, to certified reformatory schools. This was immediately followed by Lord Palmerston's act, applicable both to England and Scotland, which authorized the removal to reformatory schools, for periods varying from two to five years, of young people under sixteen convicted of crimes and sentenced to short imprisonments. A marked distinction was thus from the first established between two classes of reformatories—the one for the protection of destitute children likely to commit crime, the other for the punishment, followed by a course of reformatory discipline, of those who have actually committed offences. (J. H. B.)

PRISREND, or PERSERIN, a town of European Turkey, capital of a sanjak of the same name in Albania, on the right bank of the Rieka, an affluent of the White Drin, 82 miles E. of Scutari, and 92 N.E. of Durazzo. It is fortified; and on a neighbouring hill stands a castle, where the Turkish governor resides. Prisrend is the seat of a Roman Catholic bishop. Fire-arms are manufactured here, and are highly prized. A considerable trade is carried on as well with the surrounding regions of Albania as with Rumelia and Servia. Large fairs are held here annually in November. Pop. 8000.

PRISTINA, a fortified town of European Turkey, in Servia, at the southern extremity of the fertile plain of Cossova, 92 miles E.N.E. of Scutari, and 152 N.W. of Salonika. It is the seat of a pasha, and of a Greek bishop, and has several mosques, bazaars, baths, and other buildings. Pop. 12,000.

PRITZWALK, a town of Prussia, in the province of Brandenburg, and circle of Potsdam, on the Domnitz, 66 miles N.W. of Berlin. It is surrounded by walls, and entered by three gates. Woollen and linen fabrics are manufactured here. Pop. 4811.

PRIVAS, a town of France, capital of the department of Ardèche, stands in the midst of barren and rugged hills, on a steep ridge separating the valley of the Ouvèze from that of a small affluent, 26 miles S.W. of Valence. It has one principal street, running along the ridge, and terminating at either end in terraces planted with trees. Though presenting an imposing appearance from a distance, Privas is smaller than the capital of any other department in France; and the only conspicuous building is the courthouse, which has a Grecian portico. In the town and its vicinity there are many mills for reeling and throwing silk, which is produced in abundance in the surrounding country. There are also manufactures of woollen stuff, brandy, and leather; and an active trade is carried on in these articles, as well as in cattle and rural produce. In the civil wars of the sixteenth and seventeenth centuries in France, Privas, which was then a strongly-fortified town, played a conspicuous part, being always favourable to the Protestant party. In 1612 a synod of the Reformed churches in France was held here. In 1629 it was bravely defended by a small garrison under St André de Montbrun against Louis XIII., but after a siege of two months, had to be abandoned. Montbrun, being soon after taken, was hanged; and the fortifications of Privas were levelled to the ground. Pop. (1856) 4804.

PRIVATEER, a private ship of war, fitted out and provided with military stores by a private individual; and the persons engaged are permitted to retain their captures instead of pay, allowing the admiral his share. Privateers may not attempt anything against the laws of nations; as to assault an enemy in a port or haven under the protection of any prince or republic, whether he be friend, ally, or neutral.

PRIVITZ, or PRIVIDIA, a town of Hungary, in the county of Lower Neutra and government of Pressburg, 23 miles W.N.W. of Neusohl. It has a church, Piarist college, grammar school, and manufactures of cloth. There is some trade in corn. Pop. 4730.

PRIVY COUNCIL (*i.e.*, *Secret Council*), as at present constituted, is an assembly of natural-born subjects of Great Britain, unlimited in number, appointed by the will of the sovereign, on whose nomination, after taking the prescribed oath, the appointment is completed. The dissolution of the Privy Council, or the dismissal of an individual member,—as of the erasure of his name from the council-book by the sovereign,—depends upon the Queen's pleasure. The duration of the council is naturally during the life of the sovereign; but it is now continued for six months further, by 6 Anne, c. 7, unless dissolved by the successor. The present usage is for every privy councillor in one reign to be re-sworn at the commencement of the next. From the original twelve members who for centuries managed the most delicate state affairs, the Privy Council was afterwards inconveniently increased. Charles II. attempted to limit it to thirty members; but it was found too divided and too extensive for an effective state council, and was soon abandoned. The Privy Council now generally includes the members of the royal family, the archbishops of Canterbury and York, the Bishop of London, the great officers of state, the lord chancellor, and the judges of the courts of equity, the chief justices of the courts of common law, the ecclesiastical and admiralty judges, and the judge advocate; since 1843 some of the puisne judges to assist in the business of the judicial committee; also the speaker of the House of Commons, the ambassadors, with many of the ministers plenipotentiary and some of the governors of the principal colonies, the commander-in-chief, the master-general of the ordnance, the first lord, with usually a junior lord, of the Admiralty, and the members of the cabinet. There are likewise several offices with which a seat in the Privy Council is conferred,—as the vice-president of the Board of Trade, the paymaster of the forces, and the newly-created offices of president of the Poor-Law Board and president of the Board of Health. There is in no case either salary or emolument attached to the office.

The duty of a privy councillor, as defined by the oath, is to advise according to his best discretion for the Queen's honour and the public good; to keep the Queen's council secret; to avoid corruption; to help and strengthen that which shall be resolved; to withstand attempts to the contrary; and to do all that a true counsellor should for his sovereign. Some of the royal family are not sworn; they are merely introduced.

A considerable proportion of the business of the Privy Council is transacted by committees of council, such as the *Cabinet Council*, the *Judicial Committee*, the *Board of Quarantine*, the *Court of Claims*, the *Board of Trade*, the *Judicial Committee of Council*, and the *Committee of Council on Education*. Meetings of the council are held at intervals of three or four weeks at her Majesty's residence, when her Majesty is attended by her ministers and the officers of state. What is done by the Privy Council when the Queen is personally present, are said to be "acts of the Queen in council." The council collectively is styled "Her Majesty's most Honourable Privy Council;" and the members individually are entitled to the prefix of "Right Honourable." They rank next after the knights of the Garter; and on taking out his *dedimus*, the privy councillor has the right of acting as a magistrate of any county. (See Murray's *Official Hand-Book;* and Warren's Blackstone's *Commentaries*, c. xxi.)

PROBABILITY.

The doctrine of probability is an extensive and very important branch of mathematical science, the object of which is to reduce to calculation the reasons which we have for believing or expecting any contingent event, or for assenting to any conclusion which is not necessarily true. When it is considered that the whole edifice of human science, with the exception of a few self-evident truths, such as the axioms of geometry, is nothing more than an assemblage of propositions which can only be pronounced to be more or less probable, the importance of a calculus which enables us to appreciate exactly the degree of probability existing in each case, will be readily understood.

Our reasons for judging an event to be probable or improbable, are derived from two distinct sources; first, an *a priori* knowledge of the causes or circumstances which determine its occurrence; and, secondly, when the causes are unknown, experience of what has already happened in the same circumstances, or in circumstances apparently similar. Suppose, for example, a hundred white balls to be placed in an urn along with fifty black balls, and that a person, blindfold, proceeds to draw a ball, there is to us, who are acquainted with the contents of the urn, a determinate probability that the ball which is drawn will be white. The balls being supposed to be all in precisely the same circumstances with respect to facility of drawing, we assume that there is the same chance of drawing any one ball as of drawing any other; and, consequently, since there are two white balls for each black ball, and therefore two chances of drawing one of the first colour for each chance of drawing one of the second, we conclude the event which consists in the drawing of a white ball to be twice as probable as the opposite event, or the drawing of a black ball. In this case our knowledge of the contents of the urn enables us to judge of the probable result of the drawing. Suppose, however, that antecedently to the drawing, we were entirely ignorant of the contents of the urn, but that after a great number of trials have been made, (the ball drawn being always replaced in the urn after each trial, in order that the circumstances may be the same in all the trials) it has been observed that a white ball has been drawn twice as often as a black ball, we presume that the urn contains twice as many white as black balls, and consequently affords twice as many chances of drawing a white ball as of drawing a black; and this presumption becomes stronger in proportion to the number of instances included in the observation. In this case experience makes up for the want of *a priori* knowledge, and affords a measure of the probability of the result of a future trial.

It is only in a comparatively small number of cases that all the possible ways in which an event may happen are known *a priori*, and in which, consequently, the ratio of the number of chances favouring the event to the whole number of existing chances is determinate. In fact, most of the questions of this class to which the calculus can be applied, are connected with lotteries and games of hazard. The results obtained from the analysis of such questions cannot be considered as being of any great value in themselves, but they frequently throw light on subjects of far higher importance which present analogous combinations. It is true that the mathematical theory comes in aid of moral considerations, and demonstrates the ruinous tendency of gambling even when the conditions of the play are equal, mathematically speaking; but, unfortunately, those who indulge a passion for this vice are seldom capable of appreciating the force of such arguments. The principal advantage which has resulted from the application of analysis to games of chance is the extension and improvement of the calculus to which it has led.

The calculation of the probabilities of events, the chances of which are not known *a priori*, but inferred from experience, is founded on the presumed constancy of the laws of nature, in obedience to which events depending on constant though unknown causes, are always reproduced in the same order when considered in large numbers. Among the various phenomena of the physical and moral world, nothing is more remarkable than the constancy which is observed to prevail in the recurrence of events of the same kind. The ratio of male to female births furnishes a noted instance. If we consider only a small number of births, nothing can be more uncertain than the result; but taking a very large number, as those of a whole kingdom in the course of a year. the proportion of males to females is found to be almost invariable, and nearly as 21 to 20. The mean duration of human life affords another familiar example. Notwithstanding the proverbial uncertainty of life, the differences of constitutions, and the various accidents to which mankind are exposed, the average duration of the lives of a large number of individuals living in the same country is always found to be very nearly the same, insomuch that pecuniary risks depending on it, if undertaken in sufficiently large numbers, are among the least uncertain of all commercial speculations. A similar constancy is remarked in the results of statistical inquiries of every kind. The number of crimes of the same species committed in a year, the ratio of the number of acquittals to the number of trials, the number of conflagrations, of ships lost in a particular trade, of letters which pass through the post-office, of patients admitted into the public hospitals; in every case the numbers in a given time are observed to fluctuate between very narrow limits, and to approach nearer and nearer, as the observation is more extended, to fixed mean values.

This constant approximation to fixed ratios, which is proved by all experience, in the recurrence of events of the same kind, enables us to apply the calculus of probabilities to many of the most interesting questions connected with our social and political institutions; and to determine the average result of a series of coming events with as much precision as if their chances were determinate, and known *a priori*, like that of obtaining a given point with the throw of a die. Whatever be the nature of the phenomenon under consideration, whether it belong to the physical or moral order of things, the calculus is equally applicable when the requisite data have been determined from experience.

The foundations of the mathematical theory of probabilities were laid by Pascal and Fermat about the middle of the 17th century. Among some other questions relating to chances, the following was proposed to Pascal. "Two persons sit down to play on the condition that the one who first gains three games shall be the winner of the stakes. The first having gained two games, and the second one, they agree to leave off and divide the stakes in proportion to their respective probabilities of winning: what share is each entitled to take?" Pascal solved the question, but by a method which was applicable only to the particular case. Fermat, to whom it was communicated by Pascal, employed the direct and general method of combinations, and gave a solution which could be applied to the case of any number of players. His reasoning, however, did not at first appear to Pascal to be satisfactory, and a correspondence on the subject took place between these two illustrious geometers, which is preserved in their respective works, and throws some light on the history of mathematics in that age.[1]

About the same period Huygens composed his tract *De Ratiociniis in Ludis Aleæ*, which was first published in the *Exercitationes Geometricæ* of Schooten in 1658. This was the first systematic treatise which appeared on the doctrine of chances. It contained an analysis of the various questions which had been solved by Pascal and Fermat, and at the end five new questions were proposed, the solutions of which, simple as they may now appear, were then attended with considerable difficulty. The analysis of two of them was in fact given for the first time by Montmort, half a century after their publication. Huygen's tract was translated into English and published in 1692, with some additional remarks relative to the advantage of the banker in the game of Pharaon, in an *Essay on the Laws of Chance*, edited and supposed to have been written by Motte, then Secretary of the Royal Society.

James Bernoulli appears to have been the first who perceived that the theory of probability may be applied to much more important purposes than to regulate the stakes and expectations of gamesters, and that the phenomena, both of the moral and physical world, anomalous and irregular as they appear when viewed in detail, exhibit, when considered in large numbers, a constancy of succession which renders their occurrence capable of being submitted to numerical estimation. The *Ars Conjectandi*, published in 1713, seven years after the death of the author, contains a number of interesting questions relative to combinations and infinite series; but the most remarkable result which it contains is a theorem respecting the indefinite repetition of events, which may be said to form the basis of all the higher applications of the theory. It consists in this, that if a series of trials be instituted respecting an event which must either happen or fail in each trial, the probability becomes greater and greater, as the number of trials is increased, that the ratio of the number of times it happens, to the whole number of trials, will be equal to its *a priori* probability in a single trial; and that the number of trials may be made so great as to give a probability, approaching as nearly to certainty as we please, that the difference between the ratio of its occurrences to the number of trials, and the fraction which measures its *a priori* probability, will be less than any assigned quantity. Bernoulli informs us, that the solution of this important theorem had engaged his attention during a period of twenty years.

In the interval between the death of Bernoulli and the appearance of the *Ars Conjectandi*, Montmort published his *Essai d'Analyse sur les Jeux de Hazard*. The first edition was in 1708; the second, which is considerably extended, and enriched by several letters of John and Nicolas Bernoulli, appeared in 1713. The work possesses considerable merit; but being chiefly confined to the examination of the conditions of games of chance, many of which are now forgotten, it has lost much of its original interest.

About the same time, Demoivre began to turn his attention to the subject of probability, and his labours, which were continued during a long life, contributed greatly to the advancement of the general theory, as well as the extension of some of its most interesting applications. Demoivre's first publication on the subject was a Latin memoir *De Mensura Sortis*, in the *Transactions of the Royal Society* for 1711. His *Essay on the Doctrine of Chances* first appeared in 1716; a second edition in 1738; but the third and most valuable, including also his *Treatise on Annuities on Lives*, is dated 1756. This work contains a great variety of questions relating to chances, solved with much clearness and elegance; but it is chiefly remarkable for the theory of recurring series, there given for the first time, which is of important use in investigations of this kind, and is in fact equivalent to the methods employed in the modern calculus for the integration of equations of finite differences having constant co-efficients. Of the particular results obtained by Demoivre, one of the most important in reference to theory, is an extension of the theorem of James Bernoulli, above mentioned. It follows from Bernoulli's theorem, that if we have a given probability that the ratio of the number of occurrences of an event to the whole number of trials, will approach to the *a priori* probability of the event within certain given limits, those limits will become narrower and narrower, as the number of trials is multiplied; but in order to complete the theorem, it is necessary to assign the numerical value of the probability that in a large number of future trials, the number of occurrences will fall within assigned limits. For this purpose we must find the product of the natural numbers 1, 2, 3, 4, &c., up to the number of trials; an operation which, if attempted by direct multiplication, becomes very laborious, even when the number of trials is inconsiderable, and when the number is great, as 10,000 for example, is altogether beyond the reach of human industry. A formula was however discovered by Stirling, by means of which an approximate value of the product is found by the summation of a few of the first terms of a series which converges the more rapidly as the number of trials is greater. With the aid of this formula, Demoivre was enabled to assign the probability in question, and thus give a practical value to the theorem of Bernoulli.

The objects and important applications of the theory of probabilities having been made known by the works now mentioned, the subject has ever since been regarded as one of the most curious and interesting branches of mathematical speculation, and accordingly has received more or less attention from almost every mathematician of eminence. A great variety of questions connected with it and especially relating to lotteries, are interspersed in the volumes of the *Paris* and *Berlin Memoirs*, (particularly the latter,) by John and Nicolas Bernoulli, Euler, Lambert, Beguelin, and others. D'Alembert has likewise treated of the theory in several of the volumes of his *Opuscula;* and it is not a little remarkable, that in some instances its first principles should have been misunderstood by so ingenious and profound a writer. In the St. Petersburg Memoirs, (vol. v.) there is an interesting paper by Daniel Bernoulli on the relative values of the expectations of individuals who engage in play, or stake sums on contingent benefits, when regard is had to the difference of their fortunes; a consideration which, in many cases, it is necessary to take into account; for it is obvious, that the value of a sum of money to an individual, depends not merely on its absolute amount, but also on his previous wealth. On this principle Bernoulli has founded a theory of *moral expectation*, which admits of numerous and important applications to the ordinary affairs of life. The *Transactions of the Royal Society* for the years 1763 and 1764, contain two papers by the Rev. Mr. Bayes, with additions to the latter by Dr. Price, which deserve to be noticed, inasmuch as the principles on which the probability of an event is determined, when the event depends on causes of which the existence and influence are only presumed from experience, are there for the first time correctly laid down. The question proposed and solved by Bayes was this: a series of experiments having been made relative to an event, to determine the presumption there is, that the fraction which measures its probability falls within given limits.

One of the earliest applications of the theory of probability was to determine, from observations of mortality, the average duration of human life, and the value of pecuniary interests depending on its continuance or failure. This particular application appears to have been first thought of, or at least attempted to be carried into practical effect, in Holland, by Hudde and the celebrated pensionary De Witt; but the first tables of mortality, with the corresponding values of annuities on single lives, were constructed by our illustrious countryman Dr. Halley, and published in the Philosophical Transactions for 1693. For the history of this branch of the subject, we refer to the two articles, ANNUITIES and MORTALITY in this work. We may remark, however, that although the English writers, who have expressly treated of it, have almost without exception confined themselves to the explanation of the methods of computing annuity tables, and of determining from them the values of sums depending on life contingencies, the aid which this branch of economy derives from the general theory of probabilities, is by no means confined to the consideration of such elementary questions. The number of observations necessary to inspire confidence in the tables, the extent to which risks may be safely undertaken, the comparative weights of different sets of observations, and the probable limits of departure from the average results of previous observations in a given number of future instances, are all questions of the utmost importance, which come within the scope of the calculus, and cannot, in fact, be justly appreciated by any other means.

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[1] *Œuvres de Blaise Pascal*, tome iv. Paris, 1819; *Opera Petri de Fermat*, Tolosæ, 1679.

The application of the theory of probability to the subject of jurisprudence, and the verdicts of juries and decisions of tribunals, has been discussed by the Marquis Condorcet in various articles in the *Encyclopédie Méthodique;* but more especially in his *Essai sur l'application de l'Analyse à la Probabilité des Decisions rendues à la Pluralité des Voix,* Paris 1785; a work of great ingenuity, and abounding with interesting remarks on subjects of the highest importance to humanity. James Bernoulli, it appears, had intended to treat jurisprudence as a branch of probability in the *Ars Conjectandi,* but his premature death prevented that work from being completed. There is a memoir on the subject by his nephew Nicolas, in the Leipsic Acts for 1711. The most important questions to be determined, are the number of jurors of which a jury ought to consist, and the majority which should be required to agree in a verdict in order to afford, on the one hand, the greatest probability that an accused person will not be wrongly condemned; and, on the other, to give to society the greatest security that its interests will not be compromised, by allowing too great facilities for the guilty to escape. This important subject has been treated more profoundly, and with numerical elements derived from much better data than existed in the time of Condorcet, in a recent work by Poisson, to which we shall presently allude.

Another of the moral subjects to which the theory of probability has been applied, and connected with the preceding, is the appreciation of the evidence of testimony. In matters of this kind, it is easy to see that the calculus must be founded almost entirely upon hypothetical data. The veracity of a witness can scarcely be made the subject of direct experiment; and by reason of the complicated circumstances with which the facts forming the subject of testimony are usually accompanied, and the numberless ways in which mankind are influenced by their passions, credulity, or ignorance, it is perhaps equally impossible to deduce an average value from the comparison of a great number of statements which have been ascertained to be true or false. Numerical results can therefore only be obtained by having recourse to hypotheses, and consequently must be considered as only probable approximations. The knowledge, however, which is thus obtained of the various combinations of the quantities concerned, affords important aid in guiding our judgments in complicated cases, and when we have to decide upon conflicting testimony. Approximations deduced from a train of accurate and systematic reasoning, are always to be preferred to the most specious arguments drawn from any other source.

The analysis of probability has been applied with signal advantage in many researches of Natural Philosophy, but especially in appreciating the mean errors of observations. Owing to the imperfections of sense and of instruments, physical magnitudes are only susceptible of being measured within certain limits of accuracy; and where the last degree of precision is indispensable, as in practical astronomy, it is only by means of a very great number of measures, compared with one another, and combined according to the methods which this calculus points out, that we can obtain the nearest approximation to the true values which the observations are capable of giving. The mean errors of observations were treated as questions of probability by Lagrange in the Turin *Memoirs* for 1773; but it is to Laplace that the theory owes its principal extension and most important results. The method of combining numerous equations of condition now universally followed, known as the method of *minimum squares,* and which Laplace has demonstrated to be that which leaves the least probable amount of error in the final equations, was made known by Legendre in an Appendix to his *Nouvelles Méthodes pour la Détermination des Orbites des Comètes,* published in 1806. A similar method, however, or rather the same, (for they are identical in principle,) had been discovered by Gauss, and employed by him for several years before the work of Legendre made its appearance.[1]

Laplace's great work, the *Théorie Analytique des Probabilités,* first published in 1812, is one of the most remarkable productions that has ever appeared in abstract science. The principles of the calculus, as well as the peculiar methods of analysis which it requires, and the most interesting and difficult questions which it presents, are here discussed in a far more general manner than had been attempted by any former writer on the subject; and it may be said, accordingly, to have placed the theory under an entirely new aspect. It is much to be regretted that so little pains have been taken by the illustrious author to render the work intelligible to the generality of mathematical readers. Consisting for the greater part of separate memoirs presented at different times to the Academy of Sciences, arranged without regard to symmetry or order, it abounds with repetitions which only serve to embarrass the student; while the deficiency of explanation combined with the subtlety of the analysis, and the inherent intricacy of the subject, render it often a painfully difficult task to seize the force of the demonstrations. Notwithstanding these defects, however, it forms one of the most splendid creations of mathematical genius; and is alike admirable, whether we regard the extension which has been given to the calculus, or the results which have been arrived at, or the tone of lofty philosophy in which subjects bearing on some of the most important concerns of mankind are treated.

Next to the *Théorie Analytique* of Laplace, the most important work which has hitherto appeared on the subject of probability is the recent one of Poisson, entitled, *Recherches sur la Probabilité des Jugements,* (Paris 1837.) Although it might be inferred from the title that this work relates only to a single though very interesting application of the theory, the greater part of it is devoted to the development and demonstration of the general principles, and the discussion of the principal questions which present themselves in the different applications; and it is only in the last of the five books of which it consists that the special subject to which the title refers is taken into consideration. In applying the theory to the decisions of tribunals, Condorcet and Laplace had been unable to obtain positive results from the want of authentic data; but the recent publication by the French government of the *Comptes Généraux de l'Administration de la Justice Criminelle,* in France, having furnished an immense collection of facts from which the requisite data could be obtained, Poisson was led to consider the subject anew, and the results of his investigations, which are of singular interest, are given in the work now mentioned. Poisson had already given a theory of the mean errors of observations in the *Additions* to the *Connaissance des Tems* for 1827 and 1832.

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[1] *Theoria Motus Corporum Cœlestium,* p. 221.

It is in these two works of Laplace and Poisson that the higher and more abstruse parts of the theory of probabilities must be studied. A very clear exposition of the principles, accompanied with many interesting remarks on the uses and applications of the theory, is given by Lacroix in his valuable little work, *Traité Elémentaire du Calcul des Probabilités*, Paris 1822.

Since the time of Demoivre, the English treatises on the general theory of probability have neither been numerous, nor, with one or two exceptions, very important. Simpson's *Laws of Chance* (1740) contains a considerable number of examples, in the solution of which the author displays his usual acuteness and originality, but as they belong entirely to that class in which the chances are known *a priori*, they give no idea of the most interesting applications of the theory. Dodson's *Mathematical Repository* contains a large selection of the same kind. The Essay in the *Library of Useful Knowledge*, by Mr. Lubbock, gives a more comprehensive and philosophical, though an elementary view of the subject; but by far the most valuable work in the language is the Treatise in the *Encyclopedia Metropolitana*, by Professor De Morgan, 1837. In this very able production, Mr. De Morgan has treated the subject in its utmost generality, and embodied, within a moderate compass, the substance of the great work of Laplace.

Within the limits to which the present article must be confined, it would be hopeless to attempt giving a complete view of a branch of science which embraces so many complicated and intricate subjects of research, and which requires the aid of some of the most abstruse and recondite theories of the modern mathematics. In the higher applications of the theory, the analysis of many of the questions which arise, in order to be made intelligible, would require an extent of development and a parade of mathematical formulæ altogether incompatible with the plan and scope of this work. All that we can propose to ourselves, therefore, is to explain as briefly as may appear consistent with perspicuity, the general principles of the theory, and to give an outline of the manner in which these are applied to some of the more important questions which have been investigated by Laplace and Poisson. The examples will be selected with a view to shew the nature of the principal results of the mathematical theory, as well as the peculiar methods of analysis which are of most general application.

SECT. I. GENERAL PRINCIPLES OF THE THEORY OF PROBABILITY.

1. The term *probable*, in its popular acceptation, is used in reference to any unknown or future event, to denote that in our judgment the event is more likely to be true than not, or more likely to happen than not to happen. Without attempting to make an accurate enumeration of the various circumstances which are favourable or unfavourable to its occurrence, or to balance their respective influences, we suppose there is a preponderance on one side, and accordingly pronounce it to be probable that the event has occurred, or will occur, or the contrary.

2. If we can see no reason why an event is more likely to happen than not to happen, we say it is a *chance* whether the event will happen or not; or if it may happen in more ways than one, and we have no reason for supposing it will happen in any one of these ways rather than in another, we say it is a *chance* whether it will happen in any assigned way or in any other. Suppose, for example, an unknown number of balls of different colours to be placed in an urn, from which a ball is about to be extracted by a person blindfold. Here we have no reason for supposing that the ball about to be drawn will be of one colour rather than another, that it will be white rather than black, or red; and accordingly say it is a *chance* whether the ball will come out of a particular colour, or a different. In this instance, then, the term *chance* denotes, simply, the absence of a known cause. If, however, we are made acquainted with the number of balls in the urn, and the number there are of each of the different colours, the term is used in a definite sense. For instance, suppose the urn to contain ten balls, of which nine are white, and the remaining one black, we say there are nine chances in favour of drawing a white ball, and one chance only in favour of drawing the black ball. Chance, in this sense, denotes a *way of happening*, or a particular *case* or *combination* that may arise out of a number of other possible cases or combinations; and an event becomes probable or improbable according as the number of chances in its favour is greater or less than the number against it. *Chance* and *presumption* are also frequently used synonymously with *probability*.

3. The *mathematical probability* of any event is the ratio of the number of ways in which that event may happen to the whole number of ways in which it may either happen or fail. Thus, recurring to the previous example, the event, namely, the drawing of a ball from an urn containing 9 white balls and 1 black, may happen in 10 different ways, inasmuch as any one of the 10 balls may be drawn; but in one only of those ways will the event be a black ball; and therefore the probability of drawing the black ball is $\frac{1}{10}$. In like manner, as there are 9 different ways in which a white ball may be drawn, or 9 chances of drawing a white ball, and ten chances in all, the probability of drawing a white ball at the first trial is $\frac{9}{10}$. It follows immediately from this definition, that the probability of drawing a ball of either colour will remain the same, however the number of balls in the urn may be increased, provided those of each colour are increased in the same proportion. For instance, suppose the number of white balls to be 45, and the number of black balls to be 5; the number of chances in favour of drawing a black ball is 5, while there are 50 chances in all, consequently the probability of a black ball being drawn is $\frac{5}{50}=\frac{1}{10}$. In the same manner, the probability of drawing a white ball is $\frac{45}{50}=\frac{9}{10}$; the same as before. Generally, let E and F be two contrary events, that is to say, such that the one or the other of them must necessarily happen, and both cannot happen together; and let a be the number of chances or combinations which produce the event E, and b be the number of combinations which produce the event F, or cause the failure of E; then the probability that E will happen is $\frac{a}{a+b}$; and the probability that F will happen, or that E will *not* happen is $\frac{b}{b+a}$. In future, the term probability will be used only to signify mathematical probability.

4. It is to be carefully remarked, that the different chances or combinations which form the elements of probability are supposed to be perfectly equal. If this equality does not hold, and there is any circumstance respecting the event under consideration which renders one combination or set of combinations more likely to occur than another, the different combinations must be multiplied by numbers proportional to their respective facilities, after which the units in each multiplier may be regarded as so many distinct chances, from which the probability of the event will be found by the above formula. This is equivalent to saying that a combination or chance which is twice as likely to happen as another, must be regarded as two equal and similar combinations in comparison of that other; a proposition which is sufficiently obvious.

5. It follows from the above definition, that the probability of any contingent event is measured by a fraction less than unity, and may have any value between 0 and 1. It follows, also, that the sum of the two fractions which measure the probabilities of two contrary events is equal to unit, which is the measure of certainty, inasmuch as either the one or the other necessarily occurs. Thus, in the last example, the probability of the event E is $\frac{a}{a+b}$, and that of the contrary event F is $\frac{b}{a+b}$, and $\frac{a}{a+b}+\frac{b}{a+b}=1$. Hence if p denote the probability of any event E, and q the probability of the contrary event F, we have $q=1-p$. This consequence of the definition is of great importance in the calculation of probabilities.

6. We have here supposed the result of a trial to be necessarily one or other of two events E and F; but it is easy to imagine the trial to be of such a kind that it may give rise to any one of a number of events E, F, G, H, &c. each having a given number of chances in its favour. This case is represented by supposing an urn to contain balls of as many different colours or sorts as there are different events. Let the urn be conceived to contain a balls of the sort which produces the event E, b of the sort which produces F, c of the sort which produces G, and so on; and let $a+b+c+d$, &c. $=k$, so that k is the whole number of balls in the urn. The probabilities of the different events E, F, G, H, &c. are then, respectively, by the definition,

$$\frac{a}{k},\ \frac{b}{k},\ \frac{c}{k},\ \frac{d}{k},\ \&c.$$

the sum of which $=1$. In fact, if a ball be drawn at all, it must be of one or other of the different sorts contained in the urn; and consequently the sum of all the probabilities amounts to unit or certainty.

7. When an event is compounded of two or more simple events independent of each other, the probability of the compound event is equal to the product of the probabilities of the several simple events of which it is compounded. Let us imagine two urns, A and B, of which A contains a white balls and b black, and B contains a' white and b' black. Make $a+b=c$, and $a'+b'=c'$, and let the compound event whose probability is to be determined be the drawing of a white ball from both urns. Now, as each of the c balls in A may be drawn with any one of the c' balls in B, the whole number of ways in which the balls in A may be differently combined by pairs with the balls in B, or the whole number of possible cases is cc'. But the number of cases favourable to the compound event is evidently the number of different ways in which a white ball may be drawn from A with a white ball from B, and therefore equal to aa'. Hence by the definition (4), the probability that a white ball will be drawn from both urns is $\frac{aa'}{cc'}$. Now, if p denote the probability of drawing a white ball from A, and p' that of drawing a white ball from B, we have by the definition $p=\frac{a}{c}$, and $p'=\frac{a'}{c'}$; whence $\frac{aa'}{cc'}=pp'$.

In general, let p denote the probability of an event E, p' that of another event E′, p'' that of a third E″, and so on; then the probability of the concourse of the events E, E′, E″, &c., or the probability that they will all happen, is $p\times p'\times p''$, &c.; that is to say, the probability of an event compounded of any number of simple and independent events, is the product of the respective probabilities of the several simple events.

The probabilities that the several simple events E, E′, E″ &c., will *not* all happen, or that some of them will happen and others fail, are easily determined in the same manner; it will be sufficient to indicate their several expressions. Suppose there are only three simple events, of which the probabilities are respectively p, p', and p''; and let $q=1-p$, $q'=1-p'$, $q''=1-p''$. The product $pq'q''$ expresses the probability of the compound event which consists in E happening and E′ and E″ both failing; $qp'q''$ is the probability that E′ will happen, and that E and E″ will both fail; $pp'p''$ is the probability they will all three happen; $1-pp'p''$ is the probability they will *not* all three happen, or that one of them *at least* will fail; $qq'q''$ is the probability they will all fail; and $1-qq'q''$ is the probability they will *not* all three fail, or that one *at least* of them will happen.

8. As an example of the application of this rule, suppose it were required to assign the probability of throwing aces, at one throw, with two common dice. As a common die has six symmetrical faces, there are in respect of each die six ways equally possible, in which the simple event may happen. The probability therefore of throwing ace with one die is $\frac{1}{6}$, that is, $p=\frac{1}{6}$. In respect of the second die, we have also $p'=\frac{1}{6}$; hence the probability of the compound event, or that aces will be thrown is $pp'=\frac{1}{6}\times\frac{1}{6}=\frac{1}{36}$. The probability that aces will *not* be thrown at any assigned trial is therefore (5) $1-\frac{1}{36}=\frac{35}{36}$; and the *odds* against throwing aces at any given trial are 35 to 1.

Again, suppose two numbers, each consisting of 7 digits, to be taken at random, (for instance from a table of logarithms), and let it be proposed to assign the probability that the substraction of the one from the other will be performed without its being necessary, in any case, to increase the upper figure. Here, as each digit may have any one of the ten values from 0 to 9 both inclusive, and as each of those values in the upper line may be combined with any one of them in the lower line, there are 100 different combinations or equally possible cases for each partial substraction. Now, if the upper figure be 0, there is only one of those cases favourable to the event, or which will admit of the substraction being performed, namely, when the figure below is also 0. If the upper figure be 1, there are two cases favourable, namely, those in which the under figure is 0 or 1. If the upper figure be 2, there are three favourable cases, namely, when the under figure is 0, 1, or 2. Proceeding in this way through all the digits, the whole number of favourable cases is found to be

$$1+2+3+4+5+6+7+8+9+10=55.$$

Hence, for each partial substraction there are 55 favourable cases out of 100 possible cases; therefore (4) the probability that any one of the figures in the upper line is not less than the corresponding figure in the under line is $\frac{55}{100}$; and we have $p=p'=p''=\&c.=\frac{55}{100}$ for the probability of each of the seven simple events or partial substractions, whence, by (7), the probability of the compound event is

$$p\times p'\times p''\times\&c.=\left(\frac{55}{100}\right)^7=(\cdot 55)^7=0152243,$$

which is less than $\frac{1}{65}$, and greater than $\frac{1}{66}$.

9. When an event may happen in several different ways, each independent of the others, the probability of the event is the sum of all the partial probabilities taken in respect of each of the different ways.

Suppose there are n different urns A_1, A_2, A_3......A_n, each containing balls of two colours, white and black, and let the whole number of balls in each urn respectively, be

$$c_1,\ c_2,\ c_3,\ldots\ldots c_n,$$

and the number of white balls in each be

$$a_1,\ a_2,\ a_3,\ldots\ldots a_n,$$

and let the event E be the extraction of a white ball in drawing a ball from any urn at random. In this case there are n different ways, all equally probable, in which the event may happen, for it may be drawn with equal facility from any one of the urns. The probability that the ball will be drawn from any given urn, A_1, is therefore $\frac{1}{n}$; and if it be drawn from this urn, the probability of its being white is $\frac{a_1}{c_1}$; therefore, by (7), the probability of a white ball being drawn from A_1 is $\frac{1}{n} \cdot \frac{a_1}{c_1}$. In like manner the probability of a white ball being drawn from A_2 is shewn to be $\frac{1}{n} \cdot \frac{a_2}{c_2}$; from A_3 to be $\frac{1}{n} \cdot \frac{a_3}{c_3}$, and so on. Denoting therefore by p the whole probability of the event E, the proposition affirms that

$$p=\frac{1}{n}\left(\frac{a_1}{c_1}+\frac{a_2}{c_2}+\frac{a_3}{c_3}\ldots\ldots+\frac{a_n}{c}\right).$$

To prove this, let the fractions $\frac{a_1}{c_1}, \frac{a_2}{c_2}$ &c. be reduced to a common denominator, and suppose the equivalent fractions to be

$$\frac{a_1}{\gamma},\ \frac{\alpha_2}{\gamma},\ \frac{a_3}{\gamma}.\ \ \ldots\ldots\ \frac{a_n}{\gamma}.$$

We may now conceive the urns $A_1, A_2, A_3 \ldots A_n$ to be replaced by others, each containing the same number, γ, of balls, and of which the first contains a_1 white balls, the second a_2, and so on; and it is evident that the chance of a white ball being drawn from this new system of urns will be precisely the same as it was for a white ball being drawn from the first system. Now the probability of drawing a white ball from the new system will not be altered by placing the whole of the $n\gamma$ balls in a single urn, for they may still be conceived as arranged in groups, disposed in any manner whatever, each group containing the same number of balls, and the same proportion of white to black as were in the separate urns; and as each group contains the same number of balls, the chance of laying the hand on any one group is the same as that of laying it on any other. The probability of drawing a white ball from the single urn, is therefore the same as for drawing it from the group of separate urns which contain each the same number of balls. But the probability of drawing it from the single urn is the ratio of the number of white balls contained in the urn to the number of both colours, therefore (this probability being p) we have

$$p=\frac{1}{n\gamma}(a_1+a_2+a_3\ldots\ldots+a_n);$$

whence, substituting for $\frac{a_1}{\gamma}, \frac{a_2}{\gamma}$, &c., their respective values, $\frac{a_1}{c_1}, \frac{a_2}{c_2}$, &c., we have

$$p=\frac{1}{n}\left(\frac{a_1}{c_1}+\frac{a_2}{c_2}+\frac{a_3}{c_3}\ldots\ldots+\frac{a_n}{c_n}\right).$$

As a particular case suppose three urns A, B, C to be placed together, of which A contains 2 white balls and 1 black; B 3 white bails and 2 black, and C 4 white and 3 black, and let it be required to determine the probability p of a white ball being drawn from the group by a person who is ignorant of the contents of the different urns. As there is no reason for selecting one urn in preference to another, the probability that he will put his hand into the urn A is $\frac{1}{3}$; and if he draw from this urn the probability that a white ball will be drawn is $\frac{2}{3}$, there being 2 cases favourable to that event, and 3 cases in all. The probability of both events is therefore $\frac{1}{3}\quad\frac{2}{3}=\frac{2}{9}$. In like manner, the probability of the ball being drawn from B is $\frac{1}{3}$; and if drawn from B the probability of its being white is $\frac{3}{5}$; therefore, the probability of this compound event is $\frac{1}{3} \times \frac{3}{5}=\frac{1}{5}$. Lastly, the probability of the ball being drawn from C is $\frac{1}{3}$; and if drawn from C the probability of its being white is $\frac{4}{7}$; therefore, the probability of this compound event is $\frac{1}{3} \times \frac{4}{7}=\frac{4}{21}$. Hence, by the proposition now demonstrated, the complete probability of the event E is

$$p=\tfrac{2}{9}+\tfrac{1}{5}+\tfrac{4}{21}=\tfrac{193}{315}.$$

If all the balls had been placed in a single urn, the probability of drawing a white ball would have been $\frac{9}{15}$, for there are $3+5+7=15$ balls in all, of which $2+3+4=9$ are white. But $\frac{9}{15}=\frac{189}{315}$; a fraction which differs sensibly from $\frac{193}{315}$, the measure of the probability of the same event when the balls are distributed in the manner above supposed amongst the different urns. The distinction between the two cases is important.

10. The rule laid down in (7) for finding the probability of a compound event applies alike whether the simple events are determined simultaneously or in succession. In fact, when the simple events are entirely independent of each other, the chances which determine the compound event are not influenced in any way by the intervention of time. Suppose, for example, the compound event to be the throwing of a certain number of points with a given number m of dice; the chances for and against the event are obviously the same whether the m dice are thrown at once, or a single die is thrown m times successively. But as the determination of the probability of a compound event is in general facilitated by supposing the simple events to be decided one after the other, it will be convenient to view the subject in this light in explaining the method of forming the different combinations of the chances by which the probabilities of compound events are determined.

SECT. II. OF THE PROBABILITY OF EVENTS DEPENDING ON A REPETITION OF TRIALS, OR COMPOUNDED OF ANY NUMBER OF SIMPLE EVENTS, THE CHANCES IN RESPECT OF WHICH ARE KNOWN *A PRIORI*, AND CONSTANT.

11. Suppose an urn to contain $a+b$ balls, a white and b black, and let a ball be successively drawn, and replaced in the urn after each drawing, in order that the chances in favour of drawing a ball of either colour may be the same in every trial, and let it be required to find the respective probabilities of the different possible results of any number of drawings.

Let us first suppose the number of trials to be two. The event may happen in any of these four different ways: first white, second white; first white, second black; first black, second white; first black, second black. Assuming W to represent the simple event which consists in the drawing of a white ball, and B that of a black ball, and supposing the order of the arrangement of the two letters to correspond with the order of succession of the simple events, the four possible cases or combinations will be represented thus:—

WW, WB, BW, BB.

Now let the probability of drawing a white ball in any trial be p, and that of drawing a black ball be q, (whence, $p=\frac{a}{a+b}$, $q=\frac{b}{a+b}$) the probabilities of the four possible compound events are by (7) respectively as under:

probability of WW $=p \times p=p^2$
of WB $=p \times q=pq$
of BW $=q \times p=pq$
of BB $=q \times q=q^2$

If we disregard the order of succession, and consider the two arrangements WB and BW, which are equally probable, as forming the same compound event, namely, a ball of both colours in the two trials, the probability of this event, by (9), becomes $2pq$. The sum of the probabilities of all the possible arrangements is therefore

$$p^2+2pq+q^2=(p+q)^2;$$

whence it appears that the probabilities of the different arrangements in two trials are respectively the terms of the development of the binomial, $(p+q)^2$.

Let us next suppose the number of trials to be three.

The different arrangements that may be formed of the simple events in three trials, with the probability of each respectively, are as follows :—

WWW, probability of which $=ppp=p^3$
WWB, ... $=ppq=p^2q$
WBW, ... $=pqp=p^2q$
BWW, ... $=qpp=p^2q$
WBB, ... $=pqq=pq^2$
BWB, ... $=qpq=pq^2$
BBW, ... $=qqp=pq^2$
BBB, ... $=qqq=q^3$

It thus appears that the probability of obtaining two events of one kind, and one of the other, is the same in whatever order they succeed each other, and, in fact, is independent of the order. Disregarding, then, the order of succession, and considering the combination of two white balls with one black, in whatever order they may be arranged, as the same compound event, the probability of its occurrence *in any order whatever*, being the sum of its probabilities in each particular order (9), is $3p^2q$. In like manner, regarding the combination of two black balls with one white, in any order of arrangement, as the same compound event, its probability is $3pq^2$. The compound event resulting from three trials must then happen in one of four different ways, namely, 3 white balls; 2 white, combined with 1 black, in any order; 2 black, combined with one white, in any order; or, lastly, 3 black; and the sum of the probabilities of these different cases is

$$p^3+3p^2q+3pq^2+q^3=(p+q)^3.$$

Hence the probabilities of all the different possible combinations in three trials are respectively given by the development of the binomial $(p+q)^3$.

12. In general, let p denote the probability of any simple event E, then the probability of E happening twice in two trials is p^2, of happening thrice in 3 trials p^3, and of happening m times in m successive trials, p^m. In like manner, the probability of the contrary event F being q $(p+q=1)$, the probability of F happening n times in n successive trials is q^n. Hence (7) the probability of E happening m times, and then F happening n times in succession, in $m+n$ trials, is p^mq^n. But the probability of these events happening in any assigned order is the same as that of their happening in any other assigned order; therefore p^mq^n is the measure of the probability that E will occur m times, and F will occur n times in a determinate order. Now, let $m+n=h$, and let U be the number of different ways in which m events E, and n events F, can be combined in h trials, and P be the probability of any one of these combinations whatever, or the probability of E occurring m times, and F occurring n times in h trials, without regard to the order in which they succeed each other, we have then

$$\text{P}=\text{U}p^mq^n.$$

In order to determine the value of U, we may suppose the events in question to be so many different things represented by the letters A, B, C, D, E, &c. of which there are m of one kind, and n of another, and make $m+n=h$; then by the algebraic theory of combinations, we have

$$\text{U}=\frac{1\,.\,2\,.\,3\ldots\ldots\ldots\ldots h}{1\,.\,2\,.\,3\ldots\ldots m\times 1\,.\,2\,.\,3\ldots\ldots n}.$$

This value of U is symmetrical in respect of m and n, and may be otherwise written in either of the two following forms,

$$\text{U}=\frac{h(h-1)(h-2)\ldots\ldots\ldots h-m+1}{1\,.\,2\,.\,3\ \ldots\ldots\ldots\ m},$$

$$\text{U}=\frac{h(h-1)(h-2)\ldots\ldots\ldots h-n+1}{1\,.\,2\,.\,3\ \ldots\ldots\ldots\ n},$$

which shew that the probability P, or the product $\text{U}p^mq^n$ is the $(m+1)$th term of the development of the binomial $(p+q)^h$ arranged according to the increasing powers of p, or the $(n+1)$th term of the same development arranged according to the increasing powers of q. Hence we conclude that when p and q remain constant, the probabilities of all the different compound events which can be formed by the combination of the simple events E and F in h trials, are expressed by the different terms of the formula $(p+q)^h$ expanded by the binomial theorem.

The whole number of possible cases is evidently $h+1$, for in h experiments, E may occur h times, $h-1$ times, $h-2$ times......$h-h$ times; this last being the case in which the contrary event F occurs in all the trials. The different cases are unequally probable, both by reason of the greater or smaller number of combinations by which they may be produced, and which in reference to each case is represented by U, and by reason of the inequality between p and q. It will be shewn afterwards, that when $p=q$, and h is a whole number, the most probable case is that in which the occurrences of E and F are equal; and if h is an odd number, the two most probable cases are those in which the difference in the number of occurrences of E and the number of occurrences of F is unity.

13. In order to place the proposition now demonstrated in a clearer light, let us consider separately the different terms of the development of $(p+q)^h$, namely,

$$p^h+hp^{h-1}q+\frac{h(h-1)}{1\,.\,2}p^{h-2}q^2\ \ldots\ldots\ldots\ldots\ldots\ldots\ldots$$
$$+\frac{h(h-1)(h-2)\ldots\ldots h-n+1}{1\,.\,2\,.\,3\ \ \ldots\ldots\ \ n}p^{h-n}q^n$$
$$\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots+q^h.$$

The first term p^h expresses the probability that the event E will in every one of the h trials. The second term $hp^{h-1}q$ expresses the probability that E will occur $h-1$ times, and F once, without distinction of order; that is to say F may happen at the first or last or any intermediate trial. If a determinate succession is proposed, for example, that of $h-1$ times the event E in succession, and F in the next trial, the probability of the event in the assigned order is found by suppressing the coefficient h, and is consequently $p^{h-1}q$.

The third term $\frac{h(h-1)}{1\,.\,2}p^{h-2}q^2$ expresses the probability that the result of h trials will be $h-2$ times the event E, and twice the event F, without distinction of order. If a particular order be assigned, it is necessary to suppress the coefficient, and the probability of the simple events occurring in that particular order is $p^{h-2}q^2$.

The general term $\frac{h(h-1)(h-2)\ldots\ldots h-n+1}{1\,.\,2\,.\,3\ \ldots\ldots\ n}p^{h-n}q^n$ expresses the probability that the result of h trials will be $(h-n)$ times the event E, and n times the event F in any order. The probability of $(h-n)$ times E and n times F in an assigned order is $p^{h-n}q^n$.

14. If we suppose the event E to be such that the chances in favour of its happening or failing are equal, that is, if $p=q=\frac{1}{2}$, the different terms of the binomial $(p+q)^h$, on suppressing the coefficients, become all equal; so that a particular order being assigned in each of the possible cases or combinations, all the cases become equally probable. Thus, suppose a shilling to be tossed 100 times in succession, the probability of head turning up in every trial is $(\frac{1}{2})^{100}$. The probability of 50 heads and 50 tails in any assigned order is $(\frac{1}{2})^{50}\times(\frac{1}{2})^{50}=(\frac{1}{2})^{100}$; if $m+n=100$, the probability of m heads and n tails is also $(\frac{1}{2})^m(\frac{1}{2})^n=(\frac{1}{2})^{m+n}=(\frac{1}{2})^{100}$. Hence the probability of any compound event formed by the combination of two simple contrary events succeeding each other in an assigned order, and each having the same probability, is independent of the ratio of the simple events, and depends only on the number of trials. Before the trials, it is an even wager that head will be turned up in succession 100 times, and that the result of 100 trials will be 50 heads and 50 tails in a given order of succession, or any proportion

of heads to tails in an order arbitrarily chosen. This consideration is frequently lost sight of in reasoning about those events of the natural world, which are termed extraordinary and miraculous. If in tossing a shilling 100 times into the air, the number of heads turned up is found nearly equal to the number of tails, the event excites no surprise; something like it was expected. On the contrary, if the difference between the number of heads and the number of tails is considerable, the event is termed extraordinary; and if head turned up in every trial without exception, we should scarcely be persuaded that such an event was entirely the result of chance, and independent of a special cause. Nevertheless, the *a priori* probability that every trial will give head, is precisely the same as the probability of throwing any given number of heads and tails in an assigned order of succession. It will, however, be proved afterwards, that if such an event as throwing head 100 times in succession were actually observed, the probability of a special cause having intervened, would approach very nearly to certainty.

15. Hitherto we have supposed the compound event to be formed by the combination of two simple events only, E and F, one of which necessarily excludes the other. Let us now suppose there are any number of simple events, E_1, E_2, E_3, &c. of which the respective probabilities are p_1, p_2, p_3, &c. and such that one or other of them necessarily happens in each trial, so that $p_1+p_2+p_3+$, &c. $=1$, and determine the probability of any assigned combination of them in a given number of trials. This case may be represented by supposing an urn to contain a number of balls of as many different colours as there are distinct events; the event E_i will be the drawing of a ball of the colour i, and its probability p_i will be the fraction whose numerator is equal to the number of balls of the colour i, and denominator the whole number of balls in the urn. Now the probability of the event E_1 happening m times in succession is p_1^m by (12); that of E_2 happening n times in succession is p_2^n; that of E_3 happening r times in succession p_3^r; and so on. Therefore (7) the probability of the compound event which is formed by the occurrence of m times E_1, n times E_2, r times E_3, and so on, these events succeeding each other in order, is the product $p_1^m\,p_2^n\,p_3^r$, &c. But the probability of the simple events succeeding each other in any particular order is the same as that of their succeeding in any other assigned order (12); consequently, if U′ denote the number of different ways in which m events E_1, n events E_2, r events E_3, &c. can be combined, or succeed each other, and P′ be the probability of the compound event in any order whatever, we have,

$$P'=U'p_1^m\,p_2^n\,p_3^r,\ \&c.$$

Assuming $h=m+n+r+$, &c. we have also by the theory of combinations,

$$U'=\frac{1\,.\,2\,.\,3\ldots\ldots\ldots\ldots\ldots h}{1\,.\,2\,.\,3\ldots m\times1\,.\,2\,.\,3\ldots n\times1\,.\,2\,.\,3\ldots r\times\ \&c.}$$

the factor U′ being the coefficient of the term which has for its multiplier $p_1^m\,p_2^n\,p_3^r$, &c. in the expansion of the multinomial $(p_1+p_2+p_3+\ \&c.)^h$, whence

$$P'=\frac{1\,.\,2\,.\,3\ldots\ldots\ldots\ldots\ldots h}{1.2.3\ldots m\times1.2.3\ldots n\times1.2.3\ldots r\times\&c.}p_1^m\,p_2^n\,p_3^r,\&c.$$

We shall now proceed to give some examples of the applications of the preceding formulæ.

16. Let it be proposed to assign the probability P, of throwing ace *once*, and not oftener, in four successive throws of the same die.—Simpson, p. 15.

Here, the chance of throwing ace in a single trial being $\frac{1}{6}$, we have $p=\frac{1}{6}$, and consequently $q=\frac{5}{6}$, and also $h=4$. Now the compound event being the occurrence of the simple event E, whose probability is p, once, and of the contrary event F three times, the probability of the compound event is that term of the development of $(p+q)^4$ which is multiplied by pq^3. If, therefore, in the formula,

$$P=\frac{1\,.\,2\,.\,3\ldots\ldots\ldots h}{1\,.\,2\,.\,3\ldots m\times1\,.\,2\,.\,3\ldots\ldots n}p^mq^n,$$

we make $p=\frac{1}{6}$, $q=\frac{5}{6}$, $h=4$, $m=1$, $n=3$, we shall have

$$P=\frac{1\,.\,2\,.\,3\,.\,4}{1\times1\,.\,2\,.\,3}\times\frac{1}{6}\times\left(\frac{5}{6}\right)^3=\frac{125}{324},$$

which is the probability required, and the same as that of throwing one ace, and not more than one, at a single throw with 4 dice.

The probability of the contrary event, that is to say, the probability of either not throwing an ace at all, or of throwing more aces than one is $1-\frac{125}{324}=\frac{199}{324}$; and therefore the odds against throwing one ace and no more in 4 throws of a common die are 199 to 125, or 8 to 5 very nearly.

17. If in this example it had been proposed to assign the probability of throwing ace once *at least*, instead of once and not more, it would have been necessary to have included those cases in which the ace occurs twice, or three times, or in each of the four trials. The binomial $(p+q)^4$ gives

$$p^4+4p^3q+6p^2q^2+4pq^3+q^4,$$

the first term of which expresses the probability of throwing ace four times in succession; the second that of throwing ace three times, and another number once; the third that of throwing ace twice, and a different face twice; the fourth that of throwing ace once, and a different face three times; and the fifth that of throwing a different face in each of the four trials. But as every one of these compound events, excepting the last, satisfies the condition of ace being thrown once at least, the whole probability of that event must be the sum of the probabilities of the different events by which it may be produced (9) and is consequently

$$\left(\frac{1}{6}\right)^4+4\left(\frac{1}{6}\right)^3\frac{5}{6}+6\left(\frac{1}{6}\right)^2\left(\frac{5}{6}\right)^2+4\left(\frac{1}{6}\right)\left(\frac{5}{6}\right)^3=\frac{671}{1296}$$

In general, the sum of the first $n+1$ terms of $(p+q)^h$ expresses the probability of obtaining *not less* than $h-n$ events, the probability of each of which is p, or *not more* than n contrary events, the probability of each of which is q.

Since $p+q=1$, the sum of all the terms of the series produced by the expansion of $(p+q)^h$ is equal to unit, and therefore the sum of any number of the terms is equal to unit diminished by the sum of the remaining terms. This consideration frequently gives the means of abridging the calculations. Thus, in the preceding example, instead of expanding the binomial $(\frac{1}{6}+\frac{5}{6})^4$ in order to find the probabilities of throwing 4 aces, 3 aces, 2 aces, and 1 ace only, in a series of 4 trials, we might have sought the probability of not throwing ace at all. The probability of not throwing ace in a single trial is $\frac{5}{6}$, and therefore (7) that of not throwing it in 4 trials is $(\frac{5}{6})^4=\frac{625}{1296}$. Hence the probability of the contrary event, namely, that ace will be thrown once or oftener, is $1-\frac{625}{1296}=\frac{671}{1296}$; the same as before.

18. Let a shilling be tossed; what is the probability that more than 3 heads will turn up in the first 10 trials? In this case, $p=\frac{1}{2}$, $q=\frac{1}{2}$, $h=10$; therefore $(p+q)^h=(\frac{1}{2}+\frac{1}{2})^{10}=(\frac{1}{2})^{10}(1+1)^{10}$. Now the last term of this development expresses the probability that head will not turn up in any one of the ten trials; the last but one, the probability that it will turn up once; the last but two, the probability that it will turn up twice; and the last but three, the probability that it will turn up three times; therefore the four last terms include all the different ways in which the ten trials give not more than three heads; and their sum consequently expresses the probability that *not more* than 3 heads will be thrown. Now the last four (or first four) terms of the expansion of $(1+1)^{10}$ are

$$1\ ,\ 10\ ,\ \frac{10\cdot9}{1\cdot2},\ \ \frac{10\cdot9\cdot8}{1\cdot2\ 3},$$

and their sum is 176, which multiplied by $(\frac{1}{2})^{10}=\frac{1}{1024}$, gives $\frac{176}{1024}$, for the probability that not more than 3 heads will turn up; whence the probability of the contrary event or that more than 3 heads will be thrown, is $1-\frac{176}{1024}=\frac{848}{1024}=\frac{53}{64}$; and the odds in favour of throwing heads more than three times in 10 trials are 53 to 11.

19. A and B engage in play; the probability of A's winning a game is p, and the probability of B's winning a game is q; required the probability P, of A's winning m games before B wins n games, the play being supposed to terminate when either of those events has occurred.

It is evident that the question must be decided *at the latest*, by the $(m+n-1)$th game; for supposing $m+n-2$ games to have been played, there is only one combination according to which the match can remain undecided, namely, that in which A has won $m-1$, and B $n-1$ games; and in this case the next game necessarily decides the match.

Suppose $m+x$ games to have been played. The probability that of these games m have been won by A, and x by B, is represented by the term of the binomial $(p+q)^{m+x}$ in which the factor $p^m q^x$ occurs (13); which term is

$$\frac{1\,.\,2\,.\,3 \ldots\ldots m+x}{1\,.\,2\,.\,3 \ldots\ldots m \times 1\,.\,2\,.\,3 \ldots\ldots x} p^m q^x.$$

But A cannot win m games out of $m+x$ exactly unless he wins the last game, for otherwise he must have won m games out of $m+x-1$, if not out of a smaller number. In order therefore that A may win m games out of $m+x$ exactly, it is necessary in the first place that he wins $m-1$ out of $m+x-1$ in any order, and then that he wins also the next game. Now the probability of his winning $m-1$ games out of $m+x-1$ in any order (13) is

$$\frac{1\,.\,2\,.\,3 \ldots\ldots m+x-1}{1\,.\,2\,.\,3 \ldots m-1 \times 1\,.\,2\,.\,3 \ldots x} p^{m-1} q^x;$$

and the probability of his winning the following game is p, whence the probability of both events is (7)

$$\frac{1\,.\,2\,.\,3 \ldots\ldots m+x-1}{1\,.\,2\,.\,3 \ldots\ldots m-1 \times 1\,.\,2\,.\,3 \ldots\ldots x} p^m q^x,$$

which, therefore, expresses the probability of A's winning m games out of $m+x$ exactly.

If we suppose $x=0$, this formula becomes p^m, which is the probability of A's winning m games in succession. If $x=1$, it becomes $mp^m q$, the probability that A wins m games out of $m+1$. If $x=2$, it becomes $\frac{m(m+1)}{1\,.\,2} p^m q^2$, the probability that A wins m games out of $m+2$. If $x=3$, it becomes $\frac{m(m+1)(m+2)}{1\,.\,2\,.\,3} p^m q^3$, the probability that A wins m games out of $m+3$; and so on. Continuing this process till we arrive at the term multiplied by $p^m q^x$, the sum of the probabilities of all the different compound events is

$$p^m \left\{ 1+mq+\frac{m(m+1)}{1\,.\,2} q^2 \ldots + \frac{m(m+1) \ldots m+x-1}{1\,.\,2 \;\ldots\; x} q^x \right\};$$

which expresses the probability of A's winning m games out of a number *not greater* than $m+x$.

Now it has been shewn, that the match is necessarily decided by $(m+n-1)$ games; consequently the solution of the question is obtained by substituting $n-1$ for x in the last formula, which will then express the probability of A's winning m games in any order, out of a number not greater than $m+n-1$. On making this substitution, we obtain

$$\mathrm{P}=p^m \left\{ 1+mq+\frac{m(m+1)}{1\,.\,2} q^2 \ldots\ldots\ldots\ldots \right.$$
$$\left. \ldots\ldots\ldots\ldots + \frac{m(m+1) \ldots m+n-2}{1\,.\,2 \;\ldots\; n-1} q^{n-1} \right\}.$$

The probability Q that the match will be decided in favour of B, or that B will win n games out of a number not greater than $m+n-1$, is found by changing m into n, and p into q, and is therefore

$$\mathrm{Q}=q^n \left\{ 1+np+\frac{n(n+1)}{1\,.\,2} p^2 \ldots\ldots\ldots\ldots \right.$$
$$\left. \ldots\ldots\ldots\ldots + \frac{n(n+1) \ldots\ldots m+n-2}{1\,.\,2 \;\ldots\ldots\; m-1} p^{n-1} \right\}.$$

As an example, let us suppose $p=\frac{2}{3}$, $q=\frac{1}{3}$, $m=4$, and $n=2$. The probability of A's winning the match, or the value of P, becomes

$$\left(\frac{2}{3}\right)^4 \left\{ 1+4\,.\,\frac{1}{3} \right\} = \frac{112}{243};$$

and the probability of B's winning the match, or the value of Q,

$$\left(\frac{1}{3}\right)^2 \left\{ 1+\frac{4}{3}+\frac{2\,.\,3}{1\,.\,2}\left(\frac{2}{3}\right)^2+\frac{2\,.\,3\,.\,4}{1\,.\,2\,.\,3}\left(\frac{2}{3}\right)^3 \right\} = \frac{131}{243}.$$

In this example the skill of A is supposed to be twice as great as that of B, and the number of games that must be won by him in order to gain the match is also twice as great as the number required to be won by B in order that B may gain; one might therefore suppose, that when they begin to play the chances in favour of each are equal. But the result shews that the chances in favour of A are fewer than those in favour of B in the proportion of 112 to 131; whence it appears that it would be unsafe to wager that a player who has two chances in his favour while his adversary has only one, will gain four games before his adversary shall have gained two.

Suppose A and B, engaged in play, agree to leave off before the match is decided, it is evident that the stakes ought to be shared between them in proportion to their respective probabilities of winning, and consequently the share of each is found from either of the above expressions for P and Q. This was one of the questions proposed by the Chevalier de Méré to the celebrated Pascal, to which allusion has already been made.

20. An urn contains $n+1$ balls, marked with the numbers 0, 1, 2, 3……n; a ball is successively drawn and replaced in the urn, so that the chance of drawing any given number remains the same in each trial, what is the probability that in h trials the sum of the numbers drawn will be equal to s?[1]

The solution of this problem depends on the number of ways in which the number s can be formed by the addition of h different numbers, each of which may have any value from 0 to n. If we suppose the numbers marked on the balls to be indexes of a certain quantity x, and develope the expression $(x^0+x^1+x^2 \ldots\ldots + x^n)^h$, the coefficient of any term of the development will indicate the number of different ways in which the balls may be drawn, so that the sum of the numbers drawn in h trials shall be equal to the sum of the indexes of x in that term. If, therefore, we denote by N the coefficient of that term of the development in which the sum of the indexes is s, then N will be the number of cases favourable to the event. But the whole number of possible cases is $(n+1)^h$; therefore the probability of the event is $\mathrm{N} \div (n+1)^h$.

On account of the particular form of the polynomial in question, the value of N is found without difficulty.

Because $x^0+x^1+x^2 \ldots\ldots + x^n = \frac{1-x^{n+1}}{1-x}$, therefore $(x^0+x^1+x^2 \ldots\ldots + x^n)^h=(1-x^{n+1})^h(1-x)^{-h}$. Now, expressing these two factors in series, we have $(1-x^{n+1})^h$

$$=1-hx^{n+1}+\frac{h(h-1)}{1\,.\,2}x^{2(n+1)}-\frac{h(h-1)(h-2)}{1\,.\,2\,.\,3}x^{3(n+1)}+\&c.$$

$$(1-x)^{-h}=1+hx+\frac{h(h+1)}{1\,.\,2}x^2+\frac{h(h+1)(h+2)}{1\,.\,2\,.\,3}x^3+\&c.;$$

and the coefficients of the several terms of the product of these two series in which the sum of the indexes is s will be found as follows:—

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[1] Demoivre, *Miscellanea Analytica*, p 196; Laplace, *Essai sur les Probabilités*, p. 253, et seq.

(1.) Multiply the first term of the first series by that term of the second series of which the argument is x^s; the coefficient of the product will be $\frac{h(h+1)(h+2)\ldots\ldots h+s-1}{1\,.\,2\,.\,3\quad\ldots\ldots\quad s}$

(2.) Multiply the second term of the first series by that term of the second series which has for its argument x^{s-n-1}; the coefficient of the product will be

$$-h\times\frac{h(h+1)(h+2)\ldots\ldots h+s-n-2}{1\,.\,2\,.\,3\quad\ldots\ldots\quad s-n-1}.$$

(3.) Multiply the third term of the first series by that term of the second series which has for its argument $x^{s-2(n+1)}$; the coefficient of the product will be

$$\frac{h(h-1)}{1\,.\,2}\times\frac{h(h+1)(h+2)\ldots\ldots h+s-2n-3}{1\,.\,2\,.\,3\quad\ldots\ldots\quad s-2n-2}.$$

(4.) Proceed in the same manner with the fourth term of the first series, and so on with the others, advancing at each new multiplication one term to the right in the first series. and $n+1$ terms to the left in the second series, until a term is reached in the first series, the exponent of x in which is equal to, or greater than s. The sum of the several products thus obtained will be the value of N. We have therefore

$$\begin{aligned}\mathrm{N}=&\frac{h(h+1)(h+2)\ldots\ldots h+s-1}{1\,.\,2\,.\,3\quad\ldots\ldots\quad s}\\&-\frac{h}{1}\times\frac{h(h+1)(h+2)\ldots\ldots h+s-n-2}{1\,.\,2\,.\,3\quad\ldots\ldots\quad s-n-1}\\&+\frac{h(h-1)}{1\,.\,2}\times\frac{h(h+1)(h+2)\ldots\ldots h+s-2n-3}{1\,.\,2\,.\,3\quad\ldots\ldots\quad s-2n-2}\\&-\&\mathrm{c.}\end{aligned}$$

The series now found for N may be changed into another, having a more elegant form, by reducing all the terms to others having the common denominator $1\,.\,2\,.\,3\ldots\ldots h-1$. This will be accomplished by leaving out of the numerator and denominator of the first term all the numbers after $h-1$ to s, (including s), when s is greater than $h-1$, or by inserting the numbers between s and $h-1$ (the last included), when $s \angle h-1$; by leaving out of the numerator and denominator of the second term all the numbers from $h-1$ to $s-n$, or by inserting those numbers; and so on with the other terms. If we then make the common denominator $1\,.\,2\,.\,3\ldots h-1=k$, we shall have

$$\begin{aligned}\mathrm{N}=&\frac{1}{k}(s+1)(s+2)(s+3)\ldots\ldots(s+h-1)\\&-\frac{h}{k}(s-n)(s-n+1)\ldots\ldots(s-n+h-2)\\&+\frac{h(h-1)}{1\,.\,2k}(s-2n-1)(s-2n)\ldots\ldots(s-2n+h-3)\\&-\&\mathrm{c.}\end{aligned}$$

to be continued till the last factor of one of the terms becomes 0 or negative. If we also make

$$\begin{aligned}&s+h-1=f\\&s-n+h-2=f-(n+1)=f'\\&s-2n+h-3=f-2(n+1)=f''\\&s-3n+h-4=f-3(n+1)=f'''\\&\&\mathrm{c.}\end{aligned}$$

and write the factors in each of the terms in the reverse order, the above value of N will become

$$\begin{aligned}\mathrm{N}=&+f(f-1)(f-2)\ldots\ldots(f-h+2)\frac{1}{k}\\&-f'(f'-1)(f'-2)\ldots\ldots(f'-h+2)\frac{h}{k}\\&+f''(f''-1)(f''-2)\ldots\ldots(f''-h+2)\frac{h(h-1)}{1\,.\,2k}\\&-f'''(f'''-1)(f'''-2)\ldots\ldots(f'''-h+2)\frac{h(h-1)(h-2)}{1\,.\,2\,.\,3k}\\&+\&\mathrm{c.}\end{aligned}$$

21. As an example of the application of this formula, let it be required to assign the probability of throwing the point 16 with 4 common dice. (Simpson, p. 53.)

A die having no face marked 0, it is necessary, in order to adopt the formula to this case, to suppose the number of points on each face to be diminished by unit, which is equivalent to supposing $s-h$ to be substituted for s. The numbers are then 0, 1, 2, 3, 4, 5, and we have $n=5$, $h=4$, and $s=(16-4)=12$. Hence

$$\begin{aligned}&f=s+h-1=15\\&f'=f-(n+1)=9\\&f''=f-2(n+1)=3\\&f'''=f-3(n+1)=-3,\end{aligned}$$

and $k=1\,.\,2\,.\,3$. Substituting these values in the formula, we find

$$\begin{aligned}\mathrm{N}=&15\,.\,14\,.\,13\times\frac{1}{6}(=+455)\\&-9\,.\,8\,.\,7\times\frac{4}{6}(=-336)\\&+3\,.\,2\,.\,1\times\frac{4\,.\,3}{1\,.\,2\,.\,6}(=+6)\end{aligned}$$

or $\mathrm{N}=125$. Now the probability of the event is $\mathrm{N}\div(n+1)^h$; and in the present case $(n+1)^h=6^4=1296$; consequently the probability required, namely that of throwing the point 16 with 4 dice, is $\frac{125}{1296}$.

22. In the numerical solution of questions of this sort, it sometimes happens that the labour may be abridged by computing the probability of throwing a different point from that which is proposed, but which has the same number of chances in its favour. For example, let it be proposed to determine the probability that in throwing 10 dice the sum of the points will be 50. In this case, the smallest number of points that can possibly be thrown is 10, and the greatest 60; and the chances in favour of throwing 10 and of throwing 60 are obviously equal. The probability of throwing any given number of points above 10 is also evidently the same as that of throwing the number which is as much under 60; and consequently the probability of throwing 50 is the same as the probability of throwing 20, these numbers being at equal distances from the extremes. Now to find the probability of throwing 20 with 10 dice, or, which is the same, the probability that in 10 successive drawings from an urn containing 6 balls, marked with the numbers 0, 1, 2, 3, 4, 5, the sum of the numbers drawn will be 10, we have $h=10$, $n=5$, $s=10$; whence $f=19$, $f'=13$, $f''=7$, f''' negative, and $k=1\,.\,2\ldots9$. Substituting these numbers in the series for N, and observing that since $f''-h+2=-1$, the third term becomes negative, we have

$$\begin{aligned}\mathrm{N}=&\frac{19\,.\,18\,.\,17\,.\,16\,.\,15\,.\,14\,.\,13\,.\,12\,.\,11}{1\,.\,2\,.\,3\,.\,4\,.\,5\,.\,6\,.\,7\,.\,8\,.\,9}(=92378)\\&-\frac{13\,.\,12\,.\,11\,.\,10\,.\,9\,.\,8\,.\,7\,.\,6\,.\,5}{1\,.\,2\,.\,3\,.\,4\,.\,5\,.\,6\,.\,7\,.\,8\,.\,9}(=-7150),\end{aligned}$$

and consequently $\mathrm{N}=85228$. Dividing this by $(n+1)^h=6^{10}=60466176$, the probability of throwing 20, or of throwing 50, with 10 dice is found $=\frac{85228}{60466176}$, or between $\frac{1}{709}$ and $\frac{1}{710}$.

23. The probability that the whole number of points drawn in h trials will *not exceed* s is found by substituting for s the different values 0, 1, 2……s in the series for N, and taking the sum of the results. This labour, however, may be avoided by means of a property of the figurate numbers. It is well known that the sum of the series of numbers obtained by giving n every value from $n=1$ to $n=v$ (v being any number whatever) in the formula

$$\frac{n(n+1)(n+2)\ldots\ldots(n+u)}{1\cdot 2\cdot 3\ \ldots\ldots\ u+1}$$

is expressed by this other formula

$$\frac{v(v+1)(v+2)\ldots\ldots(v+u)(v+u+1)}{1\,.\,2\,.\,3\ \ldots\ldots(u+1)(u+2)};$$

or, which is the same thing, that the sum of the series obtained by giving x successively every value from $x=1+u$ to $x=1+u+v$ in the formula

$$\frac{x(x-1)(x-2)\ldots\ldots(x-u)}{1\,.\,2\,.\,3\qquad u+1}$$

is expressed by this other formula

$$\frac{(x+1)x(x-1)\ldots\ldots x-u}{1\,.\,2\,.\,3\ldots\ldots\ldots u+2},$$

in which $x=1+u+v$.

Comparing the different terms of the series for N (20) with these last formulæ, it will be evident, that on giving s every value successively, from 0 to s in the value of f, and denoting by N′ the sum of all the results, we shall have

$$N'=+\frac{(f+1)f(f-1)(f-2)\ldots(f-h+2)}{1\,.\,2\,.\,3\,.\,4\quad\ldots\quad h}$$
$$-\frac{(f'+1)f'(f'-1)(f'-2)\ldots(f'-h+2)}{1\,.\,2\,.\,3\,.\,4\quad\ldots\quad h}\times h$$
$$+\frac{(f''+1)f''(f''-1)(f''-2)\ldots(f''-h+2)}{1\,.\,2\,.\,3\,.\,4\quad\ldots\quad h}\times\frac{h(h-1)}{1\,.\,2}$$
$$-\&c.$$

for the probability that the number of points thrown will not be greater than s.

As an example, let $h=10$, $s=5$, $n=5$; we have then $f=s+h-1=14$, $f'=f-(n+1)=8$, whence $f'-h+2=0$, and consequently the second term vanishes. Hence

$$N'=\frac{15\,.\,14\,.\,13\,.\,12\,.\,11\,.\,10\,.\,9\,.\,8\,.\,7\,.\,6}{1\,.\,2\,.\,3\,.\,4\,.\,5\,.\,6\,.\,7\,.\,8\,.\,9\,.\,10}=3003.$$

The probability, therefore, of the sum of the numbers drawn in 10 drawings not exceeding 5, is $3003\div(6)^{10}$, or $\frac{3003}{60466176}$. And this is also the probability that in throwing 10 common dice the sum of the points does not exceed 16. (Simpson, p. 60.)

24. In the preceding questions the number of trials, denoted by h, has been supposed to be given; and the object, in every case, has been to determine the value of a given term, or of a given number of terms of the series produced by the development of the binomial $(p+q)^h$. But there is a numerous class of questions in respect of which the exponent h is unknown, and is required to be determined from the condition that an assigned term, or the sum of a certain number of assigned terms of the development, must have a given value. For example, let it be proposed to determine how often a common die must be thrown in order to give the probability of ace turning up *once at least*, equal to a given fraction u. Here the probability of throwing ace in any throw being $\frac{1}{6}$, we have $p=\frac{1}{6}$, and $q=\frac{5}{6}$. Now, as every term of the development of $(p+q)^h$, excepting the last, gives a combination in which ace occurs once or oftener, the question requires a value to be found for h, such, that the sum of the first h terms of that development, shall be equal to u. This may be done, in general, by the common methods of trial and error; but in the present case, the last term being the only one not included among those which contain a chance of throwing ace, it is evident that it is only necessary to find the last term alone in order to have the probability of *not* throwing ace in h trials, which by the question is $1-u$. The last term of the development is q^h; therefore we must have the equation $q^h=1-u$; whence $h \log q=\log(1-u)$, and $h=\log(1-u)\div\log q$. Let $1-u=\frac{\beta}{\gamma}$ and $q=\frac{b}{c}$, we shall then have $\log(1-u)=\log\beta-\log\gamma$, and $\log q=\log b-\log c$; whence

$$h=\frac{\log\beta-\log\gamma}{\log b-\log c}.$$

Substituting in this general formula the particular numbers given in the question, namely $b=5$, $c=6$; and supposing $u=\frac{1}{2}$, and consequently $\beta=1$, $\gamma=2$, we have $h=\frac{\log 2}{\log 6-\log 5}$; whence, by computing from the logarithmic tables, $h=3{\cdot}8$. From this it follows, that in four trials the probability of throwing ace once at least, is greater than the probability of not throwing it at all.

If the question had been to determine in how many throws with two dice one may undertake, on an equality of chance, to throw aces at least once, we should have had $p=\frac{1}{36}$, $q=\frac{35}{36}$, and consequently $b=35$, and $c=36$. Substituting these numbers in the general formula, and observing, that in this case also $\beta=1$, $\gamma=2$, we get $h=\frac{\log 2}{\log 36-\log 35}=24{\cdot}6$. The probability of not throwing aces once is therefore greater than the opposite probability or that of throwing aces once or oftener, when the number of throws is 24, but less when the number is 25.

These two questions are celebrated in the early history of the theory of Probability, from the circumstance that the Chevalier de Méré, by whom they were proposed to Pascal, declared the two results above stated to be inconsistent with each other, and thence took occasion to question the accuracy of the theory of combinations by means of which they had been obtained. He reasoned thus: Since the probability of throwing ace with one die is $\frac{1}{6}$, and that of throwing aces with two dice $\frac{1}{6}$ of $\frac{1}{6}=\frac{1}{36}$; therefore, if there be a given probability in favour of throwing ace in four throws with one die, there must likewise be the same probability of throwing aces with two dice in $6\times4=24$ throws; in other words, the chances in favour of an event E in a single trial, being six times more numerous than those in favour of F, there will be as many chances in favour of F in six trials as there are in favour of E in one. The error consists in supposing that the number of trials must increase or diminish exactly in the inverse ratio of the probability of obtaining the proposed point.[1]

25. The general question may be enunciated as follows: Let p= the probability an event E will happen, q the probability it will fail; how many trials are required to give a probability $=u$ that E will happen k times.

Let x= the number required. Taking the sum of all the terms of the development of $(p+q)^x$ in which the exponent of p is less than k, we shall have the probability that the event does *not* happen k times in x trials. This sum must consequently be made equal to $1-u$; therefore, beginning the last term, and writing the terms in the reverse order, we have the equation

$$q^x+x\,q^{x-1}p+\frac{x\,(x-1)}{1\ldots2}q^{x-2}\,p^2\ldots\ldots$$
$$+\frac{x\,(x-1)\ldots(x-k+2)}{1\,.\,2\ldots\ldots\ldots(k-1)}q^{x-k+1}\,p^{k-1}=1-u.$$

Let $p=e\,q$, and this equation becomes

$$q^x\left\{1+x\,e+\frac{x\,(x-1)}{1\,.\,2}\,e^2\ldots\ldots+\frac{x\,(x-1)\ldots\ldots(x-k+2)}{1\,.\,2\ldots\ldots(k-1)}\,e^{k-1}\right\}$$
$$=1-u$$

from which the value of x may be found by the ordinary methods of converging series.

If $p=q=\frac{1}{2}$, then $e=1$; and if we also suppose $u=\frac{1}{2}$, and consequently $1-u=\frac{1}{2}$, the equation will become

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[1] Pascal, *Œuvres*, tom. iv. p. 367; Lacroix, *Elémentaire*, p. 36.

$$1+x+\frac{x(x-1)}{1\,.\,2}\ldots+\frac{x(x-1)\ldots x-k+2}{1\,.\,2\ldots\ldots\ldots k-1}=\tfrac{1}{2}(1+1)^x.$$

But the first side of this equation is the expansion of $(1\times 1)^x$ continued to k terms; therefore, since the sum of the first k terms is equal to one-half of the whole series, and the terms of the first half of the series are the same as those of the last, it follows that the whole number of terms must be $2k$. But the whole number of terms in the expansion of $(1+1)^x$ is $x+1$; therefore $2k=x+1$, and $x=2k-1$. Suppose $k=10$, then $x=19$; hence in tossing a shilling it is an even bet that head will turn up 10 times in 19 throws.

SECT. III. OF THE PROBABILITY OF EVENTS DEPENDING ON A REPETITION OF TRIALS, OR COMPOUNDED OF ANY NUMBER OF SIMPLE EVENTS, THE CHANCES IN RESPECT OF WHICH ARE KNOWN *A PRIORI*, AND VARY IN THE DIFFERENT TRIALS.

26. Let us suppose the trials to consist in drawing balls from an urn containing a white balls, and b black balls, and that when a ball is extracted it is not returned to the urn. Make $a+b=c$, and let the extraction of a white ball be the event W, and that of a black ball the event B. At the first trial the probability of W is $\frac{a}{c}$ (4), and that of B, $\frac{b}{c}$. But at the second trial, the number of balls in the urn is diminished by 1; and the probability of drawing a white ball at the second trial is therefore not the same as it was in the first, but is influenced by the event which has already taken place. If W happened at the first trial, the number of white balls remaining in the urn is then $a-1$; the number of black is b, and the number of both colours $c-1$. The probability of W at the next trial is therefore $\frac{a-1}{c-1}$, and that of B is $\frac{b}{c-1}$. In like manner, if B happened at the first trial, the probability of W at the second is $\frac{a}{c-1}$, and that of B is $\frac{b-1}{c-1}$. Hence (7) the different combinations which can arise from two trials are the following:

WW, WB, BW, BB,

the probabilities of which are respectively,

$$\frac{a(a-1)}{c(c-1)},\quad \frac{ab}{c(c-1)},\quad \frac{ba}{c(c-1)},\quad \frac{b(b-1)}{c(c-1)}.$$

Now if we neglect the order of succession in the two cases in which W and B are combined, the probability of the compound event which consists of the extraction of a ball of each colour in the two trials, is $\frac{2ab}{c(c-1)}$, and the probabilities of the three possible combinations are respectively:—

$$\frac{a(a-1)}{c(c-1)},\quad \frac{2ab}{c(c-1)},\quad \frac{b(b-1)}{c(c-1)}.$$

Comparing these with the probabilities of the same combinations when the chances are constant, or the ball is returned to the urn after each drawing, namely

$$\frac{a^2}{c^2},\quad \frac{2ab}{c^2},\quad \frac{b^2}{c^2},$$

the analogy of the two cases is obvious.

After two balls have been drawn, the whole number remaining in the urn is $c-2$; but the number of each colour depends on the two events that have already occurred. If two white balls have been drawn, the probability of drawing a white ball at the next trial will be $\frac{a-2}{c-2}$; but we have just seen that the probability of WW is $\frac{a(a-1)}{c(c-1)}$; therefore (7) the probability of WWW is $\frac{a(a-1)(a-2)}{c(c-1)(c-2)}$. The probability of drawing a black ball after two white have been drawn is $\frac{b}{c-2}$ (for there are now $c-2$ balls in the urn, of which b are white); therefore the probability of WWB is $\frac{a(a-1)b}{c(c-1)(c-2)}$. On forming in this manner all the different possible combinations which can result from three trials, we find

WWW, probability, $=\frac{a(a-1)(a-2)}{c(c-1)(c-2)}$,

WWB, ——— $=\frac{a(a-1)b}{c(c-1)(c-2)}$,

WBW, ——— $=\frac{ab(a-1)}{c(c-1)(c-2)}$,

BWW, ——— $=\frac{ba(a-1)}{c(c-1)(c-2)}$,

BBW, ——— $=\frac{b(b-1)a}{c(c-1)(c-2)}$,

BWB, ——— $=\frac{ba(b-1)}{c(c-1)(c-2)}$,

WBB, ——— $=\frac{ab(b-1)}{c(c-1)(c-2)}$,

BBB, ——— $=\frac{b(b-1)(b-2)}{c(c-1)(c-2)}$.

If we disregard the order of succession in those combinations into which W and B both enter, and consider the occurrence of W twice and B once as the same compound event; and also the occurrence of W once and B twice as the same compound event, in whatever order they occur, the probability of the former will be $\frac{3a(a-1)b}{c(c-1)(c-2)}$, and of the latter $\frac{3ab(b-1)}{c(c-1)(c-2)}$.

27. In general, if $m'+n'$ balls have been drawn, of which m' have been found to be white and n' black, the number of white balls in the urn will now be $a-m'$, the number of black $b-n'$, and the whole number of both colours $c-m'-n'$. Hence the probability of drawing a white ball in the next trial will be $\frac{a-m}{c-m'-n'}$; and that of drawing a black ball $\frac{b-n'}{c-m'-n'}$. Now if in these two fractions we substitute successively for m' and n' all the different numbers from 0 to $m-1$ and $n-1$ respectively, the product of the $m+n$ numbers thus obtained will (7) be the probability of drawing m white balls and n black in an assigned order, in $m+n$ trials Let this probability be denoted by K, and we shall have

$$K=\frac{a(a-1)(a-2)\ldots\ldots(a-m+1)\times b(b-1)(b-2)\ldots\ldots(b-n+1)}{c(c-1)(c-2)\ldots\ldots(c-m-n+1)},$$

whatever the given order may be. Hence, if we denote by P the probability of m white balls and n black being drawn in any order whatever, in h trials, we shall have $P=UK$, where, as in (12), $U=\frac{1\,.\,2\,.\,3\ldots\ldots h}{1\,.\,2\,.\,3\ldots\ldots m\times 1\,.\,2\,.\,3\ldots\ldots n}$ the co-efficient of that term of the binomial $(p+q)^h$ which has for its argument $p^m\,q^n$; this co-efficient expressing all the different arrangements which can be formed of m things of one kind, and n things of another.

28. When the urn is supposed to contain balls of more than two different colours, the probability of any proposed number of each colour being drawn in a given number of trials is found with the same facility. Suppose it to contain a_1 of the first colour, a_2 of the second, a_3 of the third, and so on and let $a_1+a_2+a_3$ &c.$=c$; then the probability that

in $m+n+r+\&c.=h$ trials, there will be drawn m of the first colour, n of the second, r of the third, &c. is

$$\begin{aligned}&U'\times a_1(a_1-1)(a_1-2)\ldots\ldots\ldots(a_1-m+1)\\ &\times a_2(a_2-1)(a_2-2)\ldots\ldots\ldots(a_2-n+1)\\ &\times a_3(a_3-1)(a_3-2)\ldots\ldots\ldots(a_3-r+1)\\ &\times a_4(a_4-1)(a_4-2)\ldots\ldots\ldots(a_4-s+1)\\ &\times \&c.\\ &\div c(c-1)(c-2)\ldots\ldots\ldots(c-h+1)\end{aligned}$$

where, as in (15),

$$U=\frac{1\,.\,2\,.\,3\ldots\ldots\ldots\ldots h}{1\,.\,2\,.\,3\ldots\ldots m\times 1\,.\,2\,.\,3\ldots\ldots n\times 1\,.\,2\,.\,3\ldots\ldots\, r\times\&c.}.$$

29. The following examples will shew the use of the preceding formulæ.

Suppose a bag to contain 16 balls, of which 8 are white and 8 black, what is the probability that in drawing 8 balls from the bag the whole of them will be white?

Applying the formula (27) to the solution of this question, we have $a=8$, $b=8$, $c=16$, $m=8$, $n=0$, and as the probability required is that of drawing white balls only, b cannot enter into any of the factors of the numerator; hence

$$K=\frac{8\,.\,7\,.\,6\,.\,5\,.\,4\,.\,3\,.\,2\,.\,1}{16\,.\,15\,.\,14\,.\,13\,.\,12\,.\,11\,.\,10\,.\,9}=\frac{1}{12870};$$

and since $m=h$, $U=1$, the probability sought, is therefore $\frac{1}{12870}$.

Let there be a heap of 20 cards, wherein are 7 diamonds, 6 hearts, 4 spades, and 3 clubs; required the probability that in drawing 8 of them at a venture there shall come out 3 diamonds and 2 hearts? (Simpson, p. 21.)

The probability required in this case being that of drawing 3 diamonds, 2 hearts, and 3 other cards which are neither diamonds nor hearts, the spades and clubs may be considered as forming one parcel, containing 7 cards. We have then in the formula (28) $a_1=7$, $a_2=6$, $a_3=7$, $c=20$; $m=3$, $n=2$, $r=3$, $h=8$; therefore

$$U'=\frac{1\,.\,2\,.\,3\,.\,4\,.\,5\,.\,6\,.\,7\,.\,8}{1\,.\,2\,.\,3\times 1\,.\,2\times 1\,.\,2\,.\,3}=560,$$

and the probability required becomes,

$$560\times\frac{7\,.\,6\,.\,5\times 6\,.\,5\times 7\,.\,6\,.\,5}{20\,.\,19\,.\,18\,.\,17\,.\,16\,.\,15\,.\,14\,.\,13}=\frac{1225}{3978}.$$

The odds against the event are therefore 2753 to 1225, or nearly 9 to 4.

Let 4 cards be drawn from a pack of 52; what is the probability of drawing one of each sort?

In this case we have $a_1=13$, $a_2=13$, $a_3=13$, $a_4=13$, $c=52$; also $m=1$, $n=1$, $r=1$, $s=1$, $h=4$, whence $U'=\frac{1\,.\,2\,.\,3\,.\,4}{1\,.\,1\,.\,1\,.\,1}=24$, and the probability required becomes, on substituting these numbers in the formula (28),

$$24\times\frac{13\,.\,13\,.\,13\,.\,13}{52\,.\,51\,.\,50\,.\,49}=\frac{2197}{20825}=\frac{1}{9}\text{ nearly.}$$

The odds against this event are nearly 8 to 1.

30. The following question, proposed by Huygens, and solved by Demoivre and Bernoulli (*Ars Conjectandi*, p. 59), belongs to the class of problems now under consideration.

An urn contains 12 balls, of which 4 are white and 8 black. Three gamesters A, B, and C agree that the first who, blindfold, shall draw a white ball shall be the winner of the stakes. They also agree that A shall draw first, B second, C third, A fourth, and so on; and the balls drawn are not replaced in the urn. It is proposed to find their respective probabilities of winning.

Here the play terminates as soon as a white ball is drawn, and it must therefore terminate with the 9th trial, if not sooner, inasmuch as, after 8 black balls have been drawn, the urn will contain only white balls, and the probability of drawing a white ball at the next trial will become certainty. The question will therefore be solved, if we determine the probabilities of the play ending with the 1st, 2d, 3d, 4th, &c. games respectively, and take the sum of the probabilities of its ending with the 1st, 4th, and 7th, for the probability of A's winning; the sum of the probabilities of its ending with the 2d, 5th, and 8th, for the probability of B's winning; and the sum of the probabilities of its ending with the 3d, 6th, and 9th, for the probability of C's winning.

For the sake of rendering the solution more general, let a be the number of white balls in the urn, b the number of black, and let $a+b=c$. The probability of drawing a white ball at the first trial, or of the play ending with the first trial, is then $\frac{a}{c}$.

The probability of the play ending with the second trial is compounded of the probability of a black ball being drawn at the first trial, and a white at the second; and the probability of both events (26) is $\frac{ba}{c(c-1)}$.

The probability of the play ending with the third trial is compounded of three separate probabilities, namely, that a black ball will be drawn at the first trial; that a black ball will be drawn at the second; that a white ball will be drawn at the third;—and the probability of the concourse of these events (26) is $\frac{b(b-1)a}{c(c-1)(c-2)}$.

In general the probability of a black ball being drawn in $x-1$ trials successively, and a white ball at the xth is $\frac{b(b-1)(b-2)\ldots\ldots(b-x+2)a}{c(c-1)(c-2)\ldots\ldots\;(c-x+1}$. Substituting for a, b, and c in this formula the numbers proposed by Huygens, we obtain in respect of the 1st, 4th, and 7th trials, or the probability in favour of A,

$$\frac{4}{12}+\frac{8\,.\,7\,.\,6}{12\,.\,11\,.\,10}\cdot\frac{4}{9}+\frac{8\,.\,7\,.\,6\,.\,5\,.\,4\,.\,3}{12\,.\,11\,.\,10\,.\,9\,.\,8\,.\,7}\cdot\frac{4}{6}=\frac{77}{165};$$

in respect of the 2d, 5th, and 8th trials, or the probability in favour of B,

$$\frac{8}{12}\cdot\frac{4}{11}+\frac{8\,.\,7\,.\,6\,.\,5}{12\,.\,11\,.\,10\,.\,9}\cdot\frac{4}{8}+\frac{8\,.\,7\,.\,6\,.\,5\,.\,4\,.\,3\,.\,2}{12\,.\,11\,.\,10\,.\,9\,.\,8\,.\,7\,.\,6}\cdot\frac{4}{5}=\frac{53}{165},$$

and in respect of the 3d, 6th, and 9th trials, or the probability in favour of C,

$$\frac{8\,.\,7}{12\,.\,11}\cdot\frac{4}{10}+\frac{8\,.\,7\,.\,6\,.\,5\,.\,4}{12\,.\,11\,.\,10\,.\,9\,.\,8}\cdot\frac{4}{7}+\frac{8\,.\,7\,.\,6\,.\,5\,.\,4\,.\,3\,.\,2\,.\,1}{12\,.\,11\,.\,10\,.\,9\,.\,8\,.\,7\,.\,6\,.\,5}\cdot\frac{4}{4}=\frac{35}{165}.$$

The chances in favour of A, B, and C, are therefore proportional to the numbers 77, 53, 35, respectively.

If the condition of the play had been that the ball was to be returned to the urn after each trial, the chances in favour of the three gamesters would have been easily found by the formula (12) to be respectively as the numbers 9, 6, and 4.

SECT. IV. OF MATHEMATICAL AND MORAL EXPECTATION.

31. In the theory of probability, the term *expectation* is used to denote the product found by multiplying the value of a casual benefit into the probability of the event on which it is contingent taking place. But the value of a benefit may be estimated either with respect to its absolute amount, or to the amount of relative advantage it affords the individual who receives it. This consideration has led to a distinction between mathematical and moral expectation. When we place the circumstances of the individual entirely out of consideration, and have regard merely to the abstract or absolute value of the benefit, the product of its amount by the probability of obtaining it is the *mathematical expec-*

tation of the individual; but when a relative value is assigned to the benefit, the product of this relative value by the probability of obtaining it is called the *moral expectation*, because it is estimated by certain moral considerations respecting the circumstances or fortune of the individual in whose favour the expectation exists, on the principle that a sum of money which may be relatively of very little importance to a man in possession of a large fortune may be of great importance to another who is less favourably circumstanced. We shall first consider the *mathematical expectation*.

32. Suppose A and B to engage in play; let p be the probability of A's winning a game, q the probability of B's winning it, and s a sum of money staked on the issue of the game. By the definition, the mathematical expectation of A is ps, and that of B is qs. Now if we suppose these expectations to be purchased by A and B, the sums they ought respectively to pay for them, or in other words to stake on the issue of the game, must be proportional to their respective expectations, in order that they may play on equal terms. Let therefore a be the sum staked by A, and b the sum staked by B, we have then $ps : qs :: a : b$, and consequently $pb=qa$. Now suppose $a+b=s$, or that the sum played for is the amount of the stakes; then, since b is the sum A expects to gain, and p is the probability of his gaining it, pb is the mathematical value of A's expectation of gain. In like manner qa is the mathematical value of B's expectation of gain. Hence it follows, that when the sum staked by each is proportional to his probability of winning, the mathematical expectations of the two players are equal; so that after the stakes have been placed, and before the event is decided, they might exchange places without advantage or disadvantage to either. It follows likewise, that since the sum which the one must gain is just that which the other must lose, the product qa, which is B's expectation of gain, may be regarded as A's expectation of loss; or (if taken with a negative sign) as part of A's whole expectation, which then becomes $pb-qa$. But $pb-qa=0$; whence the condition of A before the event is decided is not altered by the circumstance of his having staked on the issue of the play.

33. This conclusion at first sight appears paradoxical; for it is certain, that after the stakes are placed, A must either gain the sum b or lose a, and therefore his fortune will of necessity either be increased by the gain of his adversary's stake, or diminished by the loss of his own. The explanation depends on theorems which will afterwards be demonstrated relative to the repetition of trials, from which it results, that though in a single trial the player must either lose or gain, yet on multiplying sufficiently the number of games, a probability will at length be obtained, approaching as nearly to certainty as we please, that the sum gained or lost in the long run will not exceed a certain given fraction (which may be as small as we please) of the whole sum staked, provided the play is undertaken on terms of mathematical equality. But this indefinite repetition of the hazard is practically impossible; and innumerable cases may easily be imagined, in which an individual will be guided by other considerations than the mere mathematical value of the expectation in undertaking or declining a risk. A person of moderate fortune would scarcely be persuaded to risk L.500 for the expectation of gaining L.5, though the chances might be 100 to 1 in favour of the event which would produce that sum; but numbers would be found willing enough to pay L.5 for the expectation of gaining L.500, the chances being 100 to 1 against them. In both cases, however, the expectation would be purchased at its real abstract value. According to the formula of mathematical expectation, the man whose sole fortune consists of a lottery ticket which has an equal chance of turning up a prize of L.20,000 or a blank, is in an equally advantageous position as he who is in possession of L.10,000; yet no man of ordinary prudence, if offered his choice of the two states, would hesitate as to which he ought to give the preference. Common sense will prevent a man from risking a sum, the loss of which would be attended with great privations, even when, mathematically speaking, the chances are considerably in his favour. It is also obvious that two individuals whose fortunes are very unequal cannot engage in play with the same advantage, although the chances in favour of each, in respect of a single game, are precisely the same. The one who has a large fortune can repeat the hazard so often as to obtain a probability almost equal to certainty that his loss will not amount to any given sum; whereas the other, who cannot continue the play in case of loss, runs the risk of being ruined. It is thus evident, that in a multitude of cases the abstract theory of probability is not alone sufficient to give the value of an expectation, and that in dealing with contingent events, an individual must be guided to a certain extent by considerations of relative advantage.

34. Various hypotheses have been imagined for the purpose of reducing such relative or moral considerations to accurate calculation; but that which appears the most natural, and applicable to the greatest number of cases, consists in supposing the relative value of any infinitely small sum to be directly proportional to its absolute value, and inversely as the fortune of the individual who has an expectation of receiving it. This principle was first proposed by Daniel Bernoulli in the *Petersburg Commentaries* (vol. v.), and is there applied by him to the solution of a number of questions of great practical interest.

Let x be the absolute value of the capital, or, as it is denominated by Laplace, the physical fortune, of an individual; then, according to the hypothesis of Bernoulli, the moral advantage which he derives from an infinitely small increment of fortune $=dx$, is measured by the expression $c\frac{dx}{x}$, c being a constant to be determined by the nature of the question. Now, if we suppose the physical fortune to arise from the accumulation of the elements dx, and denote by y the relative or *moral value* of the fortune, of which the absolute or physical value is x, we shall have

$$y=\int c\frac{dx}{x}=c\ \text{log.}\ x+\text{constant}.$$

To determine the constant, we may suppose $y=o$, when x has a given value $=a$; this gives $o=c\ \text{log.}\ a+\text{constant}$, whence $y=c\ (\text{log.}\ x-\text{log.}\ a)$, or $y=c\ \text{log.}\ \frac{x}{a}$; and it is to be observed, that those values of x and y can never become negative, for as Bernoulli has remarked, it is only the person who is dying of hunger that can be said to possess absolutely nothing. In every other circumstance the mere possession of existence may be accounted a moral advantage, to which, however, it would be absurd to attempt to assign a numerical value.

35. From the above formula, it is easy to deduce a numerical expression for the value of a moral expectation. Let a be the original fortune of the individual, and α, β, γ, &c. sums to be received on the occurrence of certain contingent events, E, F, G, &c. This being supposed, if the event E happens, the absolute fortune of the individual becomes $a+\alpha$, and its relative value, therefore, according to the formula, is $c\ \text{log.}\ \frac{a+\alpha}{a}$. If F happens, his absolute fortune becomes $a+\beta$, to which the corresponding relative value is $c\ \text{log.}\ \frac{a+\beta}{a}$; and so on. Now, let the probabilities of the events E, F, G, &c. be respectively p, q, r, &c. (assuming $p+q+r+$ &c.$=1$, so that one or other of the events will necessarily happen), and let Y represent the relative fortune of the individual arising from his expectation, then, since the

value of a benefit in expectation is equal to the amount of the benefit multiplied by the probability of obtaining it, we have

$$Y=c\left\{p \log.\frac{a+\alpha}{a}+q \log.\frac{a+\beta}{a}+r \log.\frac{a+\gamma}{a}+\&c.\right\}$$

Let also X denote the absolute value of Y; then, by the formula, we have $Y=c \log.\frac{X}{a}$. On comparing these two values of Y, we get

$$\log.\frac{X}{a}=p\log.\frac{a+\alpha}{a}+q \log.\frac{a+\beta}{a}+r \log.\frac{a+\gamma}{a}+\&c.;$$

and on passing to numbers,

$$\frac{X}{a}=\frac{(a+\alpha)^p(a+\beta)^q(a+\gamma)^r,\&c.}{a^{p+q+r+\&c.}},$$

therefore, since $p+q+r+\&c.=1$,

$$X=(a+\alpha)^p(a+\beta)^q(a+\gamma)^r, \&c.$$

In this expression X denotes the absolute value of the original fortune and of the expectation added together; if, therefore, we deduct a from X, the difference will be the value of the expectation, or the sum which, if it were to be received certainly, would procure the individual the same relative advantage as his expectation.

36. If the sums α, β, γ, &c. are supposed to be very small in comparison of a, so that quantities of the order $\left(\frac{\alpha}{a}\right)^2$ may be neglected, the preceding equation becomes

$$X=a^{p+q+r+\&c.}+a^{p+q+r\&c.-1}\left\{p\alpha+q\beta+r\gamma+\&c.\right\}$$

whence, since $p+q+r+\&c.=1$,

$$X=a+p\alpha+q\beta+r\gamma+\&c.$$

Deducting from this the original fortune a, the remainder $p\alpha+q\beta+r\gamma+\&c.$ is the value of the expectation, or the sum equivalent to the moral advantage. But the value of the mathematical expectation of the benefits α, β, γ, &c. of which the probabilities are respectively p, q, r, &c. is also $p\alpha+q\beta+r\gamma+\&c.$ (31), therefore, when the contingent benefits are very small in comparison of the original fortune, the moral advantage and the mathematical expectation are sensibly the same.

37 From the formula $X=(a+\alpha)^p(a+\beta)^q(a+\gamma)^r$ &c. Bernoulli deduces the consequence that gambling or betting is attended with a moral disadvantage, even when the chances of gain or loss, mathematically speaking, are perfectly equal. To shew this, he proposes the following question. A, whose fortune is 100 crowns, bets 50 crowns with B, on the issue of an event of which the probability is $\frac{1}{2}$, on these terms: if the event happens, A is to receive from B 50 crowns; if it fails, he is to pay B 50 crowns; what is the relative value of A's fortune, after undertaking the bet, and before the event is decided? In this case, we have $a=100$, $\alpha=50$, $\beta=-50$, $\gamma=0$; also $p=\frac{1}{2}$, $q=\frac{1}{2}$, $r=0$; and the formula (35) becomes

$$X=(100+50)^{\frac{1}{2}}\times(100-50)^{\frac{1}{2}},$$

whence $X=\sqrt{150\times 50}=87$; and, consequently, the condition of A is worse by 13 crowns than it was before he hazarded the bet. The moral disadvantage is therefore equivalent to this sum, though the terms of the play, according to the mathematical theory, are equal.

38. The conclusion arrived at in this particular case is easily shewn to be universally true. Let a be the capital of the player, p his probability of winning, q his probability of losing, and s the sum at stake. In order that he may play on terms of mathematical equality, the part of the stakes contributed by himself, or the sum which he can lose, must be ps (32), and the part contributed by his adversary, or that which he may gain, must be qs. The equation in (35) therefore becomes

$$X=(a+qs)^p\times(a-ps)^q,$$

and if it can be shewn that this value of X is less than a, it will follow that his condition is rendered worse in consequence of having staked on the game. Now, dividing by a, and taking the logarithm of both sides of the equation, we get $\log.\frac{X}{a}=p \log.\left(1+\frac{qs}{a}\right)+q \log.\left(1-\frac{ps}{a}\right)$, the differential of which (making s variable) is

$$d \log.\frac{X}{a}=pqds\left(\frac{1}{1+\frac{qs}{a}}-\frac{1}{1-\frac{ps}{a}}\right).$$

But the second side of this equation is evidently negative; therefore $d \log. X\div a$ is negative; consequently the logarithm of $X\div a$ is negative, and X must be less than a. In all cases, therefore, the bet, if on even terms, produces a moral disadvantage.

39. Another consequence deduced by Bernoulli from this theory of moral expectation, is, that when property of any kind is exposed to a risk or hazard, it is more advantageous to expose it in parts to several risks independent of each other, than to expose the whole at once to a single risk, although the probability of loss be in both cases precisely the same. To prove this, he takes the following example. A merchant has a capital of L.4000, besides goods of the value of L.8000, which must be transported by sea. The probability of the loss of a vessel in the voyage being $\frac{1}{10}$, let it be proposed to find the value of the moral expectation of the merchant in the case of the goods being embarked in a single vessel, and also in the case of one half being embarked in one vessel and the other half in another. Supposing the merchandise embarked in one ship, the absolute fortune of the merchant will be increased to L.12,000 in the event of the safe arrival of the ship, and will be reduced to L.4000 in the event of its being lost. The probability of the first of these events is $\frac{9}{10}$, and of the second $\frac{1}{10}$; therefore his absolute fortune becomes, in virtue of his expectation,

$$X=(12{,}000)^{\frac{9}{10}}\times(4000)^{\frac{1}{10}},$$

whence X=10751. Deducting his other capital, L.4000, there remains L.6751 for the value of the moral expectation in respect of the venture.

Let us next suppose the merchandise embarked in equal parts in two ships. In this case there are three compound events to be considered, 1st, Both vessels may arrive in safety; the probability of which is $\frac{9}{10}\times\frac{9}{10}=\frac{81}{100}$. 2d, One may arrive in safety and the other be lost; the probability of which, as it may happen in two ways, (11) is $2\times\frac{9}{10}\times\frac{1}{10}=\frac{18}{100}$. 3d, Both may be lost; the probability of which is $\frac{1}{10}\times\frac{1}{10}=\frac{1}{100}$. If the first of these events happen, the capital of the merchant will become L.4000+L.8000=L.12,000; if the second happen it will be L.4000+L.4000=L.8000; and if the third happen it will be only L.4000. With these numbers the formula becomes

$$X=(12{,}000)^{\frac{81}{100}}\times(8000)^{\frac{18}{100}}\times(4000)^{\frac{1}{100}},$$

whence X=11033. Deducting his other capital, which was exposed to no risk, there remains L.7033 for the value of the moral expectation. This sum exceeds the former by L.282; and it is easily found by following the same process of reasoning, that in proportion as the risk is divided among a greater number of ships, the moral expectation is increased, and approaches its limit, which is the value of the mathematical expectation, or $\frac{9}{10}$ of L.8000=L.7200.

40. The theory of moral expectation enables us likewise to assign the circumstances in which it is advantageous or

otherwise, to insure property against particular hazards. There are three principal questions to be considered in reference to this subject; 1. The amount of premium the insured may pay without disadvantage, 2. The ratio of his fortune to the value of the sum exposed to risk, in order that it may be advantageous to insure at a given premium; and 3. The capital which the insurer or underwriter ought to possess, in order that he may insure a given risk with probable advantage to himself, and safety to the insured.

Let s be the value of a cargo which a merchant embarks in a ship, p the probability of the safe arrival of the vessel, and a his capital independently of s. The mathematical value of the premium for insurance is qs; for, if we denote the premium by y, then y is the sum the insurer will gain if the vessel reaches its destination in safety, and $s-y$ is the sum he will lose if it does not; and by the theorem for the mathematical expectation $py=q(s-y)$; whence, since $p+q=1$, $y=qs$. If, therefore, the merchant insures the cargo, his absolute fortune becomes $a+s-qs=a+ps$; and if he does not insure, it is the value of X in the equation $X=(a+s)^p a^q$. Hence it will be advantageous or otherwise to insure according as $a+ps$ is greater or less than $(a+s)^p a^q$. Now the logarithm of the first of these expressions, or $\log(a+ps)$, is equivalent to the integral $\int\frac{pds}{a+ps}$; and the logarithm of the second, or $p\log(a+s)+q\log a$, is equivalent to $\int\frac{pds}{a+s}$; but since p is a proper fraction, $a+ps$ is less than $a+s$, and therefore the first integral is greater than the second. Consequently $a+ps$ is, in general, greater than $(a+s)^p a^q$, and the insurance is attended with advantage. Let us now assume $x=a+ps-(a+s)^p a^q$, and x will be the sum the merchant could afford to pay the insurer above the mathematical value of the risk without moral disadvantage. If he pays less than $qs+x$, his relative fortune is increased by insuring; and if he pays more he is a loser. In practice the premium may be considered as less than $qs+x$, but greater than qs; so that while the insured pays more than the mathematical value of the risk, he gains a moral advantage by the transaction.

To solve the second question, let e be the premium demanded for insuring the amount s; then, the other capital of the merchant being a, his fortune after being insured is $a+s-e$; while if he takes the risk on himself, its value becomes $(a+s)^p a^q$. If, therefore, the value of a be determined from the equation $a+s-e=(a+s)^p a^q$, we shall have the amount of capital he ought to possess in order that it may be *morally* a matter of indifference to him whether he insures or not. As an example, let the value of the merchandise, or s, be L.10,000, $e=$L.800, and $p=\frac{19}{20}$. The equation then becomes

$$a+9200=(a+10,000)^{\frac{19}{20}}a^{\frac{1}{20}};$$

whence a is found by approximation $=5043$. It follows, therefore, that unless his other capital amount to L.5043, it would be disadvantageous to neglect insuring, although the premium demanded exceed the mathematical value of the risk (which is $\frac{1}{20}\times$ L.10,000$=$L.500) by L.300.

The third question, the amount of capital the underwriter ought to possess, is determined precisely in the same way. Let b be his capital. After accepting the risk of the sum s for the premium e, his capital will become $b+e$ in the case of the vessel arriving in safety, and $b-s+e$ in the case of its being lost. The formula of the moral expectation therefore becomes $X=(b+e)^p(b-s+e)^q$; and in order that there may be neither advantage nor disadvantage in undertaking the risk, this value of X must be equal to his original capital, b. Supposing, therefore, s, e, p, q, to have the same significations as above, the equation from which b is to be determined is $b=(b+800)^{\frac{19}{20}}(b-9200)^{\frac{1}{20}}$, whence $b=14243$. Unless, therefore, the capital of the insurer amounts to L.14,243, there would be a moral disadvantage in undertaking the risk of insuring a cargo worth L.10,000 for a premium of L.800; and it is easy to see, that if a smaller premium were demanded, the capital ought to be still greater. On making $e=600$, (which still exceeds the mathematical value of the risk), the value of b becomes L.29,878. Hence it follows, that a company possessing a large capital may not only with safety engage in speculations which might prove ruinous to another whose resources are more limited, but even derive from them a sure profit.[1]

41. The theory of moral expectation which we have now been considering had its origin in a problem proposed by Nicolas Bernoulli to Montmort, which, from its having been discussed at great length by Daniel Bernoulli in the *Petersburg Memoirs*, has been usually called the Petersburg problem. It is this; A and B play at heads and tails. A agrees to pay B 2 crowns if head turn up at the first throw; 4 crowns if it turn up at the second, and not before; 8 if it turn up at the third, and not before; and, in general, 2^n crowns if it turn up at the nth throw, and not before: required the value of B's expectation? Here the probability of head turning up at the first throw is $\frac{1}{2}$; the probability of its turning up at the second, and not at the first, is $\frac{1}{2}\times\frac{1}{2}=\frac{1}{4}$; the probability of its not turning up either at the first or second, and of its turning up at the third, $\frac{1}{2}\times\frac{1}{2}\times\frac{1}{2}=\frac{1}{8}$, and so on. Hence the probabilities of B receiving 2, 4, 8, 16......2^n crowns are respectively $\frac{1}{2}, \frac{1}{4}, \frac{1}{8}, \frac{1}{16}\cdots\cdots\frac{1}{2^n}$, consequently (31) the mathematical value of B's expectation is

$$\frac{1}{2}\times 2+\frac{1}{4}\times 4+\frac{1}{8}\times 8+\frac{1}{16}\times 16\ldots+\frac{1}{2^n}\times 2^n \text{ crowns.}$$

Now, as no limit can be assigned to n, inasmuch as it is possible that head may not turn up till after a very great, or any assignable number, of throws, this series, of which each term is unity, may go on for ever, and consequently the value of B's expectation becomes infinite. Yet it is obvious that no one would pay any considerable sum for the expectation. This disagreement between the dictates of common sense and the results of the mathematical theory, appeared to Montmort to involve a great paradox; although the question differs in this respect from no other question of chances in which the contingent benefit is very great, and the probability of receiving it very small. If the play could be repeated an infinite number of times, B might undertake to pay without disadvantage any sum, however large, for his expectation. A result, however, more in accordance with ordinary notions, is obtained from the principle of Bernoulli. Let a be the amount of B's fortune before the play begins, x the value of his expectation, or the sum he pays A in consideration of the agreement, and make $z=a-x$. If head turn up at the first throw, B's fortune becomes $z+2$; if at the second, and not before, $z+2^2$; if at the third, and not before, $z+2^3$; and so on. But the probabilities of these events being respectively $\frac{1}{2}, \frac{1}{4}, \frac{1}{8}\cdots\cdots\frac{1}{2^n}$, the formula for the moral expectation becomes (35)

$$X=(z+2)^{\frac{1}{2}}(z+2^2)^{\frac{1}{4}}(z+2^3)^{\frac{1}{8}}\ldots\ (z+2^n)^{\frac{1}{2^n}}.$$

Now the sum which B ought to pay will be determined by making the value of his moral expectation, after the bet, and before the play begins, equal to his previous fortune; we have therefore $a=X$, that is,

$$a=(z+2)^{\frac{1}{2}}(z+2^2)^{\frac{1}{4}}(z+2^3)^{\frac{1}{8}}\ldots\ldots$$

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[1] See the *Commentarii Acad. Petropolitanæ*, tom. v.; Laplace, *Théorie des Prob.* p. 432; Lacroix, *Traité Elémentaire*, p. 132.

The general term of this series being $(z+2^n)^{\frac{1}{2^n}}=2^{\frac{n}{2^n}}\left(1+\frac{z}{2^n}\right)^{\frac{1}{2^n}}$, the equation may be put under the form

$$a=(2^{\frac{1}{2}}+2^{\frac{2}{4}}+2^{\frac{3}{8}}+2^{\frac{4}{16}}\ldots.)\times\left(1+\frac{z}{2}\right)^{\frac{1}{2}}\left(1+\frac{z}{4}\right)^{\frac{1}{4}}\left(1+\frac{z}{8}\right)^{\frac{1}{8}}\ldots;$$

and since the logarithm of the first factor of this expression is $\left(\frac{1}{2}+\frac{2}{4}+\frac{3}{8}+\frac{4}{16}+\text{\&c.}\right)\log 2$, or $=\frac{1}{2}\left\{1+2\left(\frac{1}{2}\right)+3\left(\frac{1}{2}\right)^2+4\left(\frac{1}{2}\right)^3+\text{\&c.}\right\}\log 2=\frac{1}{2}\left(1-\frac{1}{2}\right)^{-2}\log 2=2\log 2$, we have $\log a=2\log 2+\frac{1}{2}\log\left(1+\frac{z}{2}\right)+\frac{1}{4}\log\left(1+\frac{z}{4}\right)+\frac{1}{8}\log\left(1+\frac{z}{8}\right)+\text{\&c.}$ from which a value of z may be found by trial and error for any given value of a. Suppose $z=100$; on computing the first 10 terms of the series there results $a=107{\cdot}89$, whence (since $x=a-z$) $x=7{\cdot}89$; that is to say, if B possessed only 100 crowns before beginning the play, it would be morally disadvantageous for him to risk 8 crowns for the expectation, although its mathematical value be infinitely great. If we suppose $z=1000$, the sum of 11 terms gives $a=1011$, nearly; so that if B possessed a fortune of 1011 crowns, the value of the moral expectation would, to him, be about 11 crowns.

It is scarcely necessary to remark, that the results deduced from the principle of Bernoulli are of a character widely different from those which are calculated according to the mathematical expectation. The latter gives the precise value of a contingent benefit, without any assumption or hypothesis respecting the personal circumstances of the individual who may gain or lose it; whereas the considerations of relative advantage, of which it is the object of Bernoulli's theory to take account, are entirely arbitrary, and by their very nature incapable of being made the subject of accurate computation. It is evidently impossible to have regard to, or appreciate, all the circumstances which may render the same sum of money a more important benefit to one man than to another; and consequently every rule that can be given for the purpose must be liable to numerous exceptions. The principle, however, is thus far valuable, that it gives in the most common cases a plausible and judicious estimate of the value of things which are not susceptible of exact appreciation; and it has the advantage of being readily submitted to analysis. A different principle, proposed by the celebrated naturalist Buffon, consists in making the value itself of a casual benefit, instead of its infinitely small elements, inversely proportional to the fortune of the expectant; but as this hypothesis has seldom been adopted, it is unnecessary to discuss it in this place.

SECT. V.—OF THE PROBABILITY OF FUTURE EVENTS DEDUCED FROM EXPERIENCE.

42. In the preceding part of this article it has been assumed, in every case, that the number of chances favourable and unfavourable to the occurrence of a contingent event is known *a priori*, and consequently, that the probability of the event, or the ratio of the number of favourable cases to the whole number of cases possible, can be absolutely determined. But in numerous applications of the theory of probabilities, and these, generally speaking, by far the most important, the ratio of the chances in favour of an event to those which oppose it is altogether unknown; and we can form no idea of the probability of the event excepting from a comparison of the number of instances in which it has been observed to happen, with the whole number of instances in which it has been observed to happen and fail. In order to assign the probability of a contingent event in such cases, it is necessary to consider all the different causes or combinations of circumstances by which the event could possibly be produced, and to determine its probabilities successively on the hypotheses that each of these causes exists to the exclusion of all the others. The comparative facilities which these hypotheses give to the occurrence of the event which has actually arrived, will then enable us to determine the relative probabilities of the different hypotheses, and consequently their absolute probabilities, since their sum is necessarily equal to unity; and when the probabilities of the different hypotheses, and of the occurrence of the event on each hypothesis, have been determined, the probability of the event occurring in a future trial will be found by the methods already explained.

43. Taking a simple case, let us suppose an urn to contain 4 counters, which are either white or black; that the number of each colour is unknown, but in four successive drawings (the counter drawn being replaced in the urn after each trial) a white counter has been drawn three times, and a black one once; and let it be proposed to assign the probability of drawing a counter of either colour at the next trial.

In the present case three hypotheses may be formed relative to the number of white and black counters in the urn. 1st, The urn may contain 3 white counters and 1 black; 2d, It may contain 2 white and 2 black; 3d, It may contain 1 white and 3 black; for a counter of each colour having been drawn, the other two possible cases, namely, that they are all white or all black, are excluded by the observation. Now, let p_1, p_2, p_3, be the probabilities respectively of drawing a white counter on each hypothesis, and q_1, q_2, q_3, the probabilities of drawing a black. Supposing the first hypothesis to be true, or that the compound event which has been observed was produced by the cause indicated by that hypothesis, we have $p_1=\frac{3}{4}$, $q_1=\frac{1}{4}$; and the probability of the observed event, or that 3 white counters and 1 black would be drawn, (12) is $4p_1^3\,q_1=\frac{27}{64}$. The second hypothesis gives $p_2=\frac{1}{2}$, $q_2=\frac{1}{2}$, whence $4p_2^3\,q_2=\frac{16}{64}$. The third hypothesis gives $p_3=\frac{1}{4}$, $q_3=\frac{3}{4}$, whence $4p_3^3\,q_3=\frac{3}{64}$. The probabilities of the observed compound event, on each of the three hypotheses, are therefore, respectively, $\frac{27}{64}$, $\frac{16}{64}$, $\frac{3}{64}$; and the question now arises, how are the probabilities of the different hypotheses to be estimated? As we have no data, *a priori*, for determining this question, we must assume the probabilities of the different hypotheses to be respectively proportional to the probabilities they severally give of the observed compound event; in other words, we must assume the probability of any hypothesis to be greater or less according as it affords a greater or smaller number of combinations favourable to the event which has been observed to take place. Thus, if C and C_1 be two independent causes from which an observed event E may be supposed to arise, and C furnishes 20 different combinations out of a given number, favourable to the occurrence of E, while C_1 furnishes only 10 such combinations out of the same number, we naturally infer that the probability of the cause C having operated to produce E, is twice as great as the probability that the event was produced by the operation of the cause C_1. Applying this principle to the present example, the probabilities of the three hypotheses are respectively proportional to the three fractions $\frac{27}{64}$, $\frac{16}{64}$, $\frac{3}{64}$, or to the numbers 27, 16, 3; and as no other hypotheses are admissible, the sum of their probabilities must be unity; therefore, making ϖ_1 the probability of the first hypothesis, ϖ_2 that of the second, and ϖ_3 that of the third, we have

$$\varpi_1=\frac{27}{46},\quad \varpi_2=\frac{16}{46},\quad \varpi_3=\frac{3}{46}.$$

44. Having found the probabilities of the different hypotheses, that of drawing a white counter at the next trial

is obtained without difficulty; for according to what was shewn in (9), the probability of this simple event must be equal to the sum of its probabilities relative to the different hypotheses, each multiplied into the probability of the hypothesis itself. Now it has been seen that, on the first hypothesis, the probability of drawing a white ball is $\frac{3}{4}$; on the second $\frac{2}{4}$, and on the third $\frac{1}{4}$; and that the probabilities of the hypotheses are respectively $\frac{27}{46}$, $\frac{16}{46}$, $\frac{3}{46}$; therefore the probability of a white counter being drawn at the next trial is

$$\frac{3}{4}\times\frac{27}{46}+\frac{2}{4}\times\frac{16}{46}+\frac{1}{4}\times\frac{3}{46}=\frac{116}{184}.$$

In like manner, the probability of a black counter being drawn at the next trial is

$$\frac{1}{4}\times\frac{27}{46}+\frac{2}{4}\times\frac{16}{46}+\frac{3}{4}\times\frac{3}{46}=\frac{68}{184};$$

and the sum of these two fractions is unity, as it ought to be, since the counter drawn must necessarily be white or black.

45. The reasoning which has been employed in this particular case is of general application. Let E be an observed event, simple or compound, of which the particular cause is unknown, but which may be ascribed to any one of the n causes, C_1, C_2, C_3,......C_n, which, before the event has happened, are all equally probable, and such that the operation of any one of them excludes that of the others, so that the event E is produced by one of them alone, and not by the joint agency of several of them. Let the probabilities of the observed event E on the hypothesis that it has proceeded from each of those causes be respectively P_1, P_2, P_3,...P_n, so that if the cause, for instance, C_i were the true one, the probability of the event E, previous to the observation, would be P_i; and let the probabilities (as determined by the event) of the existence of the different causes be respectively ϖ_1, ϖ_2, ϖ_3,.........ϖ_n. From the principle laid down in the preceding paragraph, namely, that the probabilities of the different causes or hypotheses are proportional to the probabilities they respectively give of the observed event, we have

$$\varpi_1 : \varpi_2 : \varpi_3 \ldots\ldots : \varpi_n :: P_1 : P_2 : P_3 \ldots\ldots : P_n$$

whence, making $P_1+P_2,+P_3\ldots\ldots+P_n=\Sigma P_i$, and observing that $\varpi_1+\varpi_2+\varpi_3\ldots\ldots+\varpi_n=1$ (since it is assumed that there are no other causes than those specified from which the event could arise), we have

$$\varpi_1=\frac{P_1}{\Sigma P_i},\ \varpi_2=\frac{P_2}{\Sigma P_i},\ \varpi_3=\frac{P_3}{\Sigma P_i},\ldots\ldots\varpi_n=\frac{P_n}{\Sigma P_i},$$

whence it appears that the probability of each hypothesis respecting the cause of the observed event is found by dividing the probability of the event on the supposition that that particular cause alone existed, by the sum of its probabilities in respect of all the causes. Let us now assume the probabilities of a future event E′ (which may be the same with E or different, but depending on the same causes) in respect of the several hypotheses, to be, p_1, p_2, p_3,......p_n; so that if the particular cause C_i be the true one, the probability of E′ is p_i; and let Π be the probability of E′ in respect of all the causes, then by (9), Π will be equal to the sum of the probabilities p_1, p_2, p_3.....p_n relative to the different hypotheses, each multiplied by the probability of the hypothesis; that is to say we shall have

$$\Pi=p_1\varpi_1+p_2\varpi_2+p_3\varpi_3\ldots\ldots+p_n\varpi_n;$$

or $\Pi=\Sigma p_i\varpi_i$, the symbol Σ indicating the sum of all the different values of p and ϖ in respect of the different causes C_1, C_2, C_3,......C_n.

46. It may be worth while to remark that the word cause is not here used in its ordinary acceptation to denote the combination of circumstances, physical or moral, of which the event is a *necessary* consequence. In the sense we have used the term, the cause C is that which gives rise to the determinate probability P, that the event E will happen; but so long as this probability falls short of certainty, its existence also implies that of another probability, $1-P$, that the contrary event F will happen. If we make $P=1$, the existence of the cause C would necessarily involve the occurrence of E; and it is in this particular sense that the word cause is ordinarily used. In the theory of probabilities the causes of events are considered only in reference to the number of chances they afford for the occurrence of those events which they may possibly, but do not necessarily, produce.

47. The following example may serve to illustrate the method of applying the preceding formulæ. An urn contains n balls, which are known to be either white or black. A ball is drawn at random and found to be white; required the probability of drawing a white ball at the next trial?

In this case, the number of hypotheses that may be made respecting the contents of the urn, is n; for we may suppose that it contained one, or two, or any number of white balls from 1 to n, and each of these cases may be considered as a distinct cause of the observed event E. Let these causes or hypotheses be C_1, C_2, C_3,......C_n, and let us suppose the true cause was C_i, or that the urn contained i white balls. On this hypothesis the probability of the observed event E is $\frac{i}{n}$, whence $P_i=\frac{i}{n}$; and therefore, making i successively equal to 1, 2, 3,....n, we have $\Sigma P_i=\frac{1}{n}(1+2+3..+n)$. But the sum of this arithmetical series is $\frac{n(n+1)}{2}$, therefore $\Sigma P_i=\frac{1}{2}(n+1)$, and consequently,

$$\varpi_i=\frac{P_i}{\Sigma P_i}=\frac{2i}{n(n+1)},$$

which is the probability of the assumption that the event proceeded from the cause C_i, or that the urn contained i white balls. If we suppose $i=n$ we have $\varpi_n=\frac{2}{n+1}$ for the probability that all the balls are white; and if we also suppose $n=3$, this becomes $\frac{1}{2}$; whence if an urn contain 3 balls which must be either black or white, and a white ball be drawn at the first trial, it is an even wager, after the trial, that all the balls are white.

48. Having found, from the observed event E, the probabilities of the different hypotheses, we have now to determine the probability Π of the event E′ (the drawing of a white ball) at the next trial. Here two cases present themselves; according as the ball is replaced in the urn, or is not; or in general, according as the law of the chances remains constant during the series of trials or varies.

1st, Let us suppose that the ball has been replaced in the urn. In this case the probability of the event E′, on the hypothesis that the urn contains i white balls, is $\frac{i}{n}$; that is to say $p_i=\frac{i}{n}$. But the probability ϖ_i of this hypothesis, as found above, is $\frac{2i}{n(n+1)}$; therefore $p_i\varpi_i=\frac{2i^2}{n^2(n+1)}$; whence the general formula (45) $\Pi=\Sigma p_i\varpi_i$ becomes $\Pi=\Sigma\frac{2i^2}{n^2(n+1)}=\frac{2}{n^2(n+1)}\Sigma i^2$. Now $\Sigma i^2=\Sigma i(i+1)-\Sigma i$. But by the property of the figurate numbers referred to in (23), the sum of the series of numbers obtained by giving i every value from $i=1$ to $i=n$ in the formula $\frac{n(n+1)}{1\,.\,2}$ is expressed by $\frac{n(n+1)(n+2)}{1\,.\,2\,.\,3}$; therefore $\Sigma i(i+1)=\frac{n(n+1)(n+2)}{3}$.

We have also as above

$$\Sigma i = 1+2+3\ldots\ldots+n = \frac{n(n+1)}{2};$$

consequently,

$$\Sigma i^2 = \frac{n(n+1)(n+2)}{3} - \frac{n(n+1)}{2} = \frac{n(n+1)(2n+1)}{2 \quad 3}$$

and therefore

$$\Pi = \frac{2}{n^2(n+1)} \times \frac{n(n+1)(2n+1)}{2 \ . \ 3} = \frac{2n+1}{3n}.$$

2d, Suppose the ball which has been extracted is not replaced in the urn. In this case, on the hypothesis that the urn at first contained i white balls, the probability of drawing a white ball at the next trial is $\frac{i-1}{n-1}$; that is, $p_i = \frac{i-1}{n-1}$; and the probability of the hypothesis is the same as in the former case, or $\varpi_i = \frac{2i}{n(n+1)}$; therefore $p_i \varpi_i = \frac{2i(i-1)}{(n-1)n(n+1)}$; and consequently $\Pi = \Sigma p_i \varpi_i = \frac{2}{(n-1)n(n+1)} \Sigma i(i-1)$. Now the value of $\Sigma i(i-1)$ will evidently be found by writing $n-1$ for n in the above expression for $\Sigma i(i+1)$; whence $\Sigma i(i-1) = \frac{(n-1)n(n+1)}{3}$, and, therefore, in this case

$$\Pi = \frac{2}{(n-1)n(n+1)} \times \frac{(n-1)n(n+1)}{3} = \frac{2}{3}.$$

When n is a very large number, the ratio of $2n+1$ to $3n$, the value of Π in the former case, does not sensibly differ from $\frac{2}{3}$, and therefore in both cases $\Pi = \frac{2}{3}$. Hence it follows, that if an event, depending on unknown causes, can happen only in one of two ways, and it has been observed to happen once, the odds are two to one in favour of its happening in the same way at the next occurrence.

49. The expression for ϖ in (45) was determined on the supposition that previously to the experiments being made, we are entirely ignorant of the relative numbers of the two sorts of balls in the urn, and have no reason to suppose one hypothesis more probable than another. If, however, we happen to know, previously to the experiment, that the different causes C_1, C_2, C_3, &c. have not all the same number of chances in their favour, or that the probabilities of the different hypotheses have relative values, it becomes necessary to introduce those relative values, in consequence of which ϖ_1, ϖ_2, &c., will receive a modification. Let us conceive a number of urns, each containing balls of two colours, black and white, to be distributed in n groups, A_1, A_2, A_3........A_n, in such a manner that the ratio of the number of white balls to the number of black balls is the same in respect of each urn belonging to the same group, and consequently that the probability of drawing a ball of either colour is the same from whichever urn in the group it may happen to be drawn, but different in respect of the different groups; and let the probabilities of drawing a white ball from each of the different groups be respectively P_1, P_2, P_3,......P_n. Now, let us suppose there are a_1 urns in the group A_1, a_2 in the group A_2, and so on, and let s = the whole number of urns, so that $s = a_1 + a_2 + a_3 \ldots\ldots + a_n$; then, if we make $\frac{a_1}{s} = \lambda_1$, $\frac{a_2}{s} = \lambda_2$, and so on, λ_1 will be the *a priori* probability that a ball drawn from any urn at random, will be drawn from the group A_1; λ_2 the probability it will be drawn from the group A_2; and, in general, λ_i the probability it will be drawn from the group A_i. This being premised, suppose a trial to be made, and that the event E is a white ball; the probability ϖ_i of the hypothesis that the ball was drawn from the group A_i is found as follows. The *a priori* probability of the ball being drawn from the group A_i is λ_i; and if the ball is actually drawn from that group, the probability of its being white is P_i; therefore the probability of both events is $\lambda_i P_i$; and consequently (45), $\varpi_i = \frac{\lambda_i P_i}{\Sigma \lambda_i P_i}$, the symbol of summation Σ extending to all the values of i from $i=1$ to $i=n$.

50. In the applications of the theory to physical or moral events, the different groups of urns here imagined may be regarded as so many independent causes C_1, C_2, C_3, &c. by any one of which the event E might have been produced; ϖ_i is the probability that the event was produced by the particular cause C_i; P_i is the probability that the cause C_i if it had alone existed, would have produced the observed event E; and λ_i is the probability, previously to the experiment, that C_i would be the efficient cause. The formula $\varpi_i = \frac{\lambda_i P_i}{\Sigma \lambda_i P_i}$, therefore, shews that the probability of any one of the possible causes (C_i) of an observed event is equal to the product of the probability (P_i) of the event taking place if that cause acted alone multiplied into the probability λ_i that the cause C_i is the true one, and divided by the sum ($\Sigma \lambda_i P_i$) of all the similar products formed relatively to each of the causes from which the event can be supposed to arise.

51. The formulæ now obtained can only be used when the number of hypotheses is finite; but in the applications of the theory it most frequently happens that an infinite number of hypotheses may be made respecting the causes of an observed event, as would be the case in the above example if the number of balls in the urn had been unknown. In such cases, in order to find the values of ϖ and Π, it becomes necessary to transform the sums Σ into definite integrals, which is accomplished by means of the theorem $\Sigma X = \int_0^1 X\, dx$, where X is a function of x. Suppose a ball to have been drawn a great number of times in succession from an urn (the number in which is unknown) and replaced in the urn after each drawing, and that the result has been a white ball m times and a black ball n times, the probable constitution of the urn, and thence the probability of drawing a white ball at a future trial will be found as follows. Assume the hypothesis that the ratio of the number of white balls to the whole number in the urn is $x : 1$, and let ϖ be the probability of the hypothesis. On this hypothesis the probability of drawing a white ball in any trial is x, and that of drawing a black ball $1-x$, and consequently, the probability of drawing m white and n black in $m+n$ trials is $Ux^m(1-x)^n$ by (12). We have therefore for the probability of the observed compound event $P = Ux^m(1-x)^n$; whence in consequence of the above formula for transforming a sum into a definite integral $\Sigma P = U\int_0^1 x^m(1-x)^n\, dx$ (U being independent of x) and therefore

$$\varpi = \frac{P}{\Sigma P} = \frac{x^m(1-x)^n}{\int_0^1 x^m(1-x)^n\, dx}.$$

The value of the integral in the denominator of this fraction is obtained by the usual method of integrating by parts. Since

$$d\,\frac{x^{m+1}(1-x)^n}{m+1} = x^m(1-x)^n dx - \frac{n}{m+1}\, x^{m+1}(1-x)^{n-1} dx,$$

therefore

$$\int x^m(1-x)^n dx = \frac{x^{m+1}(1-x)^n}{m+1} + \frac{n}{m+1}\int x^{m+1}(1-x)^{n-1} dx,$$

In like manner we get $\int x^{m+1}(1-x)^{n-1} dx$

$$= \frac{x^{m+2}(1-x)^{n-1}}{m+2} + \frac{n-1}{m+2}\int x^{m+2}(1-x)^{n-2} dx.$$

Continuing this operation n times, or till the exponent of $(1-x)$ becomes $n-n=0$, the last integral will be

$$\int x^{m+n}dx=\frac{x^{m+n+1}}{m+n+1};$$

therefore, collecting the several terms into one sum, we have

$$\int x^m(1-x)^n dx=\frac{x^{m+1}(1-x)^n}{m+1}+\frac{nx^{m+2}(1-x)^{n-1}}{(m+1)(m+2)}\cdots\cdots\cdots$$
$$\cdots\cdots\cdots+\frac{n(n-1)(n-2)\cdots\cdots\cdots 2\,.\,1\,.\,x^{m+n+1}}{(m+1)(m+2)\cdots\cdots\cdots\ m+n+1}.$$

When $x=0$, all the terms of this series vanish, and when $x=1$ they all vanish excepting the last; therefore between the limits $x=0$ and $x=1$, the value of the integral is the last term of the series when x in that term $=1$; that is to say,

$$\int_0^1 x^m(1-x)^n dx=\frac{n(n-1)(n-2)\cdots\cdots\ 2\,.\,1}{(m+1)(m+2)\cdots\cdots m+n+1}.$$

For the sake of brevity, let the symbol $[x]$ be adopted to represent the continued product $1\,.\,2\,.\,3\ldots x$ of the natural numbers from 1 to x,[1] whence by analogy $[x+y]$ will represent the continued product of the same series from 1 to the number denoted by $x+y$. Multiplying, then, the numerator and denominator of the above expression by $1\,.\,2\,.\,3\ldots\ldots m=[m]$, we get

$$\int_0^1 x^m(1-x)^n dx=\frac{[m][n]}{[m+n+1]};$$

whence the probability of the hypothesis, in consequence of the equation above found, becomes

$$\varpi=\frac{[m+n+1]}{[m][n]}x^m(1-x)^n.$$

From this value of ϖ we are enabled to deduce that of Π, the probability of drawing a white ball at the next trial. By (45) $\Pi=\Sigma\varpi p$. Now, since by hypothesis the number of white balls in the urn is to the whole number of both colours in the ratio of x to 1, the probability of drawing a white ball is x; consequently $p=x$, and therefore $\Pi=\Sigma\varpi x=\int_0^1\varpi x dx=\frac{[m+n+1]}{[m][n]}\int_0^1 x^{m+1}(1-x)^n dx$. But the value of $\int_0^1 x^{m+1}(1-x)^n dx$ will evidently be obtained by substituting $m+1$ for m in the expression found for $\int_0^1 x^m(1-x)^n dx$. This substitution gives

$$\int_0^1 x^{m+1}(1-x)^n dx=\frac{[m+1][n]}{[m+n+2]},$$

whence, observing that $[m+1]\div[m]=m+1$, and $[m+n+2]\div[m+n+1]=m+n+2$, we have

$$\Pi=\frac{m+1}{m+n+2}.$$

The probability of the contrary event, or of drawing a black ball, is $1-\Pi=\frac{n+1}{m+n+2}$. As the numbers m and n become larger, these two fractions approach nearer and nearer to their limits $\frac{m}{m+n}$ and $\frac{n}{m+n}$, which are the *a priori* probabilities p and q of the respective events when the ratio of the number of white balls in the urn is to that of the black balls as m to n.

52. The probability of drawing m' white balls and n' black balls in $m'+n'$ future trials is found in a similar manner, and the problem may be thus stated. E and F are two contrary events, depending on constant but unknown causes; and it has been observed, that in $m+n=h$ successive instances the event E has occurred m times and F n times, required the probability that in $m'+n'=h'$ future instances, E will occur m' times and F n' times.

Assume, as in the last case, the facility of the occurrence of E to that of F to be in the ratio of x to $1-x$; we have then, as before, for the probability of the hypothesis, $\varpi=\frac{[h+1]}{[m][n]}x^m(1-x)^n$. Now on this hypothesis the probability of E in the next instance is x, and that of F is $1-x$, whence the probability of m' times E and n' times F in the next h' trials being denoted by p, we have (12) $p=U'x^{m'}(1-x)^{n'}$, making $U'=\frac{1\,.\,2\,.\,3\ldots h'}{1\,.\,2\,.\,3\ldots m'\times 1\,.\,2\,.\,3\ldots n'}=\frac{[h']}{[m'][n']}$. We have therefore $\varpi p=U'\frac{[h+1]}{[m][n]}x^{m+m'}(1-x)^{n+n'}$ for the probability of the compound event on this hypothesis. To find its probability Π on the infinite number of hypotheses formed by supposing x to increase by infinitely small increments from $x=0$ to $x=1$, we have $\Pi=\Sigma\varpi p=\int_0^1\varpi p dx$. On substituting for ϖp the value just found, we get $\Pi=U'\frac{[h+1]}{[m][n]}\int_0^1 x^{m+m'}(1-x)^{n+n'}dx$, and it is manifest that the value of this integral will be obtained by substituting $m+m'$ for m, and $n+n'$ for n in the value of $\int_0^1 x^m(1-x)^n dx$ found above. This substitution gives

$$\int_0^1 x^{m+m'}(1-x)^{n+n'}dx=\frac{[m-m][n+n']}{[h+h'+1]},$$

whence we conclude

$$\Pi=U'\frac{[m+m'][n+n'][h+1]}{[m][n][h+h'+1]}.$$

The most probable hypothesis will be found by making the value of ϖ a maximum, or its differential coefficient equal to zero. Differentiating the equation $\varpi=\frac{[h+1]}{[m][n]}x^m(1-x)^n$, and making $\frac{d\varpi}{dx}=0$, we get $m(1-x)=nx$, whence $x=\frac{m}{m+n}$. The most probable supposition, therefore, respecting the contents of the urn is, that the two sorts of balls are in the same proportions as have been shewn by the previous drawings. We shall have further occasion for these formulæ when we come to consider the cases in which m and n are large numbers.

SECT. VI.—OF BENEFITS DEPENDING ON THE PROBABLE DURATION OF HUMAN LIFE.

53. In applying the principles of the theory of probability to the determination of the values of benefits depending on life, the fundamental element which it is necessary to determine from observation is the probability that an individual at every given age within the observed limits of the duration of life, will live over a given portion of time, for instance one year; for when this has been determined for each year of age, the probability that an individual, or any number of individuals, will live over any assigned number of years, is easily deduced. Thus, if the probabilities that an individual A, whose age is y, will live over 1, 2, $3\ldots x$ years, be denoted respectively by $p_1, p_2, p_3\ldots p_x$; and if $q_1, q_2, q_3\ldots q_x$ denote the same probabilities in respect of an individual whose age is $y+1$ years; $r_1, r_2, r_3\ldots r_x$, the same in respect of an individual whose age is $y+2$ years, and so on; then, since the probability p_2 which A has of living over 2 years is obviously compounded of the probability p_1 of his living over 1 year, and of the probability q_1 that, having attained the age $y+1$, he will live another year, we

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[1] This convenient notation has been adopted by Mr. De Morgan.

have, by (7), $p_2=p_1 q_1$. Again, the probability p_3 that A will live over three years, being compounded of the probability p_2 that he will live over two years, and of the probability r_1 that, having attained the age $y+2$ years, he will survive another year, we have $p_3=p_2 r_1=p_1 q_1 r_1$. In like manner $p_4=p_1 q_1 r_1 s_1$, and so on; so that the probabilities p_2, p_3, $p_4 \ldots p_x$ are successively derived from p_1, q_1, r_1, s_1, &c. which are supposed to be the data of observation.

If a large number n of individuals, all born in the same year, were selected, and if it were observed that the number of them remaining alive at the end of the first year is n_1, at the end of the second year n_2, at the end of the third n_3, and so on, then the probabilities p_1, p_2, p_3, &c. would be given directly by the observation, being respectively equal to the quotients $\frac{n_1}{n}$, $\frac{n_2}{n}$, $\frac{n_3}{n}$, &c. But the most accurate observations of mortality are furnished by the experience of the annuity and assurance offices, where they are not made on an isolated number, diminishing, and consequently giving a less valuable result every year, but on a comparison of the numbers which, in a series of years, enter upon and survive each year of age. This observation gives p_1, q_1, r_1, s_1, &c, whence p_2, p_3, p_4, &c. are found, as above, for every year of life.[1]

54. The values of annuities on lives, and of reversionary sums to be paid on the failure of lives, are found by combining the probabilities p_1, p_2, p_3, &c. with the rate of interest of money. Let $r=$ the rate of interest, that is to say, the interest of L.1 for a year, and $v=$ the present value of L.1 to be received at the end of a year, we shall then have $v=1\div(1+r)$. Now an annuity, payable yearly, is always understood in this sense, that the first payment becomes due at the end of a year after the annuity is created. Suppose then the annuity to be L.1, the present value of the first payment, if it were to be received certainly, is v; but the receipt of this sum is contingent on the annuitant being alive at the end of the year, the probability of which we suppose to be p_1; therefore (7) the present value of L.1 subject to the contingency, is vp_1. In like manner, the present value of L.1 to be received certainly at the end of x years is v^x; but the annuity will only be received at the end of the xth year if the annuitant be then living, the probability of which is p_x; therefore the present value of that particular payment is $v^x p_x$. Hence if A denote the present value of the annuity, or the sum in hand which is equivalent to all the future payments, we shall have $A=\Sigma v^x p_x$; the sum Σ including all values of x from $x=1$ to $x=$ the number for which $p=0$. If the annuity be a pounds, its value is obviously $=a\Sigma v^x p_x=aA$.

55. The series denoted by $\Sigma v^x p_x$ may be divided into two parts, $\Sigma v^n p_n+\Sigma v^z p_z$, where n is to be taken from 1 to n, and z from $n+1$ to the number for which p vanishes. The first gives the value of the *temporary* annuity on the given life for n years, and the second the value of the *deferred* annuity, that is to say, of the annuity to commence n years hence if the individual shall be then living, and to continue during the remainder of his life. Let A be the value of the annuity on the life of a person now aged y years for the whole of life, $A^{(tn)}$ the value of a temporary annuity on the same life for n years, and $A^{(dn)}$ the value of an annuity deferred n years on the same life, we have then $A=A^{(tn)}+A^{(dn)}$.

To find $A^{(dn)}$, let A_n be the value of an annuity on a life aged $y+n$ years. If the person now aged y years lives over n years, the value of an annuity on the remainder of his life will *then* be A_n. The present value of this sum, if it were to be received certainly, is $v^n A_n$, and the probability of receiving it is p_n; therefore its value is $v^n p_n A_n$. Hence

$$A^{(dn)}=v^n p_n A_n, \text{ and } A^{(tn)}=A-v^n p_n A_n;$$

so that the values of temporary and deferred annuities are readily computed from tables of A and p for all the different ages.

56. The equation $A=A^{(tn)}+A^{(dn)}$ gives a formula by which the values of A are readily deduced from one another. Let $n=1$; we have then $A=A^{(t1)}+vp_1 A_1$. But $A^{(t1)}$, the value of an annuity for one year, is merely the value of the first payment to be received in the event of the given life surviving one year. Its value is therefore vp_1; and we have consequently $A=vp_1+vp_1 A_1$, or $A=vp_1(1+A_1)$. This formula, which gives the value of an annuity at any age in terms of the next higher age, and greatly facilitates the computation of the annuity tables, is due to Euler.

57. The value of an annuity on the joint lives of any number of individuals, that is, to continue only while they are *all* living, is calculated precisely in the same manner as the annuity on a single life. Let there be any number of individuals, A, B, C, D, &c. and let the probabilities of each living over one year be respectively p_1, q_1, r_1, s_1, &c. and let P_1 be the probability that they will *all* live over one year; then

$$P_1=p_1\times q_1\times r_1\times s_1, \text{ \&c.}$$
$$P_2=p_2\times q_2\times r_2\times s_2, \text{ \&c.}$$
$$\cdots\cdots\cdots\cdots\cdots\cdots$$
$$P_x=p_x\times q_x\times r_x\times s_x, \text{ \&c.}$$

and the value of an annuity of L.1 on the joint lives is $\Sigma v^x P_x$, from $x=1$ to $x=$ the number which renders any one of the probabilities p, q, r, s, &c. nothing.

58. The value of an annuity on the survivor of any number of given lives, that is, to continue so long as any one of them exists, is thus found. The probability that A will be alive at the end of the xth year being p_x, the probability that he will not be alive at the end of that time is $1-p_x$. The probability that *all* the lives will be extinct at the end of the xth year is therefore

$$(1-p_x)(1-q_x)(1-r_x)(1-s_x), \text{ \&c.}$$

and the probability that they will not all be extinct, or that at least one of them will be in being, is

$$1-(1-p_x)(1-q_x)(1-r_x)(1-s_x), \text{ \&c.}$$

which becomes by multiplication

$$\begin{aligned}&p_x+q_x+r_x+s_x+\text{\&c.}\\&-p_x q_x-p_x r_x\ldots\ldots-q_x r_x-q_x s_x\ldots\ldots-r_x s_x-\text{\&c.}\\&+p_x q_x r_x+p_x q_x s_x\ldots\ldots+q_x r_x s_x+\text{\&c.}\\&-p_x q_x r_x s_x-\text{\&c.}\\&+\text{\&c.}\end{aligned}$$

Multiplying each of the terms by v^x, and taking the sums of the respective products from $x=1$, and observing that $\Sigma v^x p_x q_x$ is the value of the annuity on the joint lives of A and B, $\Sigma v^x p_x q_x r_x$ that on the joint lives of A, B, and C, and so on, we have this rule:—

The value of an annuity on the survivor of any number of lives is equal to the sum of the annuities on each of the lives, minus the sum of the annuities on each pair of joint lives, plus the sum of the annuities on the joint lives taken by threes, and so on. When there are only two lives, the value of the annuity on the life of the survivor becomes

$$\Sigma v^x p_x+\Sigma v^x q_x-\Sigma v^x p_x q_x.$$

59. Let V denote the value of an assurance on the life of A, or the present worth of L.1 to be received at the end of the year in which A shall die. In respect of any year, the xth, after the present, the probability of A dying in the course of that year is $p_{x-1}-p_x$. For let u be the probability that a life $x-1$ years older than A will live over one year, then $1-u$ is the probability of a life of that age not living over one year; therefore p_{x-1} being the probability of A living over $x-1$ years, $p_{x-1}(1-u)$ is the chance of his living over $x-1$ years, and dying in the following year (7). But $p_{x-1}(1-u)=p_{x-1}-p_{x-1}u$; and by (53), $p_{x-1}u=p_x$; therefore $p_{x-1}-p_x$ is the chance that A will survive $x-1$

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[1] For further details on this subject, see MORTALITY, vol. xv. p. 637.

years and not survive x years. Now v^x is the value of L.1 to be received certainly at the end of the xth year; therefore in respect of the xth year the value of the expectation is $v_x(p_{x-1}-p_x)$; whence we have for the value of the assurance

$$V=\Sigma v^x(p_{x-1}-p_x),$$

from $x=1$ to $x=$ the number which makes $p=0$. Now, if we observe that $p_0=1$, and $\Sigma v^x p_{x-1}=v\Sigma v^{x-1}p_{x-1}$, it will be obvious that $\Sigma v^x p_{x-1}=v(1+\Sigma v^x p_x)$; whence, denoting $\Sigma v^x p_x$ by A, (A being as in (54) the value of the annuity on the given life), we have

$$V=v(1+A)-A;\ \text{or}\ V=v-(1-v)A.$$

60. The values of assurances on joint lives, (that is, to be paid at the end of the year in which any one of the lives shall fail), or on the survivor of any number of joint lives, are calculated from the corresponding annuities by means of the same formula. Thus, let A′ be the value of an annuity of L.1 on any number of joint lives, and V′ the value of an assurance of L.1 on the same joint lives, then $V'=v-(1-v)A'$. If A″ be the annuity, and V″ the assurance on the life of the survivor of any number of given lives, we have still $V''=v-(1-v)A''$.

61. Assurances on lives are usually paid not in single payments, but by equal yearly payments, the first being made at the time the contract is entered into, and the succeeding ones at the end of each future year during the life of the assured. The present value of the sum which the assured contracts to pay is therefore equal to the first payment added to the value of an annuity of the same amount on his life; and if the assurance is made on terms of mathematical equality, this sum must be precisely equal to the value of the assurance in a single payment. Therefore, if y denote the amount of the yearly payment, we have the equation $y(1+A)=V$; whence $y=V\div(1+A)$.

62. The value of a temporary assurance for n years, that is, of an assurance to be paid only in the event of the individual dying before the end of n years is thus found. Let V be the present value of L.1, to be paid on the death of a person now aged y years, and V_n the present value of L.1, to be paid on the death of a person now aged $y+n$ years. At the end of n years from the present time, the value of L.1 assured on the life of a person now aged y years will be V_n, if he be then living. But the present value of L.1 to be received certainly at the end of n years is v^n; and the probability that the life will continue n years is p_n; therefore the present value of V_n, subject to the contingency of the life continuing n years, is $v^n p_n V_n$. If, therefore, we subtract this from V, we shall have the value of the temporary assurance in a single payment, namely $V-v^n p_n V_n$.

The equivalent annual premium is found by observing, that as the first payment is made immediately, and n payments are to be made in all, the value of all the premiums after the first is that of a temporary annuity of the same amount for $n-1$ years. Denoting therefore the annual premium by u, and the value of a temporary annuity for $n-1$ years by $A^{(tn')}$, the value of all the premiums is $u+uA^{(tn')}=u(1+)A^{(tn')}$; and we have consequently $u(1+A^{(tn')})=V-v^n p_n V_n$, whence

$$u=\frac{V-v^n p_n V_n}{1+A^{(tn')}}.$$

63. The following question is of frequent occurrence. Required the present value of a sum of money to be received at the end of the year in which A dies, provided he die while B is living.

Let the sum be L.1, W= its present value, $p_x=$ the probability of A living over x years, and $q_x=$ the probability of B living over x years. The chance of receiving the sum at the end of any given year, the xth, depends on two contingencies; 1. A may die in the course of that year, and B live over it; 2. A and B may both die in that year, A dying first. The probability of A dying in the xth year has been shewn (59) to be $p_{x-1}-p_x$; whence (7) the probability of the first contingency is $(p_{x-1}-p_x)q_x$. The probability that A and B will both die in the xth year is $(p_{x-1}-p_x)(q_{x-1}-q_x)$; and for so short a period as one year, it may be considered an even chance whether A or B will die first, whatever be the difference of their ages; therefore the probability in respect of the second contingency is $\frac{1}{2}(p_{x-1}-p_x)(q_{x-1}-q_x)$. Hence the whole probability of the sum being received at the end of the xth year, is $(p_{x-1}-p_x)q_x+\frac{1}{2}(p_{x-1}-p_x)(q_{x-1}-q_x)=\frac{1}{2}(p_{x-1}-p_x)(q_{x+1}+q_x)$, which being developed, and multiplied by v^x, becomes

$$\tfrac{1}{2}v^x(p_{x-1}q_{x-1}+p_{x-1}q_x-p_x q_{x-1}-p_x q_x),$$

and the sum of all the values of this expression from $x=1$, gives the value of W.

It has been already shewn (59) that $\Sigma v^x(p_{x-1}-p_x)=v-(1-v)A$, where A= the annuity on the life of A. In like manner, if we denote by $\overline{AB}$ the value of an annuity on the joint lives of A and B, we shall have $\Sigma v^x(p_{x-1}q_{x-1}-p^x q^x)=v-(1-v)\overline{AB}$, which is the value of an assurance to be paid on the death of the first dying. Assume p' such that $p'_x=p'_1 p_{x-1}$, then p'_x is evidently the probability that an individual A′ one year *younger* than A, will live over x year (53), and $\Sigma v^x p_{x-1}q_x=\frac{1}{p'_1}\Sigma v^x p'_x q_x=\frac{1}{p'_1}\overline{A'B}$; denoting by $\overline{A'B}$ the value of an annuity on the joint lives of A′ and B. Again, let $q'_x=q'_1 q_{x-1}$, then q'_x is the probability that B′, who is one year *younger* than B, will live over x years, and $\Sigma v^x p^x q_{x-1}=\frac{1}{q'_1}\Sigma v^x p_x q'_x=\overline{AB'}$; denoting by $\overline{AB'}$ the value of an annuity on the joint lives of A and B′. Collecting the different terms, we have therefore

$$W=\tfrac{1}{2}\left\{v-(1-v)\overline{AB}+\frac{1}{p'_1}\overline{A'B}-\frac{1}{q'_1}\overline{AB'}\right\},\ \text{whence W}$$

is easily computed from tables of annuities on joint lives.

If A and B are both of the same age, the two last terms destroy each other, and W is equal to $\frac{1}{2}$ the value of L.1, to be paid on the failure of the joint lives, as it evidently ought to be, since there is in this case the same chance of A dying before B as of B dying before A.

The formula gives the value of L.1 in a single payment; the equivalent yearly payment is W divided by $1+\overline{AB}$, for the contract ceases on the failure of the joint lives by the death of either.

It would be easy to extend the formula to the case of an assurance to be paid on the contingency of the failure of any number of lives during the continuance of any number of other lives, or of an assurance to continue only during a stated time; but as it is not our purpose to give solutions of the various problems of this kind which may occur in practice, but merely to shew the manner in which the general principles of the theory are applied to them, we shall not pursue the subject farther, but refer the reader to the article ANNUITIES, and to the standard works of Baily[1] and Milne,[2] in which it is treated in detail.

SECT. VII. OF THE APPLICATION OF THE THEORY OF PROBABILITY TO TESTIMONY, AND TO THE DECISIONS OF JURIES AND TRIBUNALS.

64. The case of a witness making an assertion may be represented by an urn containing balls of two colours, the

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[1] *The Doctrine of Life Annuities and Assurances analytically investigated and practically explained, &c.* By Francis Baily. London, 1813.

[2] *A Treatise on the Valuation of Annuities and Assurances on Lives and Survivorships, &c.* By Joshua Milne. London, 1815.

ratio of the number of one colour to that of the other being unknown, but presumed from the result of a number of experiments, which consist in drawing a ball at random, and replacing it in the urn after each trial. A true assertion being represented by a ball of one colour, and a false one by a ball of the other, it follows from the theorem in (51), that if a witness has made $m+n$ assertions, of which m are true and n false, the probability of a future assertion being true is $\frac{m+1}{m+n+2}$, and that of its being false $\frac{n+1}{m+n+2}$. Let the first of these fractions be represented by v, and the second by w, then v is the measure of the veracity of the individual, or the probability of his speaking the truth, and w the opposite probability, since $v+w=1$. In general, the existing data are insufficient to enable us to determine the numerical values of v and w in this manner; and therefore in applying the formulæ to particular cases, we must assign arbitrary values to these quantities, founded on previous knowledge of the moral character of the individual, or on some notions, more or less sanctioned by experience, of the relative number of true and false statements made by men in general, placed in similar circumstances.

65. Having assumed v and w, let us suppose a witness to testify that an event has taken place, the *a priori* probability of which is p, and let it be proposed to determine the probability of the event after the testimony. In this case the event observed (E) is the assertion of the witness, and two hypotheses only can be made respecting its cause; 1st, that the event testified really took place; and 2d, that it did not. On the first hypothesis the witness has spoken the truth, the probability of which is v; and an event has occurred of which the probability is p; therefore (7) the probability (P_1) of the coincidence is vp. On the second hypothesis, the witness has testified falsely, the probability of which is w; and the event attested did not happen, the probability of which is q; therefore the probability (P_2) of the coincidence is wq. Hence, by the formula (47) $\varpi_1=P_i\div\Sigma P_i$) the probability ($\varpi_1$, of the first hypothesis becomes $\frac{vp}{vp+wq}$, and the probability (ϖ_2) of the second $\frac{wq}{vp+wq}$. The sum of these two probabilities is unit, a condition which ought evidently to be fulfilled, since no other hypothesis can be made, and consequently one or other of the two must be true. It is to be observed, that these values of ϖ_1 and ϖ_2 are the respective probabilities, after the testimony has been given, that the event attested took place, and that it did not.

Since $\varpi_1=\frac{vp}{vp+wq}$, we have $\varpi_1-p=\frac{p(v-vp-wq)}{vp+wq}$ $=\frac{p\{v(1-p)-wq\}}{vp-wq}=\frac{p(vq-wq)}{vp-wq}$; but $v-w=v-1+v=2v-1$, therefore $\varpi_1-p=\frac{p(2v-1)q}{vp+wq}$. This fraction being positive or negative, according as $2v-1$ is greater or less than unity, or as v is greater or less than $\frac{1}{2}$, it follows that if $v>\frac{1}{2}$, then $\varpi_1>p$; that is to say, the probability of the event after the testimony is greater than its *a priori* probability when the veracity of the witness is greater than $\frac{1}{2}$. On the contrary, if the veracity of the witness is less than $\frac{1}{2}$, the effect of the testimony is to render the probability of the event less than its *a priori* probability.

66. If the event asserted by the witness be of such a nature that its occurrence is *a priori* extremely improbable, so that p is a very small fraction, and q consequently approaches nearly to unity, although at the same time the veracity of the witness be great, and measured by a fraction approaching to unity, the value of ϖ_1 becomes nearly equal to $p\div w$, (for on this supposition $p+wq\cdot v$ is nearly equal to w). But it is obvious, that however great the improbability of a witness giving false testimony may be supposed, the improbability of a physical event may be any number of times greater; in other words, however small a value may be given to w, the value of p may still be any number of times smaller; so that notwithstanding the veracity of the witness, the probability of the event after the testimony, namely $\varpi_1=p\div w$ may be less than any assignable quantity. On this principle mankind do not easily give credence to a witness asserting a very extraordinary or improbable event. The odds against the occurrence of the event may be so great, that the testimony of no single witness, however respectable his character, would suffice to induce belief.

67. In the case of the character of a witness being altogether unknown, we may suppose v to have all possible values within certain limits, and to find the value of ϖ_1 by integrating the fraction $\int\varpi_1 dv$ between those limits. Since $\varpi_1=\frac{vp}{vp+wq}$, we have $\int\varpi_1 dv=\int\frac{pvdv}{vp+wq}$, which on substituting $1-v$ and $1-p$ for w and q respectively, becomes $\int\frac{pvdv}{1-p+(2p-1)v}$, the integral of which is

$$p\left\{\frac{v}{2p-1}-\frac{1-p}{(2p-1)^2}\log.\left(1-p+(2p-1)v\right)\right\}+\mathrm{C},$$

C being a constant, the value of which will be determined from the assumed limits. If v be supposed to vary between the limits $v=0$ and $v=1$, then

$$\int\varpi_1 dv=\frac{p}{2p-1}\left\{1-\frac{1-p}{2p-1}\log.\frac{p}{1-p}\right\};$$

and if we assume $p=\frac{3}{4}$, we have $\int\varpi_1 dx=\frac{3}{2}(1-\frac{1}{2}\log.3)$, which, since the logarithm is the Napierian logarithm, and Nap. log. $3=1.0986$, becomes $\frac{3}{2}\times.4507=.676$, or nearly $\frac{2}{3}$. Whence we see, that on this hypothesis the probability of the event is diminished in consequence of the testimony.

68. The credit due to the testimony of a witness depends not merely on his good faith, but also on the probability that he is not himself deceived with respect to the event he asserts. The chances of a witness being deceived through credulity or ignorance are much more numerous in general than the chances of intentional fraud; and this must be the case more particularly when the event is of such a nature that it may happen in various ways which may be mistaken one for another: as for instance, in the case of a lottery ticket being drawn, and the witness asserting that it bears a particular number, which might with equal probability be any other number on the wheel. The following question will illustrate the method of applying the calculus when a distinction is made between these sources of error.

An urn contains s balls, of which a_1 are marked A_1, a_2 marked A_2......a_n marked A_n. A ball having been drawn at random, a witness of the drawing affirms that the ball drawn is marked A_m; required the probability of the testimony being true.

Here we have $s=a_1+a_2+a_3......+a_n$, (n being the number of the different indices or sorts of balls); so that if we make $p_1=a_1\div s$, $p_2=a_2\div s$.....$p_m=a_n\div s$, then p_1 is the *a priori* probability that the ball drawn is of the class marked A_1, p_2 the probability that it belongs to the class whose index is A_2, and so on. It is evident that n different hypotheses may be made respecting the index of the ball which has been drawn, for it may belong to any one of the different classes A_1, A_2...A_n. Let the probabilities of these hypotheses be respectively ϖ_1, ϖ_2...ϖ_n, (that is, in respect of any particular index i, ϖ_i is the probability after the assertion that the ball drawn is marked A_i); and let the probabilities of the assertion on each of these hypotheses be respectively P_1, P_2...P_n, (that is, if the ball drawn be marked A_i, then P_i is the probability the witness will assert it to be marked A_m). Lastly, let v be the veracity of the witness, and u the probability that he has not been deceived.

(1.) Let us first consider the hypothesis that the ball drawn is marked A_m, and consequently that the assertion is true. In order to find P_m, the probability of the assertion being made, there are four cases to be considered. 1st, we may suppose the witness is not deceived himself (u), and that he speaks the truth (v). The probability of the assertion in this case is uv. 2d, The witness knows the truth, but intends to deceive, or testifies falsely. In this case the probability of the assertion being made, on the hypothesis under consideration, is 0. 3d, The witness has been deceived himself, but intends to speak the truth. In this case also the probability of the assertion being made is 0. 4th, The witness has been deceived himself, and intends to deceive. In this case the assertion might be made; and to find the probability of its being made we have to consider, that since the witness has been deceived, he must have supposed some other index than A_m to have been drawn; and since he intends to deceive, he must assert some other index to be drawn than that which he supposes to be drawn. Setting aside, therefore, the index which he supposes to have been drawn, there remain $n-1$ others, any one of which he is as likely to name as any other. The probability, therefore, of his naming A_m when he intends to deceive is $1\div(n-1)$. Hence the probability of the assertion in this case is compounded of the probabilities of three simple events, as follows: 1. Probability the witness is deceived $=(1-u)$; 2. Probability he intends to deceive $=(1-v)$; 3. Probability he names A_m $=1\div(n-1)$. The probability of the assertion is therefore in this case $=(1-u)(1-v)\div(n-1)$. Adding this to the probability found in the first case, we have P_m, the whole probability of the assertion being made on the hypothesis that the index of the ball drawn was A_m, namely

$$P_m=uv+\frac{(1-u)(1-v)}{n-1}.$$

(2.) Let us now consider one of the remaining hypotheses, and suppose that the ball actually drawn was marked A_i, and not A_m, as attested by the witness. As before, there are four possible cases for consideration. 1st, The witness knows the fact and speaks the truth. In this case the assertion could not be made, or its probability is 0. 2d, The witness knows the fact, and intends to deceive. In this case the probability of his asserting A_m to be drawn is compounded of the probability that he is not deceived (u), the probability that he testifies falsely ($1-v$), and the probability that, knowing the index A_i to be drawn, he selects A_m from among the $n-1$ which remain after rejecting A_i, ($1\div(n-1)$). The probability of the assertion being made in this case is therefore $u\,(1-v)\div(n-1)$. 3d, The witness is deceived, and intends to speak the truth. By reasoning as in the last case, it is easy to see that the probability of the assertion being made in this case is $v\,(1-u)\div(n-1)$. 4th, The witness is deceived, and intends to deceive. The probability of the assertion being made in this case will be found by considering, that as the witness is himself deceived, he must suppose some particular index to be drawn different from A_i, (which is drawn by hypothesis), for instance A_e, the probability of which is $1\div(n-1)$; and intending to deceive, he must fix on some index different from A_e, which he supposes to be drawn; and he announces A_m, the probability of which selection is also $1\div(n-1)$. The probability, therefore, that the witness supposes A_e to be drawn, and annnounces A_m, is $1\div(n-1)^2$. But it is evident, that whatever can be affirmed with respect to the particular index A_e, may be affirmed with equal truth of every one of the other n indexes, excepting A_i, which is actually drawn, (since by hypothesis the witness is deceived), and A_m, which he announces, (since by hypothesis he lies). There are therefore $n-2$ different ways in which he may at the same time be deceived, and intend to deceive, and announce A_m; consequently the probability of this announcement in any of these ways is $(n-2)\div(n-1)^2$. Multiplying this into the probability of his being deceived ($1-u$), and the probability of his giving false testimony ($1-v$), the probability of the assertion in this case becomes $\dfrac{(1-u)(1-v)(n-2)}{(n-1)^2}$. Hence the whole probability of the assertion, in all the cases included in the hypothesis that the ball actually drawn was marked A_i, is

$$P_i=\frac{u(1-v)}{n-1}+\frac{(1-u)v}{n-1}+\frac{(1-u)(1-v)(n-2)}{(n-1)^2}.$$

As this expression will evidently be the probability of the assertion on any other of the $n-1$ hypotheses that the ball actually drawn was marked with an index different from A_m, the sum of the probabilities of the assertion on all these hypotheses is ΣP_i, where i is successively each of the numbers 1, 2, 3,...n, excepting m.

We have now to find ϖ_m, the probability of the first hypothesis. Since the hypotheses, in the present question, are not all equally probable *a priori*, we must have recourse to the formula (49) $\varpi_i=\lambda_i P_i\div\Sigma\lambda_i P_i$, and consequently in the present case we have

$$\varpi_m=\frac{\lambda_m P_m}{\lambda_m P_m+\Sigma\lambda_i P},$$

the sign of summation Σ including every value of i from 0 to n, excepting $i=m$. Now the value of P_i being the same in respect of each of the hypotheses which suppose the assertion untrue, $\Sigma\lambda_i P_i=P_i\Sigma\lambda_i$; and the sum of all the values of λ_i from $i=0$ to $i=n$ being 1, on excluding $\lambda_m=a_m\div s$, we have $\Sigma\lambda_i=(s-a_m)\div s$. Substituting this, together with the values of P_m and P_i, as above found, and making $u'=1-u$, $v'=1-v$, the formula becomes, after the proper reduction,

$$\varpi_m=\frac{a_m\{(n-1)uv+u'v'\}}{a_m\{(n-1)uv+u'v'\}+(s-a_m)\{u'v+uv'+\frac{n-2}{n-1}u'v'\}};$$

which is the probability of the hypothesis that a ball marked A_m was drawn, or that the testimony is true.

When there are no two balls in the urn having the same index, the numbers a_1, a_2, a_3, &c. become each $=1$, and $s=n$. In this case the formula gives

$$\varpi_m=\frac{(n-1)uv+u'v'}{(n-1)uv+u'v'+(n-1)(u'v+uv')+(n-2)u'v'},$$

which, on observing that $uv+u'v+uv'+u'v'=1$, becomes by reduction

$$\varpi_m=uv+\frac{(1-u)(1-v)}{n-1}.$$

This is the probability of the truth of the testimony of a witness, who affirms that the number m is drawn from an urn which contains n balls, numbered 1, 2, 3...n. It is obvious, that when u and v are fractions approaching to unity, and n is a considerable number, the second term becomes very small, and may be neglected. The probability then becomes simply $\varpi_m=uv$.

69. We now proceed to consider the probability of an event attested by several witnesses; and first let us suppose the witnesses to agree in their testimony. The measures of the veracity of the several witnesses being respectively v_1, v_2, v_3, &c., and the *a priori* probability of the event being p, we have by (58) for its probability after the testimony of the first witness,

$$\varpi_1=\frac{v_1 p}{v_1 p+(1-v_1)(1-p)}.$$

In order to find the probability of the event after the second witness gives his testimony, we may suppose the *a priori* probability to be changed from p to ϖ_1 by the testimony of the first witness, and the same formula gives

$$\varpi_2=\frac{v_2\varpi_1}{v_2\varpi_1+(1-v_2)(1-\varpi_1)}=\frac{v_1v_2p}{v_1v_2p+(1-v_1)(1-v_2)(1-p)}.$$

Let a third witness now come forward, and give testimony in favour of the same event. Its probability after his testimony will become in like manner

$$\varpi_3=\frac{v_3\varpi_2}{v_3\varpi_2+(1-v_3)(1-\varpi_2)}=\frac{v_1v_2v_3p}{v_1v_2v_3p+(1-v_1)(1-v_2)(1-v_3)(1-p)}.$$

In general, let ϖ^x be the probability of an event after it has been attested by x witnesses, and let v_x be the veracity of the last witness, then ϖ_{x-1} being the probability of the event after $x-1$ eyewitnesses have each testified in its favour, we have

$$\varpi_x=\frac{v_1v_,\ldots\ldots v_xp}{v_1v_2\ldots v_xp+(1-v_1)(1-v_2)\ldots(1-v_x)(1-p)}.$$

If we suppose the witnesses all equally credible, or that $v_1=v_2=v_3\ldots=v_x$, this becomes

$$\varpi_x=\frac{v_xp}{v^xp+(1-v)^x(1-p)}=\frac{1}{1+\left(\frac{1-v}{v}\right)^x\frac{1-p}{p}}.$$

Now, if $v=\frac{1}{2}$, then $(1-v)\div v=1$, and $\varpi_x=p$; whence it appears that the probability of an event is not increased by the testimony of any number of witnesses, when the veracity of each is only $\frac{1}{2}$; but when v is greater than $\frac{1}{2}$, the event becomes more probable as the number of witnesses is greater, and when v is a considerable fraction, its probability increases very rapidly with the number of witnesses.

70. When the values of v and p are given, that of x in the last formula may be found so as to render ϖ_x of any given value. Hence we may find the number of witnesses required to make it an even wager, whether an event exceedingly improbable, and in favour of which they give unanimous testimony, has happened or not. For example, let the odds against the event be a million million to one, that is, let $p=\frac{1}{1{,}000{,}000{,}000{,}001}=\frac{1}{10^{12}+1}$, and let v the veracity of each witness be $\frac{9}{10}$. In order that ϖx may equal $\frac{1}{2}$, we must have $\left(\frac{1-v}{v}\right)^x\frac{1-p}{p}=1$. Now $\frac{1-v}{v}=\frac{1}{9}$, and $\frac{1-p}{p}=10^{12}$, therefore $\left(\frac{1}{9}\right)^x\times10^{12}=1$; whence $x\log\frac{1}{9}=\log\frac{1}{10^{12}}$ or $x\log 9=12$ and therefore $x=\frac{12}{\cdot95424}=12\cdot6$ nearly, so that 13 independent witnesses would suffice to render it more probable that the event really took place than that it did not.

This example is given by Mr. Babbage, (Ninth Bridgewater Treatise, Note E), with a view to shew the fallacy of Hume's celebrated argument respecting miracles. What the example proves is simply this, that if we suppose an urn to contain a million million of white balls, and only one black ball, and that on a ball being drawn at random from the urn, thirteen eyewitnesses of the drawing, each of whom makes only one false statement in ten, without collusion, and independently of each other, affirm to A, who was not present at the drawing, that the ball drawn was black, then A would have rather a stronger reason for believing than for disbelieving the testimony. But it is sufficiently obvious, that the event attested in this case, though exceedingly improbable *a priori*, cannot be regarded as in any way miraculous. On the contrary, the black ball might be drawn with the same facility, and was *a priori* as likely to be drawn, as any other *specified* ball in the urn. Let it be granted that an event is within the range of fortuitous occurrence, and that there exists a single chance in its favour out of any number of millions of chances, it may then happen in any one trial; nay, a number of trials may be assigned, such that its non-occurrence would be many times more improbable than the contrary.

71. Let us next consider the case of a number of witnesses contradicting each other. If the first witness announces an event of which the probability is p, then the probability, after the testimony, of its having happened is ϖ_1, and the probability that it has not happened $1-\varpi_1$. Suppose a second witness now to appear, and testify that the event has not happened, and let the probability of the truth of his testimony be denoted by ϖ'_2; then $1-\varpi_1$ being the probability before his testimony was given that what he asserts is true, and v_2 being the measure of his veracity, we have, as in (69), $\varpi'_2=\frac{v_2(1-\varpi_1)}{v_2(1-\varpi_1)+(1-v_2)\varpi_1}$, whence, since

$$\varpi_1=\frac{v_1p}{v_1p+(1-v)(1-p)},$$ there results

$$\varpi'_2=\frac{(1-v_1)v_2(1-p)}{(1-v_1)v_2(1-p)+v_1(1-v_2)p}$$

for the measure of the probability that the event has not happened. The probability that it has happened is therefore $1-\varpi'_2$, and accordingly if ϖ'_2 be less than $\frac{1}{2}$, there is a stronger reason for believing that the event happened than that it did not. The method of forming the expression for the probability of the event, after it has been attested or denied by a third witness, or any number of successive witnesses, is obvious.

If we suppose the values of v_1 and v_2 to be equal, the expression becomes $\varpi'_2=1-p$, which is the *a priori* probability that the event did not happen. It is obvious that this must be the case, inasmuch as two contradictory testimonies of equal weight neutralize each other. In general, the probability of an event which is affirmed by m witnesses, and denied by n witnesses, all equally credible, is the same as that of an event which is affirmed by $m-n$ witnesses who agree in their testimony.

72. When a relation has been transmitted through a series of narrators, of whom the first only has a direct knowledge of the event, and each of the others derives his knowledge from the relation of the preceding, the probability of the event is diminished by every succeeding relation In order to obtain a general expression for the probability of traditionary testimony, we may take the event considered in (68), namely the extraction of a ball marked A_m from an urn containing s balls, of which a_1 are marked A_1, a_2 marked $A_2,\ldots a_n$ marked A_n, there being in all n different indices. Now suppose the relation to have passed through a chain of narrators, T, T_1, $T_2,\ldots T_x$, in number $x+1$, of whom the first only was an eyewitness of the event, each of the others receiving his knowledge of it from the one preceding him, and communicating it in his turn to the succeeding, the question is to determine the probability that a ball marked A_m was drawn, after this event has been narrated by T_x, the last witness of the series.

73. In order to apply the general formula of (68) to this case, it is necessary to remark that the event observed is the attestation of T_x of his having been informed by T_{x-1} that the ball drawn from the urn, the drawing of which was seen by T, was marked A_m. There are n different hypotheses respecting the index of the ball actually drawn, but it is only necessary to consider two of them, namely, the hypothesis that the ball actually drawn was marked A_m, and any one of the other hypotheses which consist in supposing that a ball with a different index from A_m was drawn, for example A_r. Let the probability of the attestation, on the hy-

pothesis that the index of the ball drawn was A_m, be denoted by y_x, and its probability on the hypothesis that the index was A_i by y'_x, (y_x and y'_x corresponding to P_m and P_i in (68), which express the same probabilities in respect of the eyewitness T), then by (68), the probability of the hypothesis that A_m was drawn is

$$\varpi_m=\frac{\lambda_m y_x}{\lambda_m y_x+\Sigma\lambda_i y'_x}.$$

But since y'_x is the same for all the hypotheses that the index drawn was different from A_m, $\Sigma\lambda_i y'_x=y'_x\Sigma\lambda_i$; and by (68) $\Sigma\lambda_i=(s-a_m)\div s$, and $\lambda_m=a_m\div s$, therefore

$$\varpi_m=\frac{a_m y_x}{a_m y_x+(s-a_m)y'_x}.$$

We have now to find y_x and y'_x in terms of x. Let v, v_1, v_2, &c. be the respective probabilities of T, T_1, T_2, &c. speaking the truth, then the probability of T_x speaking the truth is v_x, and the probability that he does not $1-v_x$, whether because he is dishonest, and intends to deceive, or because he has mistaken the statement of the preceding witness. Now there are two ways in which it may happen that A_m is announced by T_x. First, if he speaks the truth, and has been informed by the preceding narrator T_{x-1} that A_m was the index drawn; secondly, if he lies, and has been informed by T_{x-1} that a different index from A_m was drawn. Assuming y_{x-1} to have the same signification with respect to T_{x-1} that y_x has been assumed to have with respect to T_x, (that is to say, the probability of the assertion being made by T_{x-1} on the hypothesis that the ball actually drawn was A_m), the probability of the first of these combinations is $v_x y_{x-1}$. With respect to the second case, it is to be observed, that if T_x announces a different index from that which has been announced to him by T_{x-1}, the chance of his announcing A_m out of $n-1$ indexes different from that announced by T_{x-1} is $1\div(n-1)$; and on multiplying this by the probability $1-v_x$ that the testimony of T_x is false, and by the probability $1-y_{x-1}$ that T_{x-1} has announced a different index from A_m, we have, for the probability of the second combination $(1-v_x)(1-y_{x-1})\div(n-1)$. The whole probability of T_x testifying that A_m was drawn, is therefore, on the first hypothesis, given by the equation,

$$y_x=v_x y_{x-1}+(1-v_x)(1-y_{x-1})\div(n-1).$$

This is an equation of finite differences of the first order, the complete integral of which is

$$y_x=\frac{1}{n}+\frac{C(nv_1-1)(nv_2-1)\ldots(nv_{x-1}-1)(nv_x-1)}{(n-1)^x}.$$[1]

In order to determine the arbitrary constant C, it is to be observed, that, since y_1, $y_2\ldots y_x$, as well as v_1, $v_2\ldots v_x$ apply to the narrators T_1, $T_2\ldots T_x$ respectively, if we suppose $x=o$ the resulting value of the integral will be the probability that A_m was announced by the eyewitness T, on the hypothesis that A_m was actually drawn. Let this probability be P_m; then the equation becomes $P_m=C+1\div n$ whence $C=(nP_m-1)\div n$. If, therefore, we make

$$X=\frac{(nv_1-1)(nv_2-1)\ldots(nv_{x-1}-1)(nv_x-1)}{(n-1)^x}$$

we obtain, on the first hypothesis, for any value of x,

$$y_x=\{1+(nP_m-1)X\}\div n.$$

In the same manner we find the probability y'_x of the testimony given by T_x, on the hypothesis that the ball actually drawn was A_i. The probability of the event, after being testified by the eyewitness, being on this hypothesis P_i, we have,

$$y'_x=\{1+(nP_i-1)X\}\div n.$$

Substituting these values of y_x and y'_x in the expression above found for ϖ_m, we obtain for the probability of the event observed by T, and narrated by T_x, the narration having passed from one to another in the manner supposed,

$$\varpi_m=\frac{a_m\{1+n(P_m-1)X\}}{a_m\{1+(nP_m-1)X\}+(s-a_m)\{1+(nP_i-1)X\}}.$$

74. Since $\dfrac{nv_x-1}{n-1}=v_x-\dfrac{1-v_x}{n-1}$, and since v_x is always less than unity, and n always greater than unity, each of the terms of the series represented by X, whether positive or negative, is a proper fraction, whence the value of X becomes smaller and smaller as x increases. Suppose x infinite, then $X=0$, and $\varpi_m=a_m\div s$, which is the *a priori* probability of the event. Hence we see that the probability of an event transmitted through a series of traditionary evidence becomes weaker at every step, and ultimately equal to the simple probability of the event, independent of any testimony.

75. When the urn is supposed to contain only n balls, each having a different index, the expression for ϖ_m is greatly simplified; for, in this case, $a_m=1, s=n$; therefore, (since $P_m+(n-1)P_i=1$) the denominator becomes n, and we have consequently $\varpi_m=\{1+(nP_m-1)X\}\div n$, which coincides with the value of y_x found above, that is to say, with the probability of the event being testified by T_x on the hypothesis that it actually happened. Laplace, in solving this particular case of the problem, (p. 456) assumes that the probabilities here denoted by y_x and ϖ_m are identical. They are, however, as is evident from the above analysis, quite distinct in their nature, and their values are only equal in the particular case in which $s-a_m$ is to a_m in the ratio of $m-1$ to 1. (Poisson, p. 112.)

76. The question of determining the probability that the verdict of a jury is correct, is precisely analogous to that of finding the probability of an event attested by one or more witnesses. Let us first take the case of a single juror, and assume $u=$ the probability that the juror gives a correct verdict, (that is, correct in respect of the facts), and $p=$ the probability that the accused is guilty before being put on his trial. Suppose the verdict guilty to be returned; two hypotheses may be made respecting the cause of the verdict, first, that the accused is guilty; secondly, that he is innocent. On the first hypothesis, the accused will be condemned if the juror gives a right verdict, the probability of which is u. On the second hypothesis, the accused will be condemned if the juror gives a wrong verdict, the probability of which is $1-u$. But the *a priori* probabilities of these causes (the guilt or innocence of the accused) being respectively p and $1-p$, we have by (49)

$$\varpi_1=\frac{up}{up+(1-u)(1-p)},\qquad \varpi_2=\frac{(1-u)(1-p)}{up+(1-u)(1-p)},$$

ϖ_1 being the probability of the first hypothesis, or the probability that the accused is guilty after the verdict has been given, and ϖ_2 the probability resulting from the verdict that the accused is innocent.

77. Suppose the verdict not guilty to be given, and let ϖ'_1 and ϖ'_2 be the probabilities after the verdict of the two hypotheses. On the first hypothesis, namely, that the accused is guilty, this verdict will be given if the juror gives a wrong verdict, of which the probability is $1-u$; and on the second hypothesis, the verdict will be given if the juror gives a right verdict, of which the probability is u; and the

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[1] This is easily verified; for on changing x into $x-1$ in the integral, and forming the expression $v_x y_{x-1}+(1-v_x)(1-y_{x-1})\div(n-1)$, there results an identical equation.

probabilities of these hypotheses before the verdict being respectively p and $1-p$ as before, we have

$$\varpi'_1=\frac{(1-u)p}{(1-u)p+u(1-p)},\qquad \varpi'_2=\frac{u(1-p)}{(1-u)p+u(1-p)}.$$

From the above value of ϖ_1, we obtain $\varpi_1-p=\frac{p(1-p)(2u-1)}{up+(1-u)(1-p)}$; a fraction which is positive or negative according as u is greater or less than $\frac{1}{2}$. Hence it appears that the guilt of the accused is only rendered more probable by the verdict guilty being pronounced, when the probability that the juror gives a correct verdict is greater than $\frac{1}{2}$. In like manner it is shewn that ϖ'_1 (the presumption of the guilt of the accused after a verdict of acquittal), is greater than p when u is less than $\frac{1}{2}$.

78. The *a priori* probability of the condemnation of the accused before he is put on his trial is $up+(1-u)(1-p)$; for there are two ways in which this condemnation may take place; first, if the accused be guilty, and the juror give a correct verdict, the probability of which concurrence is up; and, secondly, if the accused be innocent, and the juror give a wrong verdict, the probability of which is $(1-u)(1-p)$. Therefore, making $c=$ the probability of a verdict of condemnation, we have $c=up+(1-u)(1-p)$; and for a verdict of acquittal, $1-c=(1-u)p+u(1-p)$.

79. Let us next suppose that after the verdict of the first juror has been pronounced, the accused is put on his trial before a second juror, and let u_2 be the probability the second juror gives a correct verdict, and c_2 be the probability the accused will be pronounced guilty by him. After the verdict guilty has been pronounced by the first juror, the probability of the guilt of the accused is ϖ_1, and it is evident that c_2 will be found by substituting u_2 for u, and ϖ_1 for p in the above value of c, whence $c_2=u_2\varpi_1+(1-u_2)(1-\varpi_1)$. The probability of a verdict of condemnation by both jurors is cc_2; therefore, (observing that $\varpi_1=up\div c$), we have for this probability

$$cc_2=uu_2p+(1-u)(1-u_2)(1-p).$$

The probability of the guilt of the accused after a verdict of acquittal has been pronounced by the first juror being ϖ'_1, the probability of a verdict of acquittal being given by the second juror is $1-c_2=(1-u_2)\varpi'_1+u_2(1-\varpi'_1)$; therefore, (observing that $\varpi'_1=(1-u)p\div(1-c)$, we have for the probability of a verdict of acquittal by both jurors

$$(1-c)(1-c_2)=(1-u)(1-u_2)p+uu_2(1-p).$$

Adding the probability of a verdict of condemnation by both jurors, to that of acquittal by both, we have $uu_2+(1-u)(1-u_2)$ for the probability of both giving the same verdict. This result is independent of p, and is evidently true *a priori*, inasmuch as there are two ways in which the same verdict may be given, namely, when both jurors are right, and when both are wrong.

The probability of acquittal by the second juror, after a verdict of guilty by the first, is $1-c_2=(1-u_2)\varpi_1+u_2(1-\varpi_1)$; multiplying by c, and substituting for c and ϖ_1 their values, we have for the probability of a verdict of guilty by the first, and not guilty by the second,

$$c(1-c_2)=u(1-u_2)p+(1-u)u_2(1-p).$$

In like manner, if the accused has been acquitted by the first juror, the presumption of his guilt becomes ϖ'_1, and the probability of a verdict guilty by the second is $c_2=u_2\varpi'_1+(1-u_2)(1-\varpi'_1)$; therefore the probability of a verdict of not guilty by the first, and of guilty by the second is

$$(1-c)c_2=(1-u)u_2p+u(1-u_2)(1-p).$$

The sum of these two expressions gives for the probability of a discordant verdict, $u(1-u_2)+(1-u)u_2$.

80. If we now suppose $u=u_2$, and make $1-u=w$, the probability that the two jurors will agree in their verdict, whether they are both right or both wrong, is u^2+w^2; and the probability of a discordant verdict $uw+uw=2uw$. The sum of the two expressions is $u^2+2uw+w^2=(u+w)^2$; and therefore the probabilities of the different cases are respectively given by the development of the binomial $(u+w)^2$.

By pursuing this reasoning, it is easy to see that if there be any number h whatever of jurors, or voters on any question which admits only of simple affirmation or negation, all being supposed to possess the same integrity and knowledge, so that there is the same probability u of a correct decision in respect of each, the probablities of the different cases are found by the development of the binomial $(u+w)^h$. The probability of a correct verdict being pronounced unanimously is u^h; of an erroneous one being pronounced unanimously is w^h; and the probability that a correct verdict will be given by m of the jurors, and an erroneous one by n, is Uu^mw^n, where $U=\frac{1\,.\,2\,.\,3.\,\ldots.h}{1\,.\,2\,.\,3\ldots m\times 1\,.\,2\,.\,3\ldots n}$.

81. The probability that the accused will be pronounced guilty by m jurors, and acquitted by n, on the supposition that the value of u is the same for each juror, is thus found. There are two ways in which this event may take place; 1st, if the accused be guilty (the probability of which is p), and m jurors decide correctly, and n wrongly (the probability of which is Uu^mw^n); the probability of the condemnation taking place in this way is therefore Uu^mw^np. 2d, If the accused be innocent (the probability of which is q) and n jurors decide rightly, and m wrongly (the probability of which is Uu^nw^m); the probability of the event taking place in this way is therefore Uu^nw^mq. Let G therefore denote the whole probability of the verdict, and we have

$$G=U(u^mw^np+u^nw^mq).$$

Hence the probability that the accused will be condemned unanimously by a jury consisting of h jurors is u^hp+w^hq; and the probability that he will be unanimously acquitted u^hq+w^hp.

82. Suppose the accused to have been pronounced guilty by m jurors, and not guilty by n jurors, the probability of the verdict of the majority being correct is found from the formula in (49). Two hypotheses may be made: 1st, the accused is guilty; 2d, he is innocent. The probability P_1 of the observed event (the condemnation by m, and acquittal by n jurors) on the first hypothesis is Uu^mw^n; and the *a priori* probabilities of the two hypotheses (or the probabilities denoted by λ_1 and λ_2 in (49), being p and q; therefore if ϖ_1 denote the probability of the verdict being correct, that is, the probability of the first hypothesis after the verdict has been pronounced, and ϖ_2 the probability of its being wrong, we shall have (49)

$$\varpi_1=\frac{u^mw^np}{u^mw^np+u^nw^mq},\qquad \varpi_2=\frac{u^nw^mq}{u^mw^np+u^nw^mq}.$$

If the verdict has been pronounced unanimously, then $m=h$ and $n=0$, and the formulæ become

$$\varpi_1=\frac{u^hp}{u^hp+w^hq},\qquad \varpi_2=\frac{w^hq}{u^hp+w^hq}.$$

If $p=q=\frac{1}{2}$, and $m-n=i$, we have then

$$\varpi_1=\frac{u^{n+i}w^n}{u^{n+i}w^n+u^nw^{n+i}}=\frac{u^i}{u^i+w^i}.$$

But this is the probability of a verdict being correct which has been pronounced unanimously by i jurors; whence it follows that the probability of a decision rendered by a given majority being correct, is the same as that of a decision rendered unanimously by a jury equal in number to the difference between the majority and minority, and is therefore independent of the total number of jurors. This, however, is only true on the supposition that the value of u is known *a priori*; for if u be not absolutely known, the weight of the verdict depends on the ratio of the majority to the whole number of jurors. This is in accordance with common notions, for it will readily be admitted that a verdict given unanimously by a jury of 10 will be entitled to much more weight than one pronounced by a jury consisting of a large number, as 100, in which 55 are of one opinion, and 45 of the opposite. In this case, the opinion of the minority throws great doubt on the correctness of the verdict. It is to be observed, however, that the probability of a verdict being given by a small majority becomes less and less as the number of jurors is increased.

83. When the number who dissent from the opinion of the majority is unknown, and we merely know that the majority exceeds the minority by *at least i* jurors, the probability of the verdict being correct is found as follows. Suppose the verdict to be guilty. On the hypothesis that it is correct, the probability of the accused being found guilty by $h-x$, and not guilty by x jurors, is by the formula in (80), $\text{U}u^{h-x}w^x$. Now, if we give x successively all the values 0, 1, 2,...n, where $n=\frac{1}{2}(h-i)$, and assume U_0 to denote the value of U when $x=0$, U_1 its value when $x=1$, and so on; and also make W = the probability of the accused being pronounced guilty by $h-n$ *at least*, we shall have

$$\text{W}=\text{U}_0u^h+\text{U}_1u^{h-1}w+\text{U}_2u^{h-2}w^2\ldots\ldots+\text{U}_nu^{h-n}w^n.$$

In like manner, if W′ denote the probability of a verdict guilty by $h-n$ jurors *at least*, on the hypothesis that the accused is not guilty, we shall have,

$$\text{W}'=\text{U}_0w^h+\text{U}_1uw^{h-1}+\text{U}_2u^2w^{h-2}\ldots\ldots+\text{U}_nu^nw^{h-n};$$

whence, p and q being as above the *a priori* probabilities of the two hypotheses, the probability that the verdict guilty is correct, when pronounced by $h-n$ jurors at least, becomes $\text{W}p\div(\text{W}p+\text{W}'q.)$

84. It is evident that no application can be made of these formulæ without assigning arbitrary values to u and p, unless, indeed, we have data for determining their mean values from experience. With respect to p, we may assume, for the sake of shewing the general consequences of the formulæ, its value to be $\frac{1}{2}$; for it cannot well be supposed less than $\frac{1}{2}$, or that a person brought before a jury is more likely to be innocent than guilty; and if it much exceeds $\frac{1}{2}$ and approaches to unity, a verdict of guilty may be expected from any jury, however constituted. When a mean value of u cannot be determined from experience, the only way of obtaining numerical results, is to suppose u to have all possible values within given limits, and to integrate the equations between those limits. As it seems unreasonable to suppose that a juror is more likely to give a wrong verdict than a right one, we may assume that u cannot be less than $\frac{1}{2}$. Suppose, then, that u increases by infinitely small increments from $u=\frac{1}{2}$ to $u=1$, and let it be proposed to determine the probability that a decision is correct when the accused has been pronounced guilty by m jurors, and not guilty by n. Here an infinite number of hypotheses may be made respecting the value of u, and we must therefore have recourse to the formulæ in (51.) Let $u=x$ be one of those hypotheses, $\text{P}_x=$ the probability on that hypothesis of the event observed (that is, of the accused being pronounced guilty by m, and not guilty by n jurors,) $\varpi_x=$ the probability of the assumed hypothesis, and $\Pi=$ the mean probability of the correctness of the verdict from all the hypotheses. By the formulæ in (81) we have

$$\text{P}_x=\text{U}\{x^m(1-x)^np+x^n(1-x)^m(1-p)\},$$

and as all the hypotheses are supposed equally probable, we have (45) $\varpi_x=\text{P}_x\div\Sigma\text{P}_t$. But between the proposed limits $\Sigma\text{P}_x=p\int_{\frac{1}{2}}^{1}x^m(1-x)^ndx+(1-p)\int_{\frac{1}{2}}^{1}x^n(1-x)^mdx$; if, therefore, we make $p=\frac{1}{2}$, we shall have by reason of $\int_{\frac{1}{2}}^{1}x^n(1-x)^mdx=\int_{\frac{1}{2}}^{1}x^m(1-x)^ndx, \Sigma\text{P}_x=\frac{1}{2}\int_0^1x^m(1-x)dx$, and therefore

$$\varpi_x=\frac{x^n(1-x)^n+x^n(1-x)^m}{\int_0^1x^m(1-x)^ndx},$$

for the probability of the hypothesis. But (82) the probability on this hypothesis of the accused being guilty, is $\frac{x^m(1-x)^n}{x^m(1-x)^n+x^n(1-x)^m}$; multiplying this by the probability of the hypothesis, ϖ_x, we obtain for the probability of the verdict being correct $x^m(1-x)^n\div\int_0^1x^m(1-x)^ndx$; and, therefore, for the probability of the verdict being correct on all the hypotheses from $x=\frac{1}{2}$ to $x=1$,

$$\Pi=\frac{\int_{\frac{1}{2}}^{1}x^m(1-x)^ndx}{\int_0^1x^m(1-x)^ndx}.$$

Hence the probability that a verdict given by a majority m out of $m+n=h$ jurors is wrong, is

$$1-\Pi=\frac{\int_0^{\frac{1}{2}}x^m(1-x)^ndx}{\int_0^1x^m(1-x)^ndx},$$

which, on effecting the integrations by the formula in (51) becomes after reduction

$$1-\Pi=\frac{1}{2^{h+1}}\left\{1+\frac{h+1}{1}+\frac{(h+1)h}{1\cdot2}+\frac{(h+1)h(h-1)}{1\cdot2\cdot3}\ldots\ldots+\frac{(h+1)h(h-1)\ldots\ldots(h-n+2)}{1\cdot2\cdot3\ldots\ldots\ldots\ldots n}\right\}.$$

Assuming h (the number of jurors) $=12$, and making n successively 0, 1, 2, 3, 4, 5, the series gives

$$\frac{1}{8192},\quad\frac{14}{8192},\quad\frac{92}{8192},\quad\frac{378}{8192},\quad\frac{1093}{8192},\quad\frac{2380}{8192},$$

for the respective probabilities of the error of a verdict when pronounced unanimously by 12 jurors, by a majority of 11 to 1, of 10 to 2, of 9 to 3, of 8 to 4, and of 7 to 5. In the last case the probability of the error is nearly $=\frac{2}{7}$.

85. From these results it appears that the chance of a verdict being wrong which has been pronounced unanimously by twelve jurors is very small; but it is to be remarked, that they have been deduced on the supposition that the unanimity proceeds from agreement in the same opinion, and that the jurors are unbiassed by each other. In this country, where unanimity is compelled by law, the mean probability of a correct verdict can scarcely be considered as greater than that of a verdict pronounced by a simple majority; for, though in most cases the verdict may be supposed to represent the opinion of a larger majority than seven, it may happen, not unfrequently, that a smaller number than five, possessing greater energy or perseverance, may persuade the others into a surrender of their judgment. In fact, unless the presumption of the guilt of the accused be very great, it would scarcely be possible, without concert, to procure an unanimous verdict in any case. It is also to be observed, that the assumption of all values of u from $\frac{1}{2}$ to 1 being equally probable, may lead to results widely different from the truth. The mean value of u, which depends on the general intelligence of the class of persons from amongst whom the lists of jurors are made up, can only be rightly determined from data furnished by experience. One of the elements, however, which require to be known for this purpose, is the number of jurors who concur in and dissent from, the verdict. The forced unanimity of the law renders it impossible to obtain this element from the records of the English courts; but in France and Belgium, where the majority and minority are known and recorded, the same obstacle does not exist, and the "*Comptes Généraux de l'Administration de la Justice Criminelle*," published by the French Government, have enabled Poisson to deduce mean values of u and p for that country, and consequently to obtain the necessary data for one of the most interesting applications of the theory of Probabilities. The general results were as follows: During

the six years from 1825 to 1830 inclusive, the system of criminal legislation in France underwent no change; the jury consisted of 12, and a simple majority was only required to concur, though when it happened that the majority was the least possible, the Court had power to overrule the verdict. On comparing, according to the rules of the theory, the verdicts given in the cases tried before the criminal courts during those six years, it was found that for the whole of France, the probability (u) of a juror giving a correct verdict was a little greater than $\frac{2}{3}$ with respect to crimes against the person, and nearly equal to $\frac{15}{17}$ with respect to crimes against property; without distinction of the species of crime, it was found to be a very little below $\frac{3}{4}$. The other element, the probability (p) of the guilt of the accused before the trial, was found not much to exceed $\frac{1}{2}$ (being between 0.53 and 0.54) with respect to crimes against the person, while it a little exceeded $\frac{2}{3}$ in respect of crimes against property. Without distinction of crime, its value was very nearly 0.64.

86. On substituting these values of u and p (namely $u=\frac{3}{4}$, $p=.64$, whence $w=\frac{1}{4}$, $q=.36$) in the formula in (81), and making $m=7$, $n=5$, and consequently $U=\frac{1\,.\,2\,.\,3\ldots\ldots 12}{1\,.\,2\,.\,3\ldots 7\times 1\,.\,2\,.\,3\ldots 5}=792$, we have $G=\frac{792}{4^{12}}(3^7\times .64+3^5\times .36)=.07$ nearly. Hence it may be expected, that in a hundred trials it will happen only seven times that the accused will be pronounced guilty by the smallest possible majority. If $m=12$, and $n=0$, we shall have $u^h p+w^h q=.02027=\frac{1}{50}$ nearly, for the probability of an unanimous verdict of guilty, and $u^h q+w^h p=.0114$ for the probability of an unanimous verdict of not guilty.

Making the same substitutions in the formula in (82), we have for the probability of a verdict guilty being correct, from which 5 jurors out of 12 dissent, $\varpi_1=\frac{16}{17}$; and $\varpi_2=\frac{1}{17}$ for the probability of its being wrong.

Substituting the same values in the series represented by W and W′ in (83), and supposing n to have all values from $n=0$ to $n=5$, there results $W=\frac{3^7}{4^{12}}\times 7254$, $W'=\frac{1}{4^{12}}\times 239122$, whence $\frac{Wp}{Wp+Wq}=\frac{126915984}{127992033}=\frac{118}{119}$ nearly. This is the probability that a verdict guilty, pronounced by a majority of seven against five *at least*, is correct. The probability of the same verdict being wrong, is therefore $\frac{1}{119}$; so that out of 119 verdicts, respecting which we know nothing else, than that seven at least of the jury concurred in finding the accused guilty, we may expect one to be wrong, or that one person out of 119 so condemned will be innocent.

SECT. VIII. OF THE SOLUTION OF QUESTIONS INVOLVING LARGE NUMBERS.

87. The probabilities of the different compound events which can result from the combination of any number of simple events, E_1, E_2, E_3, &c. being (13) measured respectively by the several terms of the developement of the multinomial $(p+q+r+\&c.)^h$, the most probable of those compound events will be that which corresponds to the term having the greatest numerical value. Let us consider the case of two simple contrary events E and F, the probabilities of which are respectively p and q, and suppose the number of occurrences to be 4. Neglecting the order of occurrence, the different combinations, with their respective probabilities, are the following:

$$\begin{array}{ccccc} \text{EEEE,} & \text{EEEF,} & \text{EEFF,} & \text{EFFF,} & \text{FFFF,} \\ p^4, & 4p^3q, & 6p^2q^2, & 4pq^3, & q^4. \end{array}$$

Now it is evident that the numerical values of these probabilities depend on the ratio of p to q, as well as on the coefficient by which they are multiplied, and that values may be given to p and q, such that any one of the terms may be made the greatest or the least in the series. If we suppose $p=q$, and consequently $p=\frac{1}{2}$, $q=\frac{1}{2}$, (since $p+q=1$) the probabilities of the different cases become respectively

$$\tfrac{1}{16},\quad \tfrac{4}{16},\quad \tfrac{6}{16},\quad \tfrac{4}{16},\quad \tfrac{1}{16};$$

whence it appears, that the most probable combination is that which corresponds to $6p^2q^2$, or in which each of the simple events occurs twice, the probability of this combination being $\frac{6}{16}$, while that of either of the simple events occurring four times in succession is only $\frac{1}{16}$.

When the number of trials is 5, the probabilities of the several cases are respectively

$$p^5,\quad 5p^4q,\quad 10p^3q^2,\quad 10p^2q^3,\quad 5pq^4,\quad q^5,$$

which, when $p=q$, become

$$\tfrac{1}{32},\quad \tfrac{5}{32},\quad \tfrac{10}{32},\quad \tfrac{10}{32},\quad \tfrac{5}{32},\quad \tfrac{1}{32},$$

so that there are two different combinations equally probable, namely, that in which E occurs three times and F twice, and that in which E occurs twice and F three times; and of the six possible combinations these two are the most probable, having in their favour a number of chances twice as great as the two cases in which one of the events occurs only once, and the other four times, and ten times greater than the two cases in which either of the simple events occurs in each of the five trials.

From these two instances it may be inferred in general, that when h is an even number, the most probable compound event is that of which the probability is represented by the middle term of the developement of $(p+q)^h$; and that when h is an odd number, there are two compound events equally probable, and more probable than any other, namely, those corresponding to the terms which occupy the middle of the series, supposing in both cases $p=q$. This supposition gives $(p+q)^h=(1+1)^h(\frac{1}{2})^h$; therefore in the case in which h is an even number, the general expression for the greatest term is

$$\frac{h(h-1)(h-2)\ldots\ldots(h-\frac{1}{2}h+1)}{1\,.\,2\,.\,3\quad\ldots\ldots\quad\frac{1}{2}h}(\tfrac{1}{2})^h;$$

and when h is odd, the general expression for either of the two equal terms, which are greater than any of the other terms, is

$$\frac{h(h-1)(h-2)\ldots\ldots\{h-\frac{1}{2}(h+1)+1\}}{1\,.\,2\,.\,3\quad\ldots\ldots\quad\frac{1}{2}(h+1)}(\tfrac{1}{2})^h.$$

88. When p and q are unequal, the greatest term of the expansion of $(p+q)^h$ will not occupy the middle of the series, but its place may be found by comparing two consecutive terms. Let $h=m+n$. The general term of the series then becomes

$$\frac{1\,.\,2\,.\,3\ldots\ldots\ldots h}{1\,.\,2\,.\,3\ldots\ldots m\times 1\,.\,2\,.\,3\ldots\ldots n}p^m q^n;$$

and the term immediately preceding is

$$\frac{1\,.\,2\,.\,3\ldots\ldots\ldots h}{1\,.\,2\,.\,3\ldots\ldots(m+1)\times 1\,.\,2\,.\,3\ldots\ldots(n-1)}p^{m+1}q^{n-1}.$$

Dividing the first of these by the second, we get for the quotient $(m+1)q\div np$, which, therefore, is the ratio of two consecutive terms taken at any part of the series. If this ratio be greater than 1, the term which has been taken as the dividend is greater than the preceding one which has been taken as the divisor; and it is evident that the terms must go on increasing, from the beginning of the series, so long as the ratio in question is greater than 1. But if the ratio be less than 1, the preceding term is greater than the succeeding, and the terms will become less and less as they are nearer the end of the series. Let $(m+1)q\div np=1$; then, since $p+q=1$, and $m+n=h$, we have $n=(h+1)q$, and consequently the ratio of any term to the next preceding is greater or less than 1 according as n is less or greater than $(h+1)q$. Now n is necessarily a whole number; therefore if $(h+1)q$ be a whole number, take $n=(h+1)q$, and the two terms of the series given by the expansion of $(p+q)^h$, in which the exponents of q are $n-1$ and n, will be equal to each other, and each greater than any other term of the series. But if $(h+1)q$ be not a whole number, let $(h+1)q-x$ be the nearest whole number *less* than $(h+1)q$, and make $n=(h+1)q-x$; then the greatest term of the developement will be that in which the exponent of q is n.

Since $n=(h+1)q-x$, we have $q=(n+x)\div(h+1)$, whence $p=1-\frac{n+x}{h+1}=\frac{m+1-x}{h+1}$, and therefore $\frac{q}{p}=\frac{n+x}{m+1-x}$. Now x is by hypothesis less than 1, therefore if m and n are large numbers, we have, very nearly, $q:p=n:m$; or, since $m+n=h$, $m=hp$, $n=hq$. It follows therefore, that the greatest term of the developement of the binomial $(p+q)^h$ is that in which the exponents of p and q are to each other in the ratio of p to q, or more nearly in that ratio than are any other two numbers whose sum is h. In other words, the most probable combination of two simple events, E and F, in any number of trials, is that in which the number of occurrences of E is to the number of occurrences of F in the ratio of their respective probabilities.

89. In the same manner it may be shewn, that when there are more than two simple events, of which one must occur in every trial, the most probable result of any number of trials is that combination in which the number of repetitions of each simple event is in proportion to its probability in a single trial. Thus, the probabilities of the simple events being respectively p, q, r, &c. the most probable compound event is that whose probability is expressed by that term of the expansion of $(p+q+r+\&c.)^h$, which has for its argument p^{hp}, q^{hq}, r^{hr}, &c.

90. Having determined the form of the greatest term of the series, we have next to find a method of approximating to its numerical value; for its coefficient containing the product of the natural numbers from 1 to h inclusive, its direct calculation becomes impracticable even when h is only a moderately large number. The theorem which gives the approximate value of this product is known by the name of *Stirling's Theorem*, having been discovered by that mathematician. As its investigation is a matter of pure analysis, we shall not stop to give it here, but refer the reader to the *Treatise on Differences and Series*, by Sir John Herschel, in the translation of Lacroix's *Elementary Treatise on the Differential and Integral Calculus*, p. 568.[1] The theorem is as follows: Let x be any number, then

$$1\,.\,2\,.\,3\ldots\ldots x=x^x e^{-x}\sqrt{2\pi x}\left(1+\frac{1}{12x}+\frac{1}{288x^2}+\&c.\right)$$

where e is the number of which the Napierean logarithm is unit, or the number 2·71828, and π the ratio of the circumference of a circle to the diameter, or 3·14159.

When x is a large number, the term divided by $12x$ becomes very small, and the series within the brackets may be considered as equal to unity. In this case, then, the formula becomes

$$1\,.\,2\,.\,3\ldots\ldots x=x^x e^{-x}\sqrt{2\pi x},$$

which gives a sufficient approximation in most cases. If, for example, $x=1000$, the result will be within a 12000th part of the truth.

Now, let E and F be two events of such a nature that the one or the other must happen in every trial; let p and q be their respective probabilities, and P the probability that in $m+n=h$ trials, E will happen m times and F n times; then by (12) we have

$$P=\frac{1\,.\,2\,.\,3\ldots\ldots\ldots h}{1\,.\,2\,.\,3\ldots\ldots m\times 1\,.\,2\,.\,3\ldots\ldots n}p^m q^n.$$

When m, n, and h are large numbers, the value of this coefficient may be computed from the above formula, which gives

$$1\,.\,2\,.\,3\ldots\ldots h=h^h e^{-h}\sqrt{2\pi h},$$
$$1\,.\,2\,.\,3\ldots\ldots m=m^m e^{-m}\sqrt{2\pi m},$$
$$1\,.\,2\,.\,3\ldots\ldots n=n^n e^{-n}\sqrt{2\pi n},$$

whence

$$P=\frac{h^h e^{-h}\sqrt{h}}{m^m n^n e^{-(m+n)}\sqrt{(2\pi mn)}}p^m q^n=\left(\frac{hp}{m}\right)^m\left(\frac{hq}{n}\right)^n\sqrt{\frac{h}{2\pi mn}}.$$

This expression represents any term of the series $(p+q)^h$. The greatest term, which corresponds to the most probable result, is (88) that in which m and n are to each other in the ratio of p to q, or when $m=hp$, and $n=hq$. Let the greatest term therefore be denoted by P_o, that is to say, let P_o be the chance of the most probable result of h trials, and we shall have

$$P_o=\sqrt{(h\div 2\pi mn)},\text{ or }P_o=\sqrt{(1\div 2\pi hpq)}.$$

This last formula shews that the absolute probability of that combination which has the greatest number of chances in its favour becomes less and less as the number of trials is increased; for the fraction $1\div h$, to the square root of which the probability is proportional, diminishes as h is increased.

91. As an example, suppose a shilling to be tossed 100 times in succession. In this case $p=q=\frac{1}{2}$, $hp=50$, $hq=50$, and the most probable result of the trials is 50 times head and 50 times tail. We have then $h=100$, $m=50$, and $\sqrt{(h\div 2\pi mn)}=1\div\sqrt{(50\pi)}$ for the measure of the probability that the event will happen in this way exactly. On calculation, this is found $=.07979$; whence it appears, that although 50 heads and 50 tails is a more probable result of 100 trials than any other combination which can be named, its absolute probability is measured by a very small fraction. The probability of the contrary event, or that there will not be thrown 50 heads and 50 tails exactly, is $1-.07979=.92021$, so that the odds against the event are about 92 to 8, or 23 to 2. Had the number of trials been 1000, the probability of 500 times head and 500 times tail exactly, though more likely to occur than any other combination, would have been found $1\div\sqrt{(500\pi)}$; that is to say, $\sqrt{10}$ times, or rather more than 3 times less than in the former case. In general, when the chances in favour of the simple events are equal, the probability of the combination which is more likely to happen than any other, is inversely proportional to the square root of the number of trials.

92. The formulæ in (90) enable us also to determine the ratio of the greatest term of the developement of $(p+q)^h$ to any other term of the series, and consequently the relation of the probabilities of the different compound events. Let $m:n::p:q$, whence $m=hp$ and $n=hq$, and let P_x denote the probability that in h trials the event E will occur $(m-x)$ times, and the event F $(n+x)$ times, the probabilities of the simple events E and F being respectively p and q. By (13) we have

$$P_x=\frac{1\,.\,2\,.\,3\ldots\ldots\ldots h}{1\,.\,2\,.\,3\ldots\ldots(m-x)\times 1\,.\,2\,.\,3\ldots\ldots(n+x)}p^{m-x}q^{n+x},$$

which by (90) becomes

$$P_x=\frac{h^h e^{-h}\sqrt{(2\pi h)}}{(m-x)^{m-x}e^{-(m-x)}\sqrt{2\pi(m-x)}\times(n+x)^{n+x}e^{-(n+x)}\sqrt{2\pi(n+x)}}$$

$\times p^{m-x}q^{n+x}$; whence, substituting $m\div h$ for p, and $n\div h$ for q, and leaving out the factors common to the numerator and denominator, we find,

$$P_x=\sqrt{\left(\frac{h}{2\pi}\right)}(m-x)^{-m+x-\frac{1}{2}}(n+x)^{-n-x-\frac{1}{2}}m^{m-x}n^{n+x}.$$

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[1] Stirling's investigation of the theorem, or rather of its equivalent, to find the sum of the logarithms of a series of numbers in arithmetical progression, is given in his *Methodus Differentialis*, p. 135.

Now $\log(m-x)^{-m+x-\frac{1}{2}}=(-m+x-\frac{1}{2})\log(m-x)$; and

$$\log(m-x)=\log m-\frac{x}{m}-\frac{x^2}{2m^2}-\&c.$$

therefore $\log(m-x)^{-m+x-\frac{1}{2}}=$

$$(-m+x-\tfrac{1}{2})\log m-(-m+x-\tfrac{1}{2})\left(\frac{x}{m}+\frac{x^2}{2m^2}+\&c.\right);$$

whence, neglecting terms divided by m^2, m^3, &c., m being supposed to be a large number in comparison with x,

$$\log(m-x)^{-m+x-\frac{1}{2}}=(-m+x-\tfrac{1}{2})\log m+x-\frac{x^2}{2m}+\frac{x}{2m};$$

therefore, on passing to numbers,

$$(m-x)^{-m+x-\frac{1}{2}}=m^{-m+x-\frac{1}{2}}\times e^{x-\frac{x^2}{2m}}\times e^{\frac{x}{2m}};$$

or, since $e^{\frac{x}{2m}}=1+\dfrac{x}{2m}+\dfrac{x^2}{2\,.\,4m^2}+\&c.$

$$(m-x)^{-m+x-\frac{1}{2}}=m^{-m+x-\frac{1}{2}}e^{x-\frac{x^2}{2m}}\left(1+\frac{x}{2m}\dots\right).$$

In like manner, by changing m into n, and x into $-x$, we get

$$(n+x)^{-n-x-\frac{1}{2}}=n^{-n-x-\frac{1}{2}}e^{-x-\frac{x^2}{2m}}\left(1-\frac{x}{2n}\dots\right).$$

Multiplying the first of these two expressions by m^{m-x}, and the second by n^{n+x}, we have

$$(m-x)^{-m+x-\frac{1}{2}}\times m^{m-x}=m^{-\frac{1}{2}}e^{x-\frac{x^2}{2m}}\left(1+\frac{x}{2m}\dots\right)$$

$$(n+x)^{-n+x-\frac{1}{2}}\times n^{n+x}=n^{-\frac{1}{2}}e^{-x-\frac{x^2}{2n}}\left(1-\frac{x}{2n}\dots\right),$$

whence, substituting these values in that of P_x, and neglecting the quantity divided by mn,

$$P_x=\sqrt{\left(\frac{h}{2\pi mn}\right)}\,e^{-\frac{x^2}{2m}-\frac{x^2}{2n}}=\sqrt{\left(\frac{h}{2\pi mn}\right)}\,e^{-\frac{hx^2}{2mn}}.$$

The term of the series $(p+q)^h$ which corresponds to this value of P_x is that which is x places to the right of the greatest term; and it has been shewn, (90), that the greatest term has for its expression $\sqrt{(h\div 2\pi mn)}$; therefore the greatest term being denoted, as before, by P_o, and the term which comes after it x places by P_x, we have

$$P_x=P_oe^{-hx^2\div 2mn},$$

that is to say, the probability the event E will happen m times and fail n times in $m+n$ trials, is to the probability of its happening $(m-x)$ times and failing $(n+x)$ times in the ratio of 1 to $e^{-hx^2\div 2mn}$.

Since the numbers m and n enter symmetrically into the expression $e^{-hx^2\div 2mn}$, it is evident that the result would have been the same if, instead of seeking the ratio of the greatest term to that which succeeds it by x places, we had sought the ratio of the greatest term to that which precedes it by x places. Hence if the most probable result of $m+n$ trials be that E will happen m times and fail n times, the probability that it will happen $m-x$ times and fail $n+x$ times is the same as the probability that it will happen $m+x$ times and fail $n-x$ times.

The following example will suffice to shew the application of the formula: A die is thrown 6000 times, required the probability that the number of aces turned up will be exactly 960?

Here p, the chance of throwing ace, is $\frac{1}{6}$, $q=\frac{5}{6}$, and $h=6000$; whence $m=hp=1000$, and $n=hq=5000$. We have first to find P_o, the chance of the most probable result, or of 1000 aces. By (90), $P_o=\sqrt{(h\div 2\pi mn)}$; whence, substituting the above values, $P_o=\sqrt{3}\cdot\sqrt{(5000\times 3.14159)}$. On performing the operation indicated by the logarithmic tables, we get $\log P_o=8.14050$, whence $P_o=.0138$.

The calculation of $e^{-hx^2\div 2mn}$ is as follows: Assume $t^2=hx^2\div 2mn$. We have $x=1000-960=40$.

$$\begin{array}{r}
\log 40=1.60206\\
2\\
\hline
3.20412\\
\log h=\log 6000=3.77815\\
\hline
\log hx^2=6.98227\\
\log 2mn=\log 10{,}000{,}000=7\quad\\
\hline
\log t^2=9.98227\\
\log e=.43429,\ \log .43429=9.63778\\
\hline
\log(t^2\times .43429)=9.62005\\
t^2\times .43429=t^2\log e=\ .41692\\
-t^2\log e=9.58308\\
\text{add }\log P_o=8.14050\\
\hline
\log P_x=7.72358
\end{array}$$

therefore $P_x=.0053$, which is the chance of 960 aces exactly. The odds against this event are therefore 9947 to 53, or nearly 188 to 1.

93. When h, m, and n are large numbers, and x is small, the exponential $e^{-hx^2\div 2mn}$ differs little from unity, and it decreases slowly as x increases, so long as x is small in comparison of m and n. Suppose $m=n$ and $x=\sqrt{m}$, it becomes $e^{-1}=\dfrac{1}{e}=\dfrac{1}{2\cdot 7182818}$; so that if we assume $m=100$, the 10th term before or after the greatest would still exceed the 3d part of the greatest. But when x becomes greater than $\sqrt{m}$ or $\sqrt{n}$ the exponential, and consequently also the terms which are multiplied by it, begin to diminish with great rapidity, and the diminution is more rapid as x increases. If $m=n=100$, and $x=50$, then the exponent $hx^2\div 2mn=25$, so that $e^{-hx^2\div 2mn}$, $=1\div e^{25}$, a quantity which is altogether insensible. We may therefore conclude generally that when h is a large number, the principal terms of the developement of $(p+q)^h$ are those which are near the greatest term, and that h may be taken so large that the terms towards the beginning or end of the series may at length become smaller than any assignable quantity.

94. From the proposition which has now been demonstrated it follows, that although the probability of that particular compound event which has the greatest number of chances in its favour is very small when the number of trials is great, yet on account of the rapid diminution of the terms towards the beginning and end of the series, the sum of a comparatively small number of terms taken on both sides of the greatest, may be very much greater than all the remaining terms of the series; and, consequently, there will be a very great probability that the compound event will be represented by one or other of those terms. This consideration leads us to one of the most important questions in the theory, namely, to determine the probability that in a large number of trials, h, an event E, which must either happen or fail in each trial, and of which the chance of happening in any trial is p, will happen not less than $hp-l$ times, and not oftener than $hp+l$ times; or, making $hp=m$, $hq=n$, to determine the probability that the number of occurrences of E will be included between the limits $m\pm l$.

Let x be any number between 0 and l. Then (92) the probability that E will occur $(m-x)$ times and fail $(n+x)$ times is $P_x=P_oe^{-hx^2\div 2mn}$(where $P_o=\sqrt{(h\div 2\pi mn)}$. Now if in this expression we make x successively equal to each of the numbers 0, 1, 2,…l, we shall have the respective probabilities of E happening m, $m-1$, $m-2$,……$m-l$ times in h trials; and the sum of these probabilities will be the probability that E happens *not oftener* than m times, and *not seldomer* than $m-l$ times. The same suppositions with respect to x will give the probabilities of E happening $m, m+1, m+2, \ldots m+l$ times, the sum of which will be the probability that E happens *not seldomer* than m times, and *not oftener* than $m+l$ times. Adding, therefore, those two sums, and deducting P_o the probability which corresponds to $x=0$, on account of its being included in each sum, and therefore having been counted twice, the result will be the sum of the terms of the binomial $(p+q)^h$ comprised between, and including, the two terms of which the first has for a factor p^{m+l}, and the last p^{m-l}, and will therefore express the probability that the number of occurrences of E will fall within the limits $m \pm l$. Let this probability be denoted by R, and let SP_x represent the sum of all the values of P_x obtained by substituting successively 0, 1, 2, 3,...l for x, we then have $R=2SP_x-P_o$, whence, writing for P_x and P_o, their values,

$$R=2S\sqrt{\left(\frac{h}{2\pi mn}\right)}e^{-\frac{hx^2}{2mn}}-\sqrt{\frac{h}{2\pi mn}}.$$

95. In order to find an approximate value of this expression we must have recourse to a formula first given by Euler for converting sums of the kind denoted by S into definite integrals (for which see Lacroix, *Traité du Calcul Différentiel et Intégral*, tom. iii. p. 136, or Herschel's *Treatise on Differences*, p. 513). Assuming u to denote a function of x, the formula is as follows:

$$Su=\int u\,dx+\frac{1}{2}u+\frac{1}{1.2.6}\frac{du}{dx}+\text{\&c.}+\text{constant.}$$

On making $u=P_x=P_o e^{-hx^2 \div 2mn}$, we find $\frac{du}{dx}=-\frac{P_o hx}{mn}$ $e^{-hx^2 \div 2mn}$; therefore, if we suppose x to be not greater than $\sqrt{m}$ or $\sqrt{n}$, this differential coefficient is of the order $1 \div h$, (as may be easily shewn by substituting hp for m, and hq for n), and may be rejected, since h is supposed to be a very large number. The above equation therefore becomes

$$SP_x=P_o\int e^{-hx^2 \div 2mn}dx+\tfrac{1}{2}P_o e^{-hx^2 \div 2mn}+\text{constant};$$

and on supposing $x=0$ this gives $0=-\frac{1}{2}P_o+\text{constant}$, therefore the constant is equal to $\frac{1}{2}P_o$, and we have

$$SP_x=P_o\int e^{-hx^2 \div 2mn}dx+\tfrac{1}{2}P_o e^{-hx^2 \div 2mn}+\tfrac{1}{2}P_o.$$

Assume $t=x\sqrt{(h \div 2mn)}$, whence $dt=dx\sqrt{(h \div 2mn)}$; substitute these in the above equation, and it becomes by reason of $P_o=\sqrt{(h \div 2\pi mn)}$,

$$SP_x=\frac{1}{\sqrt{\pi}}\int e^{-t^2}dt+\tfrac{1}{2}P_o e^{-t^2}+\tfrac{1}{2}P_o,$$

whence, from the equation $R=2SP_x-P_o$, we obtain

$$R=\frac{2}{\sqrt{\pi}}\int e^{-t^2}dt+P_o e^{-t^2}.$$

The integral in this expression must be taken between the limits $x=0$ and $x=l$. When $x=0$ we have also $t=0$, and when $x=l$, then $t=l\sqrt{(h \div 2mn)}$; therefore assuming τ for the limiting value of t, that is, making $\tau=l\sqrt{(h \div 2mn)}$, and therefore $l=\tau\sqrt{(2mn \div h)}$, there results

$$R=\frac{2}{\sqrt{\pi}}\int_0^\tau e^{-t^2}dt+P_o e^{-\tau^2}$$

for the probability that the number of occurrences of E will fall between $m \pm \tau\sqrt{(2mn \div h)}$; or, replacing m and n by hp and hq, the probability that the number of occurrences of E will fall within the limits $hp \pm \tau\sqrt{(2hpq)}$, or be equal to one of those limits.

This expression for R has been found by neglecting quantities of the order of smallness $1 \div h$; consequently the greater the value of h the more nearly it approaches to accuracy, but it is only rigorously true when h is infinite.

96. The integral $\int e^{-t^2}dt$ is computed as follows. Developing the exponential e^{-t^2} in a series of the ascending powers of t^2, and integrating the successive terms between the limits $t=0$ and $t=\tau$, we find

$$\int_0^\tau e^{-t^2}dt=\tau-\frac{\tau^3}{1.3}+\frac{\tau^5}{1.2.5}+\frac{\tau^7}{1.2.3.7}+\text{\&c.};$$

a series which converges rapidly when τ is less than unity. In the contrary case, however, or when τ is greater than unity, the series is divergent, and it is necessary to proceed by a different method. Let the factor e^{-t^2} be multiplied and divided by t; we have then

$$\int e^{-t^2}dt=\int\frac{1}{t}e^{-t^2}t\,dt,$$

and on integrating by parts

$$\int\frac{1}{t}e^{-t^2}t\,dt=-\frac{e^{-t^2}}{2t}-\tfrac{1}{2}\int\frac{1}{t^2}e^{-t^2}dt.$$

Repeating the same process on the last integral, and so on with the last after each succeeding integration, the following series is obtained,

$$\int e^{-t^2}dt=-\frac{e^{-t^2}}{2t}\left\{1-\frac{1}{2t^2}+\frac{3}{2^2t^4}-\frac{3\cdot5}{2^3t^6}+\text{\&c}\right\}.$$

When $t=$ infinity the right hand side of this equation becomes 0; whence between the limits $t=\tau$ and $t=$ infinity, we have

$$\int_\tau^\infty e^{-t^2}dt=-\frac{e^{-\tau^2}}{2\tau}\left\{1-\frac{1}{2\tau^2}+\frac{3}{2^2\tau^4}-\frac{3\cdot5}{2^3\tau^6}+\text{\&c}\right\},$$

a series which converges very rapidly when τ is greater than unity. Now the value of a definite integral between 0 and infinity is obviously equal to its two parts, of which the first is taken between 0 and τ, and the second between τ and infinity; that is to say,

$$\int_0^\tau e^{-t^2}dt=\int_0^\infty e^{-t^2}dt-\int_\tau^\infty e^{-t^2}dt.$$

But $\int_0^\infty e^{-t^2}dt$ is well known[1] to have for its expression $\frac{1}{2}\sqrt{\pi}$, therefore

$$\int_0^\tau e^{-t^2}dt=\tfrac{1}{2}\sqrt{\pi}-\int_\tau^\infty e^{-t^2}dt,$$

so that the integral may be computed from either of the above series, according as τ is less or greater than 1.

The integral $\int e^{-t^2}dt$ is of great importance in the higher mathematics. It occurs in the investigation of the path of a ray of light through the atmosphere, and of the law of the diffusion of heat in the interior of solid bodies, as well as in the determination of the degree of reliance that may be placed on the results of astronomical observations, and generally in most of the more difficult and important applications of the theory of probabilities. A table of its values from $t=0$ to $t=3$, for intervals each $=\cdot01$, was given by Kramp, at the end of his *Analyse des Refractions Astronomiques*, Strasburg, 1799. In the *Berliner Astronomisches Jahrbuch* for 1834, there is also a table of its values from $t=0$ to $t=2$ (for the same intervals) multiplied by $2 \div \sqrt{\pi}$, with their first and second differences for the purpose of facilitating interpolation. This last table, which appears to have been derived from that of Kramp, and which is immediately applicable in the calculation of the probability R, we have extended to $t=3$, and given at the end of the present article. As the function which is thus tabulated will occur frequently in what follows, we shall in future, for convenience in printing, denote it by Θ, that is to say, we shall assume

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[1] The formula $\int_0^\infty e^{-t^2}dt=\frac{1}{2}\sqrt{\pi}$ is ascribed by Gauss (*Theoria Motus Corporum Cœlestium*, p. 212,) to Laplace. On making $e^{-t^2}=z$, the integral is transformed into $\frac{1}{2}\int dz\left(\log\frac{1}{z}\right)^{-\frac{1}{2}}$ between the limits $z=0$ and $z=1$, the value of which $=\frac{1}{2}\sqrt{\pi}$, had been given by Euler, long before, in the *Petersburg Memoirs*. See Legendre, *Exercises du Calcul Intégral*, tom. i. p. 301.

$$\Theta=\frac{2}{\sqrt{\pi}}\int_0^\tau e^{-t^2}dt=1-\frac{2}{\sqrt{\pi}}\int_\tau^\infty e^{-t^2}dt,$$

the two forms being equivalent in consequence of the above equation.

97. Some very important conclusions follow immediately from the formula in (95). The quantity R denotes the probability that in a very great number of trials h, the event E, of which the *a priori* probability in any trial is p, will occur not seldomer than $hp-l$ times, and not oftener than $hp+l$ times, or that the number of its occurrences will be included between the limits $hp\pm l$, or at least be equal to one of those limits. Hence R also denotes the probability that the ratio of the occurrences of E to the whole number of trials, will be included within the limits $p\pm l\div h$. We have assumed $\tau=l\sqrt{(h\div 2mn)}$; but $m=hp$ and $n=hq$; therefore $\tau=l\div\sqrt{(2hpq)}$, whence $l=\tau\sqrt{(2hpq)}$, and consequently $l\div h=\tau\sqrt{(2pq\div h)}$. Now, if we suppose τ to be constant, so that the probability expressed by R may remain the same, then p and q being given, l is proportional to the square root of h, and consequently the greater the number of trials the smaller will l be in proportion to that number. Thus, if the number of trials be 1000, and we have a given probability R that the number of occurrences of E will not differ more than 10 from the number which is the most probable of all (that is, from $1000\,p$), then if we take 100,000 trials, we shall have the same probability R that the number of occurrences of E will not differ more than $10\times\sqrt{100}=100$ from the most probable number. But a difference of 10 in 1000 is 1-100th of the whole, whilst a difference of 100 in 100,000 is 1-1000th of the whole, and thus the ratio of l to h becomes smaller and smaller, or the ratio of the occurrences of E to the whole number of trials approaches nearer and nearer to p, as the number of trials is increased; and the experiments may be repeated until the difference between p and $p\pm l\div h$, in respect of a given probability R which may be as great as we please, shall be less than any assignable quantity.

If, on the other hand, we suppose $l\div h$ to be constant, then τ is proportional to the square root of the number of trials. But as τ increases, Θ, and consequently R, approaches nearer and nearer to unity, (and it may be seen, by referring to the table, that it is only necessary to have $\tau=3$ in order to have $\Theta=\cdot9999779$); whence the number of trials h may always be increased until we obtain a probability approaching as nearly to certainty as we please, that the number of occurrences of E will be comprised within the given limits $(hp\pm l)$; or, which is the same thing, that the ratio of the number of occurrences of E to the whole number of trials, shall not differ from p, the probability of E in a single trial, more than a given quantity $l\div h$ which may be less than any assigned fraction. This is the celebrated theorem which was demonstrated by James Bernoulli in the *Ars Conjectandi.*

98. The application of the preceding results to numerical examples, is rendered extremely easy by means of the table of the values of Θ. From the formula in (95) we have the probability

$$R=\Theta+P_0 e^{-\tau^2},$$

that the occurrences of E in h trials will fall within the limits $hp\pm l$, the relation between l and τ being given by the equation $l=\tau\sqrt{(2hpq)}$. If, therefore, we suppose l to be given, τ becomes known, and the corresponding value of Θ is found from the table; and, conversely, if Θ be assumed, τ is given by the table, whence the correspondiug limits l are deduced. With respect to the quantity $P_0 e^{-\tau^2}$, we may observe that it denotes the probability that the number of occurrences of the event E will be $hp+l$ or $hp-l$ precisely (92), and is therefore always a very small fraction when h is a large number (90). It may be regarded as a correction of Θ, which in most cases might be omitted without sensibly affecting the result; but when h is not very large, or l is a small number, it becomes necessary to take it into account. In such cases its value may be computed directly as in the example in (92); but this labour may be avoided by increasing τ, so as to include it within the limits of the integral Θ. Thus, let R be the probability that the number of arrivals of E will be included within the limits $hp\pm x$, and R′ the probability of the limits being $hp\pm(x+1)$, and let Θ and Θ' be respectively the correspondiug values of the integral. We have then, giving P_x the same signification as in (92), the two equations

$$R=\Theta+P_x,\quad R'=\Theta'+P_{x+1},$$

and the difference $R'-R$ of these two probabilities is obviously the double of the probability that the result of the trials will be either $(hp+x+1)$ times E, or $(hp-x-1)$ times E, exactly. But the chance of either of these events being P_{x+1}, we have therefore $R'-R=2P_{x+1}$. Now, when h is large, P_x and P_{x+1} are very small, and very nearly equal to each other, (their difference is in fact of the order of quantities omitted); hence $R'-R=\Theta'-\Theta$, and also $2P_{x+1}=2P_x$, and consequently $\Theta'-\Theta=2P_x$, or $P_x=\frac{1}{2}(\Theta'-\Theta)$. Substituting this value of P_x in the equation $R=\Theta+P_x$, we get $R=\frac{1}{2}(\Theta'+\Theta)$; so that if we take from the table the values of Θ' and Θ corresponding to l and $l+1$, half their sum will give R. But as the interval between Θ' and Θ in the table is always small, half their sum will not differ sensibly from the value of Θ corresponding to $l+\frac{1}{2}$, whence this value of Θ is equal to R, and we have the following rule for determining the limits corresponding to a given probability, or *vice versa* :—

When the limits are assumed, find τ from the equation $l+\frac{1}{2}=\tau\sqrt{(2hpq)}$; then the value of Θ in the table, corresponding to τ is the probability that in h trials the number of occurrences of the event E, the chance of which in a single trial is p, will lie within the limits $hp\pm l$ both inclusive. Conversely, when Θ is assumed, find the corresponding value of τ in the table, by means of which the limit l will be given by the equation $l+\frac{1}{2}=\tau\sqrt{(2hpq)}$. It is obvious, that if the limit l and the probability Θ be both assumed, then h may be determined from the same equation.

99. We will now give some examples of the application of the preceding formulæ.

Suppose $p=q=\frac{1}{2}$, and $h=200$, and let it be proposed to assign the limits within which there is a probability $=\frac{1}{2}$ that the number of occurrences of E will fall. In this case the equation $l+\frac{1}{2}=\tau\sqrt{(2hpq)}$ becomes $l+\frac{1}{2}=\tau\sqrt{100}=10\tau$. Now, it is easily found from the table that for $\Theta=\frac{1}{2}$ we have $\tau=\cdot4769$, whence $l+\frac{1}{2}=4\cdot769$, and $l=4\cdot269$. On tossing a shilling 200 times, it is therefore more than an even wager that head will turn up not seldomer than 95 times, and not oftener than 105 times.

Suppose $p=q=\frac{1}{2}$, $h=3600$, and let it be proposed to assign the probability that the number of occurrences of E will not exceed the limits 1800 ± 30. In this case the equation $l+\frac{1}{2}=\tau\sqrt{(2hpq)}$ becomes $30\cdot5=\tau\sqrt{(2\times900)}=30\tau\sqrt{2}$, whence $\tau=30\cdot5\div30\sqrt{2}=\cdot7189$; and the table gives $\Theta=\cdot6907=\frac{28}{41}$ nearly. Hence in tossing a shilling 3600 times, the odds are 28 to 13 that head will not turn up oftener than $1800+30=1830$ times, nor seldomer than $1800-30=1770$ times. Neglecting the second term of R (95) and taking simply $l=10\tau$, the table gives $\Theta=\cdot6827$, which is the solution given by Demoivre, p. 245.

Suppose $p=\frac{1}{6}$, $q=\frac{5}{6}$, and let it be proposed to determine how many trials must be made in order that it may be one to one that the number of occurrences of E will not differ more than 10 from the most probable number.

For $\Theta = \frac{1}{2}$ we have $\tau = {\cdot}4769$; therefore the equation $l + \frac{1}{2} = \tau\sqrt{(2hpq)}$ becomes $10{\cdot}5 = {\cdot}4769\sqrt{(10h \div 36)}$, whence $h = 3{\cdot}6(10{\cdot}5 \div {\cdot}4769)^2$. On computing this formula h is found $= 1745{\cdot}2$. Say 1746, $\frac{1}{6}$ of which is 291; and it follows that if a die be thrown 1746 times it is an even wager that the number of aces will fall between 291 ∓ 10, that is, between 281 and 301, or be equal to one of those numbers.

In (92) we found the probability to be ·0053, that in 6000 throws of a die the number of aces will be exactly 960. Let it now be proposed to assign the probability Θ, that in 6000 throws the number of aces will lie between 960 and 1040, that is, between 1000 ∓ 40. Here $h = 6000$, $p = \frac{1}{6}$, $q = \frac{5}{6}$, and $l = 40$; the equation of the limits therefore becomes $40{\cdot}5 = \tau\sqrt{(10000 \div 6)}$, whence $\tau = {\cdot}405\sqrt{6} = {\cdot}992$, corresponding to which the table gives $\Theta = {\cdot}8394$.

The following question is discussed by Nicolas Bernoulli in the Appendix to Montmort's *Analyse des Jeux de Hazard*, and is noticed by Demoivre and Laplace. From the observations of the births of both sexes in London during 82 years (from 1629 to 1711) it was found that the average number of children annually born in London, was about 14,000, and the ratio of the number of males to that of females, was nearly as 18 to 17, the average number of male births being 7200, and of female births 6800. In the year in which the greatest difference from this ratio took place, the actual numbers were 7037 males and 6963 females, so that the difference from the average amounted to 163. Assuming, then, the comparative facility of male and female births to be as 18 to 17, required the probability that out of 14000 children born, the number of males shall not be greater than 7363, nor less than 7037.

This question is evidently equivalent to the following:—Let 14000 dice, each having 35 faces, 18 white and 17 black, be thrown; what is the probability that the number of white faces turned up, will be comprised between the limits 7200 ± 163. We have therefore $h = 1400$, $p = \frac{18}{35}$, $q = \frac{17}{35}$, $l = 163$, and the formula $l + \frac{1}{2} = \tau\sqrt{(2hpq)}$ becomes $163.5 = \tau\sqrt{(2 \times 14000 \times 18 \times 17)} \div 35$, whence $\tau = 1{\cdot}955$. The corresponding value of Θ is found from the table $= {\cdot}9943$, which is the probability that the number of white faces shall not be greater than 7363, nor less than 7037. The odds in favour of the event are therefore 9943 to 57, or about 175 to 1.

100. We now proceed to consider the case in which the probabilities of the simple events are not known, *a priori*, but inferred from the results of experience. It was shewn in (52) that the probability Π of an event happening m' times, and failing n' times in h' trials, $(h' = m' + n')$, when it has been observed to happen m times, and fail n times in h previous trials, is expressed by this equation

$$\Pi = U' \frac{[m+m'][n+n'][h+1]}{[m][n][h+h'+1]}.$$

Now, when m, n, m', n', are large numbers, an approximate value of Π, more accurate in proportion as those numbers become larger, is obtained from Stirling's theorem (90), which for any number x gives $[x] = x^x e^{-x}\sqrt{(2\pi x)}$. Applying the theorem therefore to the expressions within the brackets in the above equation, and assuming

$$K = \frac{h+1}{h+h'+1}\sqrt{\frac{(m+m')(n+n')(h+1)}{mn(h+h'+1)}},$$

we obtain, in consequence of $m + n = h$,

$$\Pi = U'K \frac{(m+m')^{m+m'}(n+n')^{n+n'}(h+1)^h}{m^m n^n (h+h'+1)^{h+h'}}.$$

Let $m' = \theta m$, $n' = \theta n$, and consequently $h' = \theta h$; then taking $\frac{h^h}{(h+h')^{h+h'}}$ for $\frac{(h+1)^h}{(h+h'+1)^{h+h'}}$ (which may be done without sensible error, since h is by supposition a large number,) the equation becomes

$$\Pi = U'K \frac{m(1+\theta)^{m+m'} n(1+\theta)^{n+n'} h^h}{m^m n^n (1+\theta)^{h+h'}};$$

or, since $m + n = h$, $m' + m' = h'$,

$$\Pi = UK \frac{m^{m'} n^{n'} (1+\theta)^{h+h'}}{h^h (1+\theta)^{h+h'}} = UK\left(\frac{m}{h}\right)^{m'}\left(\frac{n}{h}\right)^{n'}.$$

Making the same substitutions in the expression denoted by K, we get, after reduction, $K = 1 \div \sqrt{(1+\theta)}$; whence,

$$\Pi = \frac{U'}{\sqrt{1+\theta}}\left(\frac{m}{h}\right)^{m'}\left(\frac{n}{h}\right)^{n'}.$$

The value of Π now found, is the probability that in a future series of trials the ratio of the occurrences of E to those of F will be the same as in the preceding trials, which are supposed to have been very numerous. If the chances of E and F had been given *a priori* equal to $m \div h$ and $n \div h$ respectively, the probability of m' times E, and n' times F in $m' + n'$ future trials would have been $P = U'\left(\frac{m}{h}\right)^{m'}\left(\frac{n}{h}\right)^{n'}$ by (12); hence (since $m' \div h' = m \div h$ and $n' \div h' = n \div h$), the relation between the probability P_o of that combination of simple events which has the greatest number of chances in its favour, when the chances of the simple events are known *a priori*, and the probability of the same combination when the chances of the simple events are only presumed from previous trials, is expressed by this equation,

$$\Pi = P_o \div \sqrt{(1+\theta)}.$$

101. When h' is very small in comparison of h, θ becomes a very small fraction, and may be neglected, and we have then $\Pi = P_o$. But when h' is a number comparable with h, Π is less than P_o; and it diminishes rapidly when θ exceeds 1. The reason of this is obvious. If the contents of the urn are not known *a priori*, however numerous the trials may have been there is only a presumption that the chance of drawing a white ball in a single trial is measured by $m \div h$; whereas, in the case of the ratio of the balls being previously known, the measure of the probability is certain. As an instance of the manner in which the probability of an assigned series of future events diminishes, when the probabilities of the simple events are inferred from experience, let us suppose $h' = h$, whence $\theta = 1$, and consequently $\Pi = P_o \div \sqrt{2} = {\cdot}7071 \times P_o$. Now it was shewn in (91) that if a ball be drawn at random 100 times from an urn which contains an equal number of black and white balls, the probability P_o, that the result will be 50 white balls, and 50 black, precisely, is ·07979. It follows therefore, that if the contents of the urn be unknown, and we can only judge of the relative numbers of the two sorts of balls it contains from having observed that in 100 trials there have been drawn 50 white balls and 50 black, the probability Π of that combination in 100 future trials, becomes $\cdot07979 \times {\cdot}7071 = {\cdot}05642$.

102. The result obtained in (100) enables us to determine the probability that the number of occurrences of E in h' future trials, will not differ in excess or defect from the most probable number, by more than a certain given number l. It has been shewn (95) that in the case of the probabilities p and q of the simple events being given *a priori*, if we determine τ from the equation $l = \tau\sqrt{(2hpq)}$, the formula

$$R = \Theta + \sqrt{(1 \div 2\pi hpq)}\, e^{-\tau^2}$$

gives the probability R that m will be comprised within the limits $hp \pm \tau\sqrt{(2hpq)}$; or, dividing by h, the probability that the ratio of m to h will be comprised within the limits

$p \pm \tau\sqrt{(2pq \div h)}$. Conversely[1], when p and q are not known, but the event E has been observed to happen m times in h trials, then

$$\mathrm{R} = \Theta + \sqrt{(h \div 2\pi mn)}\,e^{-\tau^2}$$

gives the probability R that p is comprised within the limits

$$\frac{m}{h} \pm \frac{\tau}{h}\sqrt{\frac{2mn}{h}}.$$

These limits approach more nearly to each other as h increases; and when h is a large number, the ratios $m \div h$, $n : h$ may be assumed, without sensible error, as the chances of E and F in computing the probable result of a future series of h' trials, provided, however, that h' (though absolutely a large number) be small relatively to h. When this condition is not fulfilled, the assumption of $m \div h$ and $n \div h$ as the *a priori* chances of E and F, might lead to considerable error; but an approximation to the limits corresponding to a given value of R may be obtained from the following considerations:—

Suppose a large number h of events to have been observed, and that the result of the observation gave m times E and n times F. Let a new series of h' trials be made, and *suppose* that in this new series p is the real chance of E and q of F; we have then a given probability R that the number of occurrences of E will fall within the limits $h'p \pm \tau\sqrt{(2h'pq)}$. Now, for p and q substitute the ratios observed in the first set of experiments, namely, $m \div h$ and $n \div h$, and the limits corresponding to R become

$$\frac{mh'}{h} \pm \frac{\tau}{h}\sqrt{(2h'mn)},$$

which, therefore, are the true limits on the hypothesis that the chance of E in a single trial is $m \div h$. But as this chance is not certain, but only presumed, the limits require to be extended in order that R may preserve the same value. Confining our attention to Θ, the first term of the expression for R (the second may be disregarded in the present approximation), let $h' = m' + n'$ and $m' : n' = m : n$, then Θ is the sum of the terms of the binomial $(p+q)^{h'}$ from that in which the exponent of p is $m' + l$ to that in which the exponent is $m' - l$. Now, when p and q are given *a priori*, the chance of m' times E and n' times F in h' trials is P_o; and when p and q are only presumed from the results of previous trials, the chance of the same combination is Π; and (100) Π is less than P_o in the ratio of 1 to $\sqrt{(1+\theta)}$. In like manner, the chance of each of the other combinations of E and F included in the integral Θ will be less in the case of p and q presumed, than in the case of p and q given, in the same ratio of 1 to $\sqrt{(1+\theta)}$. But it has been seen (93) that when h' is a large number, the terms of the developement of $(p+q)^{h'}$ which are nearest the greatest term, diminish at first very slowly; and, further, that only a small number of terms on each side of the greatest are required to be taken, since l is less than $\sqrt{m'}$ or $\sqrt{n'}$ (95); we may therefore, without sensible error, assume Θ to be proportional to the number of terms included in the summation, or that the value of Θ will not be changed if we include in the summation a number of terms greater in proportion as the value of each individual term is less. Hence it follows that the limits must be increased in the ratio of $\sqrt{(1+\theta)}$ to 1, and the value of Θ corresponding to τ will give the probability that the number of events E, in h' future trials, will be included between

$$\frac{mh'}{h} \pm \frac{\tau}{h}\sqrt{(2h'mn(1+\theta))}.$$

103. The following question may be proposed as an example of the application of the last formula. Out of a given number h of individuals taken at the age A, it has been observed that m are alive at the age A$+a$; required the probability that out of h' other individuals taken at the same age A the number who survive at the age A$+a$ will be included between $m' \pm l$, the ratio of m' to h' being the same as that of m to h.

To solve this question, we have to find τ from the equation $l = \frac{\tau}{h}\sqrt{(2h'mn(1+\theta))}$; and the corresponding value of Θ in the table, will give the required probability.

From the table given in the article MORTALITY, vol. xv. p. 555, it appears that out of 5642 individuals taken at the age 30, the number surviving at the age 50, according to the Carlisle Table, is 4397. Taking those numbers as an example, we have $h = 5642$, $m = 4397$, $n = 1245$; and assuming also $h' = 5642$, whence $\theta = 1$ and $\sqrt{(1+\theta)} = \sqrt{2}$, the equation of the limits becomes $l = \tau \times 62{\cdot}30$, Let it be proposed to determine l from the condition $\Theta = \frac{1}{2}$. In this case the table gives $\tau = {\cdot}4769$, and we have consequently $l = 29{\cdot}7$. Hence it appears, that if it has been observed that of 5642 individuals taken at the age of 30, 1245 die before reaching the age of 50, it is an even wager that out of 5642 other individuals also taken at the age of 30, and subjected to the same chances of mortality, the number who die before reaching the age of 50 will lie between 1245 ± 30, that is, between 1215 and 1275.

104. The following experiment recorded by Buffon, in his *Arithmetique Morale*, affords an example of the application of the preceding formulæ to the determination of the probable existence of a physical cause from the results of a large number of observations. A piece of money was tossed 4040 times successively, and the result was head 2048 times, and tail 1992 times. Supposing the piece to have been perfectly symmetrical, the most probable result would have been the same number of heads and tails. Let it now be proposed to assign the probability afforded by the experiment that the piece was not symmetrical, and that its form or physical structure was such as to render head an event, *a priori*, more probable than tail.

In this case $h = 4040$, $m = 2048$, $n = 1992$; and by (102) we have the probability R (or Θ, neglecting the correction) that p, the unknown chance of head, is comprised between the limits $\frac{m}{h} \pm \frac{\tau}{h}\sqrt{\frac{2mn}{h}}$. Now $\frac{m}{h} = \frac{2048}{4040} = .50693$, and $\frac{\tau}{h}\sqrt{\frac{2mn}{h}} = \tau \times .011124$, therefore if we assume $\tau \times .011124 = .00693$, we shall have the probability Θ that p is comprised between the limits $.50693 \pm .00693$, that is, between two limits of which the least is .5, or one-half. This assumption gives $\tau = .00693 \div .011124 = .623$; and the corresponding value of Θ is found from the table $= .62170$. Now if p lie between the above limits, its value is evidently greater than $\frac{1}{2}$; but the probability of its lying between those limits is not the whole probability that p is greater than $\frac{1}{2}$; for there is a chance of its exceeding the greatest limit, in which case also its value will be greater than $\frac{1}{2}$. The probability that p is *not* comprised between the assumed limits is $1 - .62170 = .37830$; and if it is not comprised between these limits, there is an equal chance of its being greater than the greatest limit, or less than the least; the probability of its exceeding the greatest limit is consequently $\frac{1}{2} \times .37830 = .18915$. Hence the whole probability that p is greater than .5, or that the chance of head is greater than that of tail is $.62170 + .18915 = .81085$; and the odds are therefore 81 to 19, or rather more than 4 to 1 that the piece was not perfectly symmetrical.

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[1] This inference, though admitted by both Laplace and Poisson, is not strictly correct. In a paper published in the *Transactions of the Cambridge Philosophical Society*, (vol. vi. part iii.) Mr. De Morgan has shewn by a direct analysis that in the case of p and q not being known *a priori*, but made equal to the observed ratios $m \div h$, $n \div h$, the presumption of the true value of p lying within the limits stated in the text is not, as there inferred, $\Theta + \frac{1}{\sqrt{(2\pi hpq)}}\,e^{-\tau^2}$, but $\Theta - \frac{13p^2 - 13p + 1}{6hpq\sqrt{\pi}}\,e^{-\tau^2}$. The last correction to Θ is smaller than the former, and being divided by h, is of the order of quantities that have been rejected in the approximations. It is right to state that the method of simplifying the calculation of R in the direct case, by taking the integral Θ between limits corresponding to $l + \frac{1}{2}$ instead of l, is noticed, for the first time so far as we are aware, by Mr. De Morgan in the same paper.

105. The formulæ which have been demonstrated in the present section are immediately applicable to the determination of the probable limits of the gain or loss which may arise from undertaking a great number of risks with a given expectation in respect of each. The following question has important practical applications. A is interested in a great number of similar enterprises, in each of which E or F must necessarily happen. When E happens he receives the sum α, and when F happens he pays the sum β; required the probability that his gain or loss shall be comprised within given limits?

Let p be the chance of the event E, q that of F, and h the number of enterprises. Suppose E happens m times, and F n times; the sum to be received will be $m\alpha$, and the sum to be paid will be $n\beta$, and therefore his gain will be $m\alpha - n\beta$. Let $m = hp$, $n = hq$, then m times E and n times F is the most probable result, and in this case the gain $m\alpha - n\beta$ becomes $h(v\alpha - q\beta)$. Find τ from $l + \frac{1}{2} = \tau\sqrt{(2hpq)}$, then (98) Θ is the probability that the number of occurrences of E will lie between the limits $hp \mp l$. But if E happens $hp - l$ times, and consequently F $hq + l$ times, the corresponding benefit is $(hp - l)\alpha - (hq + l)\beta = h(p\alpha - q\beta) - l(\alpha + \beta)$; and if E happens $hp + l$ times, and F $hq - l$ times, the benefit is $(hp + l)\alpha - (hq - l)\beta = h(p\alpha - q\beta) + l(\alpha + \beta)$; whence Θ is the probability that his gain, that is, the difference between what he receives and what he pays, will be included within the limits $h(p\alpha - q\beta) \mp l(\alpha + \beta)$ both inclusive.

106. The following conclusions follow immediately from this solution.

(1). If $p\alpha$ be greater than $q\beta$, so that A has a mathematical advantage (however small) in each risk, the risk may be repeated a sufficient number of times, or h may be taken a sufficiently high number, to give a probability as nearly equal to certainty as we please, that A's gain shall exceed any given sum, however great.

(2). Let there be two players A and B, whose chances of gaining a game are respectively p and q, and let β be the sum staked upon each game by A, and α the sum staked by B, then $p\alpha$ is the mathematical expectation of A in respect of a single game, and $q\beta$ that of B; and if $p\alpha$ be greater than $q\beta$ (however small the difference) the game may be repeated so often as to give rise to a probability approaching as nearly to certainty as we please, that A's gain shall become equal to the whole of B's capital, and, consequently, that B will be ruined.

(3). If the mathematical expectations of the two players be equal, then $p\alpha - q\beta = 0$, and the most probable individual result of a large number of games, is that the gains and losses on either side shall be the same. But if l be supposed constant, then τ is inversely proportional to $\sqrt{h}$, and consequently the game may be repeated until Θ, the probability that the gain or loss $l(\alpha + \beta)$ shall be comprised within given limits, shall become as small as we please. Hence $1 - \Theta$, the probability that the gain or loss shall *not* be comprised within given limits, may be rendered as great as we please; and it follows that although the play may be on terms of perfect equality, it may be continued until a probability shall be obtained, approaching as nearly to certainty as we please, that one of the two players shall be ruined.

(4). The number of games which must be played, to afford a given amount of probability that one of the parties shall lose the whole of his fortune, depends on the magnitude of the stakes $(\alpha + \beta)$; but whether the stakes be large or small, the final result is the same. When the stakes are small, a greater number of games must be played.

107. As an example of this class of problems, we may take the following question: A and B engage in play with equal chances of winning, and stake five sovereigns on each game; how many games must they undertake to play in order that it may be two to one that one of them shall lose *at least* 100 sovereigns?

Here $p = \frac{1}{2}$, $q = \frac{1}{2}$, $\alpha = 5$, $\beta = 5$, and $l(\alpha + \beta) = 100$, whence $l = 10$. The equation $l + \frac{1}{2} = \tau\sqrt{(2hpq)}$ therefore becomes $10{\cdot}5 = \tau\sqrt{(h \div 2)}$, whence $h = 2 \times (10{\cdot}5)^2 \div \tau^2$. Now, the odds being 2 to 1 against the limits of the gain or loss not exceeding 100, the probability Θ of the limits not exceeding 100 is $\frac{1}{3} = {\cdot}33333$, corresponding to which the table gives by interpolation $\tau = {\cdot}30458$; substituting which in the above equation we find $h = 2376{\cdot}8$; so that if 2377 games are played, the odds are 2 to 1 that one of the players shall have gained at least 10 games more than half that number, and, consequently, that the other shall have gained at least 10 less than half, or that one of them shall have gained at least 20 games more than the other, and consequently have gained at least 100 sovereigns.

It is to be carefully observed that this question supposes the account between A and B not to be balanced until 2377 games have been played. If the condition of the play had been that it should cease as soon as A or B should have lost 100 sovereigns, the question would have been of an entirely different kind, and a much smaller number of games would have given the same probability of an equal loss.

108. The question just alluded to belongs to a class of problems connected with the *Duration of Play*, of extreme difficulty, and which have given rise to some of the most abstruse and refined researches in the modern analysis. In order to give an idea of the subject, we may take the following question, which has been frequently considered.

A and B, whose chances of winning a game are respectively p and q, play on these terms: A has m counters, and B has n counters; when A loses a game he gives a counter to B, and when B loses a game he gives a counter to A, and the play is to cease when one of them has lost all his counters. What is the probability that the play, which may go on for ever, shall be finished before more than h games shall have been played.

To take a simple case, suppose each to have three counters, and let the probability be required that the play shall be concluded with or before the ninth game. As the play cannot end with less than three games, let the binomial $(p + q)^3$ be developed, and the terms

$$p^3 + 3p^2q + 3pq^2 + q^3$$

give the respective probabilities of all the cases which can arise in three games. The first term is the probability of A gaining all the three games, the last term is the probability of B gaining them, and the sum of the remaining two terms is the probability that neither will win all the games, or the chance that a fourth will be played. Now, if the fourth game be played, p is A's chance of winning it, and q B's chance; but these chances will only exist in respect of the fourth game, provided the play be not concluded with the previous one, the probability of which is $3p^2q + 3pq^2$. Multiplying, therefore, $3p^2q + 3pq^2$ by $p + q$, the product

$$3p^3q + 6p^2q^2 + 3pq^3$$

gives the respective probabilities of the different ways in which the four games may be gained by A and B, excepting the two ways in which the play would have terminated with the third game. But the play cannot end in any of these ways; for, taking the first term for example, if B gains a counter before A gains three, the play cannot terminate until A gain back that counter, and three others besides, so that five games must be played. In fact, it is obvious that there is no way of gaining an odd number of counters in an even number of games, or *vice versa*. The last product therefore expresses the chance of the 5th game being played; and by reason of $p+q=1$ it is equal to $3p^2q+3pq^2$, the chance of the 4th being played, as it obviously ought to be, since the play cannot terminate with the 4th. Again, if the 5th game be played, p is A's chance of gaining it, and q B's chance of gaining it; multiplying therefore the last product by $p+q$, the different terms of the result, namely,

$$3p^4q+9p^3q^2+9p^2q^3+3pq^4$$

give the respective probabilities of all the cases which can arise by the 5th game. The first term is the probability of A gaining 4 games and B gaining 1, and the last term is the probability of B gaining 4 and A gaining 1. These terms therefore are the probabilities of the play ending in favour of A and B respectively with the 5th game, and the sum of the other two terms is the probability that the play will not terminate with the 5th game, or the chance of another game being played.

By pursuing the same reasoning it will be evident that on rejecting the two extreme terms of the above product, and multiplying the remainder by $p+q$, there will result the probabilities of the different ways in which six games may be played without the one player gaining all the counters of the other. But as the play cannot termimate with the 6th game, multiply again by $p+q$, and the result

$$9p^5q^2+27p^4q^3+27p^3q^4+9p^2q^5$$

will indicate the probability of the different cases that can arise out of the 7th game. Rejecting the two extreme terms, which give the respective probabilities of the play being concluded in favour of A or B, and multiplying the remaining two first by $p+q$ to obtain the different probabilities in respect of the 8th game, and again by $p+q$, as the play cannot terminate with the 8th, we have the product

$$27\,p^6q^3+81\,p^5q^4+81\,p^4q^5+27\,p^3q^6,$$

of which the first and last terms give the respective chances of A and B winning at the 9th game, and the sum of the other two terms the probability that the play will not be concluded by the 9th.

If we now collect the terms which have been set aside in the successive products, and denote by a and b the respective probabilities of A and B gaining at the 9th game, *or sooner*, we shall have

$$a=p^3+3\,p^4q+9\,p^5q^2+27\,p^6q^3,$$
$$b=q^3+3\,q^4p+9\,q^5p^2+27\,q^6p^3,$$

where the law of the series is evident.

It is easy to see that this process may be applied whatever be the number of counters which A and B have at the commencement, and whatever be the number, h, of games to which the play is limited. The general rule is as follows: of the two numbers m and n, let m be that which is not less than the other. Raise $p+q$ to the power n, and reject the first term (which gives the chance of A winning n games in succession), and also the last if $m=n$. Multiply the remainder $(h-n)$ times in succession by $(p+q)$, rejecting at each multiplication the first or last term of the product when it gives a combination which would terminate the play in favour of A or B; the sum of the terms rejected from the left-hand side of the different products gives the probability in favour of A, and the sum of the terms rejected from the right-hand side the probability in favour of B. As the coefficients of the successive products are obviously formed by adding the coefficient of the corresponding term in the preceding product to that of the term immediately before it, the products may be written down at once without the trouble of multiplication; but it is evident that when m, n, and h are large numbers, it would be quite impracticable to sum the series formed of the rejected terms by the ordinary methods. From the manner in which the series are derived, they are called *recurring* series; a general theory of which was first given by Demoivre in his *Doctrine of Chances*, and forms the most remarkable portion of that work.

109. The general problem is reduced to an equation of finite differences as follows: Let $y_{x,t}$ represent A's expectation when x games have been played, and he has still t counters to win, or B has t counters in his hand. If A gain the next game the value of his expectation will become $y_{x+1,t-1}$, and the chance of his gaining it is p; therefore his expectation in respect of that event is $py_{x+1,t-1}$. On the other hand, if A loses the next game his expectation will become $y_{x+1,t+1}$, and the chance of losing it is q; therefore his expectation in respect of that event is $qy_{x+1,t+1}$. Hence, according to the principles laid down in (32),

$$y_{x,t}=py_{x+1,t-1}+qy_{x+1,t+1}$$

a linear equation of finite differences, with three independent variables. It is therefore on the integration of an equation of this kind that the problem of the duration of play ultimately depends, but the subject is of much too complicated a nature to admit of its being satisfactorily explained in this place. We must therefore content ourselves with referring the reader to the treatise on generating functions, which forms the first part of the *Théorie Analytique* of Laplace.[1]

SECT. IX. OF THE MOST PROBABLE MEAN RESULTS OF NUMEROUS DISCORDANT OBSERVATIONS, AND THE LIMITS OF PROBABLE ERROR.

110. In the preceding section we have considered a class of questions which apply to events depending on constant causes, and supposed to be of such a nature that they necessarily happen or fail in each experiment, and have given formulæ by which approximate results can be obtained when the numbers involved are so large that they cannot be conveniently treated, or cannot be treated at all, by the ordinary methods of calculation. We come now to a more difficult problem, namely, to investigate the probable result of a large number of observations which have reference not to the simple occurrence or failure of a certain event, but to the magnitude of a thing, susceptible, within certain limits, of a very great or an infinite number of different values, equally or unequally probable, the chance of any particular value being also supposed to vary in each experiment. On account of its immediate application to the determination of the most probable values of astronomical and physical elements from the results of observation, this is, perhaps, in reference to practical utility, the most important question in the theory.

111. Let A represent a thing of any sort (as a line, or an angle, or a function of any quantity) which may have

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[1] Lagrange, in vol. i. of the *Memoirs of the Society of Turin*, was the first who shewed that the investigation of the general term of a recurring series depends on the integration of a linear equation of finite differences. In vols. vi. and vii. of the *Memoires présentés à l'Academie des Sciences* of Paris, Laplace proposed a general method for the summation of recurring series by the integration of such equations, and in the latter volume gives a number of examples of their use in the more complicated questions in the theory of chances, amongst which is the problem enunciated in (108). The subject was afterwards resumed by Lagrange in the volume of the *Berlin Memoirs* for 1775, where he has given a more direct method than that of Laplace, for the integration of the class of equations in question, and also applied it to the solution of the principal problems proposed in the works of Montmort and Demoivre. A general solution of the problem in the text is given by Ampère in a Tract entitled *Considérations sur la Théorie Mathématique du Jeu*, (Lyons, 1802.)

every possible value within given limits, or which may be constant in itself, but of such a nature that its real magnitude can only be observed within certain limits of accuracy, and suppose a great number of observations to be made. The object is, in the first place, to assign the probability that the sum of the observed values shall fall within given limits, supposing the chances of the different values of A to be known *a priori;* and, in the second place, when the law of the chances is unknown, to determine from the observations themselves the most probable mean value of A, and also the limits within which there is a given amount of probability that the difference between such mean value, and the true but unknown value of A, shall be contained.

112. Let a and b be the limits of the possible values of A, x a value of A between a and b, and P the probability that the sum of the values of A given by h observations will be s exactly, s being a given quantity between ha and hb. Assume the values of A to be equidifferent, and multiples of a certain constant ϵ, and make

$$\alpha\epsilon=a,\ \beta\epsilon=b,\ \sigma\epsilon=s,\ i\epsilon=x,$$

where α, β, and σ are whole numbers (which may be positive or negative), and i is also a whole number proportional to x, and varying between the limits $i=\alpha$, and $i=\beta$, and which, therefore, may be positive or negative, or zero. If the different values of A are supposed to be equally probable, the chance of obtaining any given one of them, as x, in a single trial is unit divided by the number of possible values, or equal to $1\div(\beta-\alpha+1)$; and if we assume an indeterminate quantity w, then (20) the number of combinations which give the sum of h values of A equal to $\sigma\epsilon$ is the coefficient of that term of the multinomial

$$(w^{\alpha}+w^{\alpha+1}+w^{\alpha+2}\ldots\ldots+w^{\beta})^{h},$$

(or of the developement of $(\Sigma w^{i})^{h}$ from $i=\alpha$ to $i=\beta$) in which the exponent of w is σ; and consequently the probability P that the sum of the values of A will be s exactly is that coefficient divided by $(\beta-\alpha+1)^{h}$.

113. If the chances of the different values of A are unequal, and also vary in each trial, let p_1 be the probability of the observed value of A being x in the first trial, p_2 the probability of its being x in the second, p_3 that of its being x in the third, and so on. Now when $h=1$, or when there is only a single trial, then $s=x=i\epsilon$, and we have $P=p^{1}$. If $h=2$, then, assuming $i\epsilon$ to be the value of A in the first trial, and $i'\epsilon$ its value in the second, (i and i' being any two numbers between α and β), the two observations may give the sum of the two values equal to $\sigma\epsilon$ in as many different ways as it is possible to satisfy the equation $i+i'=\sigma$; and consequently, according to the theory of combinations, P is the coefficient of that term of the product (arranged according to the powers of w) of the two series represented by $\Sigma p_1 w^{i\epsilon}$ and $\Sigma p_2 w^{i\epsilon}$, in which the exponent of w is equal to $\sigma\epsilon$. In like manner, if $h=3$, then the sum of the observed values of A may be equal to $\sigma\epsilon$ in as many different ways as the equation $i+i'+i''=\sigma$ admits of different solutions, and consequently P is the coefficient of the term of the developement of the product $\Sigma p_1 w^{i\epsilon}\,.\,\Sigma p_2 w^{i\epsilon}\,.\,\Sigma p_3 w^{i\epsilon}$, in which the exponent of w is equal to $\sigma\epsilon$. Generally, when the number of observations is h, the probability P of the sum of the observed values of A being s, or $\sigma\epsilon$, exactly, is the coefficient of $w^{\sigma\epsilon}$ in the developement of the product

$$\Sigma p_1 w^{i\epsilon}\,.\,\Sigma p_2 w^{i\epsilon}\,.\,\Sigma p_3 w^{i\epsilon}\ldots\ldots\ldots\ldots\Sigma p_h w^{i\epsilon},$$

the sums Σ including all values of i from $i=\alpha$ to $i=\beta$.

Assume $w^{\epsilon}=e^{\theta\sqrt{-1}}$ (e being the base of the Napierean logarithms), and let the above product be denoted by X. We shall then have

$$X=\Sigma p_1 e^{i\theta\sqrt{-1}}\,.\,\Sigma p_2 e^{i\theta\sqrt{-1}}\,.\,\Sigma p_3 e^{i\theta\sqrt{-1}}\ldots\ldots\Sigma p_h e^{i\theta\sqrt{-1}}.$$

Now since P is the coefficient of the term of the developement of this product which contains the factor $e^{\sigma\theta\sqrt{-1}}$, if we conceive the developement effected we shall have

$$X=Pe^{\sigma\theta\sqrt{-1}}+P'e^{\sigma'\theta\sqrt{-1}}+\&c.$$

a series in which all the terms are of the same form. Multiplying both sides of the equation by $e^{-\sigma\theta\sqrt{-1}}$, we get

$$Xe^{-\sigma\theta\sqrt{-1}}=P+P'e^{(\sigma'-\sigma)\theta\sqrt{-1}}+\&c.$$

Now by a well known theorem in trigonometry, (ALGEBRA, art. 269), $e^{(\sigma'-\sigma)\theta\sqrt{-1}}=\cos(\sigma'-\sigma)\theta+\sqrt{-1}\sin(\sigma'-\sigma)\theta$; substituting therefore this value, and multiplying by $d\theta$, the equation becomes

$$Xe^{-\sigma\theta\sqrt{-1}}d\theta=Pd\theta+P'\{\cos(\sigma'-\sigma)\theta+\sqrt{-1}\sin(\sigma'-\sigma)\theta\}d\theta+\&c.$$

The factor which multiplies P′ in this equation will evidently become zero when integrated from $\theta=-\pi$ to $\theta=+\pi$, (π being the semicircumference to radius 1), the positive and negative elements of the integral being equal, and consequently destroying each other. The same thing also takes place with respect to the following terms, which are all of the same form. Integrating therefore between those limits, and observing that $\int d\theta=2\pi$, we find

$$P=\frac{1}{2\pi}\int_{-\pi}^{+\pi}Xe^{-\sigma\theta\sqrt{-1}}d\theta.$$

114. This value of P denotes the infinitely small chance that the sum of the values of A in h trials will be s exactly. Let μ and ν be two integer numbers between $h\alpha$ and $h\beta$, and let Q denote the probability that s will be comprised between the two limits $\mu\epsilon$ and $\nu\epsilon$, (these limits being included between ha and hb); then Q will be found by substituting successively μ, $\mu+1$, $\mu+2,\ldots\nu$ for σ in the above value of P, and taking the sum of all the resulting terms. This substitution gives the following series multiplied by X under the sign of integration:

$$e^{-\mu\theta\sqrt{-1}}+e^{-(\mu+1)\theta\sqrt{-1}}+e^{-(\mu+2)\theta\sqrt{-1}}\ldots+e^{-\nu\theta\sqrt{-1}}$$

On multiplying the series now found by $e^{\frac{1}{2}\theta\sqrt{-1}}-e^{-\frac{1}{2}\theta\sqrt{-1}}$ $(=2\sqrt{-1}\sin\frac{1}{2}\theta)$, all the terms of the product, excepting the first and the last, destroy each other, and the sum of the terms becomes simply

$$e^{-(\mu-\frac{1}{2})\theta\sqrt{-1}}-e^{(\nu+\frac{1}{2})\theta\sqrt{-1}};$$

therefore on making the substitution, and performing the multiplication now indicated, and dividing by $2\sqrt{-1}\sin\frac{1}{2}\theta$, we obtain for the value of Q the equation Q=

$$\frac{1}{4\pi\sqrt{-1}}\int_{-\pi}^{+\pi}X\left\{e^{-(\mu-\frac{1}{2})\theta\sqrt{-1}}-e^{-(\nu+\frac{1}{2})\sqrt{-1}}\right\}\frac{d\theta}{\sin\frac{1}{2}\theta}.$$

115. In order to simplify the expression for Q, let the number of possible values of A within the given limits be conceived to be infinite, in which case the constant ϵ becomes infinitely small, and therefore, since the limits are finite, μ and ν infinitely great. Let the following substitutions also be made:

$$\mu\epsilon=\psi-\delta,\ \nu\epsilon=\psi+\delta,\ \theta=\epsilon z,$$

δ being positive in order that ν may be greater than μ, agreeably to what has already been assumed. On substituting these expressions in the above equation, the limits of the new variable z will be ± infinity; for ϵ having been supposed infinitely small, z must become infinitely great when $\theta=\pi$. Now since μ and ν are infinitely great, $\mu-\frac{1}{2}$ and $\nu+\frac{1}{2}$ become sensibly μ and ν, whence we have

$e^{-(\mu-\frac{1}{2})\theta\sqrt{-1}}-e^{-(\nu+\frac{1}{2})\theta\sqrt{-1}}=e^{-\psi z}\,(e^{\delta z\sqrt{-1}}-e^{-\delta z\sqrt{-1}})$ $=e^{-\psi z}2\sqrt{-1}\sin\delta z$. Again, by reason of $\theta=\epsilon z$, we have $d\theta=\epsilon dz$; and ϵ being infinitely small, θ must be a very small arc, therefore $\frac{1}{2}\theta$ may be taken for $\sin\frac{1}{2}\theta$, whence $d\theta\div\sin\frac{1}{2}\theta=2dz\div z$. By means of these transformations the expression for Q becomes

$$Q=\frac{1}{\pi}\int_{-\infty}^{+\infty}Xe^{-\psi z\sqrt{-1}}\sin\delta z\,.\frac{dz}{z},$$

and denotes the probability that the sum of the h values of A will lie between $\psi\mp\delta$.

116. It is now necessary to assign a value to the product denoted by X. Since the number of possible values of A between a and b has been supposed infinite, the chance of obtaining any given one of them, as x, in a single trial, is infinitely small. Assuming this chance to be a function of x, and to vary in the different trials, let it be represented by $\phi_n x$ in respect of the nth trial. In order to preserve continuity in the values of A, this must be understood as signifying that $\phi_n x dx$ is the infinitely small chance that the value of A given by the nth observation will lie between x and $x+dx$. The function $\phi_n x$, therefore, represents the *law of the facility* of the different values of A. It is positive for all values of x between a and b, and vanishes for all values of x less than a or greater than b; and it is important to remark, that whatever number n may be, the integral $\int\phi_n x dx$ taken from $x=a$ to $x=b$ is always equal to unity; for since every observation gives a value of A between a and b, the sum of all the probabilities in respect of each observation must be unity or certainty. From this assumption, then, we have $\phi_1 x dx=p_1$, $\phi_2 x dx=p_2$...... $\phi_h x dx=p_h$, whence the sums $\Sigma p_n e^{i\theta\sqrt{-1}}$ (113) are changed into definite integrals; and therefore, since $\theta=\epsilon z$, $x=i\epsilon$, and consequently $i\theta=xz$, we obtain for the value of X,

$$X=\int e^{zx\sqrt{-1}}\phi_1 x dx\,.\int e^{zx\sqrt{-1}}\phi_2 x dx\ldots\int e^{zx\sqrt{-1}}\phi_h x dx,$$

the limits of the integrals being $x=a$ and $x=b$.

By reason of $e^{zx\sqrt{-1}}=\cos zx+\sqrt{-1}\sin zx$, each of these integrals may be expressed in terms of the cosine and sine of zx. The nth, for instance, becomes $\int\phi_n x\cos zx.dx$ $+\sqrt{-1}\int\phi_n x\sin zx.dx$. Now since $\int\phi_n dx=1$, (from $x=a$ to $x=b$), and $\phi_n x$ can have only positive values, each of the integrals is less than 1; whence we may assume

$$\int\varphi_n x\cos zx.dx=R_n\cos r_n;\ \int\varphi_n x\sin zx.dx=R_n\sin r_n;$$

R_n being a positive quantity, and r_n an angle having always a real value. This gives

$$\int e^{zx\sqrt{-1}}\phi_n x dx=R_n(\cos r_n-\sqrt{-1}\sin r_n)=R_n e^{r_n\sqrt{-1}};$$

whence substituting successively for n the numbers 1, 2, 3...h, and for the sake of brevity making

$$Y=R_1\times R_2\times R_3\ldots\ldots\ldots\times R_h,$$
$$y=r_1+r_2+r_3\ldots\ldots\ldots\ldots+r_h,$$

we get $X=Ye^{y\sqrt{-1}}$; and the expression for Q becomes

$$Q=\frac{1}{\pi}\int_{-\infty}^{+\infty}Ye^{(y-\psi z)\sqrt{-1}}\sin\delta z\,.\frac{dz}{z}.$$

117. The integral in this last expression is equivalent to two others, namely

$$\int Y\cos(y-\psi z)\sin\delta z.\frac{dz}{z}+\sqrt{-1}\int Y\sin(y-\psi z)\sin\delta z.\frac{dz}{z}.$$

Now, on attending to the nature of the quantities represented by Y and y, it will be manifest that according as z is positive or negative, r_n, and consequently y is positive or negative, while Y is positive in all cases, since R_n is always positive. Hence $\cos(y-\psi z)$ is always positive, and the elements of the first of the above integrals having thus the same value and the same sign for the same value of z, whether z be positive or negative, the value of the integral from $-\infty$ to $+\infty$ is the double of its value from 0 to ∞. On the other hand, since y and z have both the same sign, $\sin(y-\psi z)$ is positive or negative according as z is positive or negative, and the elements of the integral into which it enters being equal for $-z$ and $+z$, but having contrary signs, destroy each other, and the integral from $x=-\infty$ to $x=+\infty$ vanishes. The expression for Q is therefore transformed into

$$Q=\frac{2}{\pi}\int_0^{\infty}Y\cos(y-\psi z)\sin\delta z.\frac{dz}{z}.$$

118. The formula now found cannot in general be integrated by any of the known methods, but in the present case the quantities denoted by Y and y are such that an approximate value of Q may be obtained, which will always be more nearly equal to the true value as h, the number of observations, is increased. On adding the squares of the two quantities represented by $R_n\cos r_n$ and $R_n\sin r_n$ we get

$$R_n^2=(\int\phi_n x\cos zx.dx)^2+(\int\phi_n x\sin zx.dx)^2.$$

If $z=0$, this becomes $R_n=\int\phi_n x dx$, whence by (116), $R_n=1$. When z has a real value, then it may be shewn that R_n is less than 1; for let x' be any value of A different from x, then as x' can only vary from as a to b, we have obviously,

$$\int\varphi_n x'\cos zx'.dx'=\int\varphi_n x\cos zx.dx,\ \text{and}\ \int\varphi_n x'\sin zx'.dx'=\int\phi_n x\sin zx.dx,$$

and the above equation may be put under this form,

$$R^2{}_n=\int\varphi_n x\cos zx.dx\cdot\int\varphi_n x'\cos zx'dx'+\int\varphi_n x\sin zx.dx\cdot\int\varphi_n x'\sin zx'dx,$$

whence

$$R^2{}_n=\iint\phi_n x\phi_n x'\cos z(x-x')dxdx'.$$

Now, excepting the case in which $z=0$, this double integral is always less than $\iint\phi_n x\phi_n x'dxdx'$, or less than $(\int\phi_n x dx)^2$, and consequently R_n is less than $\int\phi_n x dx$, that is, less than unity. Since, then, it has been shewn that R_n is equal to unity when $z=0$, and less than unity for all other values of z, and since Y is a quantity of the order R_n^h, it follows that Y must diminish with great rapidity when z, or its equal $\theta\div\epsilon$ differs sensibly from 0, and even for very small values of z becomes insensible when h is a large number. We may therefore assume $Y=e^{-\theta^2}$, an expression which is equal to unity when $\theta=0$, and diminishes rapidly as θ is increased, and becomes zero when θ is infinite.

119. For the sake of abridging let us assume

$$k_n=\int x\phi_n x dx,\ k'_n=\int x^2\phi_n x dx,\ k''=\int x^3\phi_n x dx,\ \&c.$$

(the integrals in respect of x being always from $x=a$ to $x=b$). From known formulæ we have

$$\cos zx=1-\frac{z^2x^2}{2}+\frac{z^4x^4}{2.3.4}-\&c.;\ \sin zx=zx-\frac{z^3x^3}{2.3}+\&c.;$$

substituting these series for $\cos zx$ and $\sin zx$ in the integrals $\int\phi_n x\cos zx.dx$ and $\int\phi_n x\sin zx.dx$, and also k_n, k'_n, k''_n, &c., for the values they have now been assumed to represent, then, from (116) we have

$$R_n\cos r_n=1-\frac{z^2}{2}k'_n+\frac{z^4}{2.4}k'''_n-\&c.$$

$$R_n\sin r_n=zk_n-\frac{z^3}{2.3}k''_n+\&c.$$

and it will be seen presently that all the terms involving higher powers of z than the cube may be neglected. Adding together the squares of these two equations, we get $R_n^2=1-z^2(k'_n-k^2{}_n)+z^4f-\&c.$; whence

$$R_n=1-\tfrac{1}{2}z^2(k'_n-k^2{}_n)+z^4f'-\&c.;$$

f' being independent of z. On dividing the second by the first, there results $\tan r_n = zk_n - \frac{1}{6}z^3k''_n + \frac{1}{2}z^3k_nk'_n - \&c.$; whence by reason of $r_n = \tan r_n - \frac{1}{3}\tan^3 r_n + \&c.$,

$$r_n = zk_n - \tfrac{1}{6}z^3\,(k''_n - 3k_nk'_n + 2k_n^3) + \&c.$$

If, therefore, we make

$$c_n = \tfrac{1}{2}(k'_n - k^2_n),\quad g_n = \tfrac{1}{6}z^3(k''_n - 3k_nk'_n + 2k_n^3),$$

the values of R_n and r_n become respectively

$$R_n = 1 - z^2c_n + z^4f' - \&c.;\quad r_n = zk_n - z^3g_n + \&c.$$

Now, by hypothesis (116) $Y = R_1 \times R_2 \times R_3 \ldots\ldots R_h$; therefore $\log Y = \Sigma \log R_n = \Sigma \log(1 - z^2c_n + z^4f' - \&c.) = -\Sigma\{z^2c_n - z^4(f' - \frac{1}{2}c_n) - \&c.\}$ (by reason of the formula $\log R_n = R_n - 1 - \frac{1}{2}(R_n - 1)^2 + \&c.$) But we have also assumed (117) $Y = e^{-\theta^2}$; hence $\log Y = -\theta^2$, and consequently $\theta^2 = \Sigma\{z^2c_n - z^4(f' - \frac{1}{2}c_n) - \&c.\}$ In like manner, since $y = r_1 + r_2 + r_3 \cdots + r_h = \Sigma r_n$, therefore $y = \Sigma zk_n - \Sigma z^3g_n + \&c.$ Now, the sums Σ include all values of c_n, k_n, g_n, from $n = 1$ to $n = h$; let the mean values of those quantities, therefore, be denoted by c, k, g, that is to say, let

$$\Sigma c_n = hc,\ \Sigma k_n = hk,\ \Sigma g_n = hg,$$

and make also $hf'' = \Sigma(f' - \frac{1}{2}c_n)$, and we have $\theta^2 = z^2hc - z^4hf'' + \&c.$ By reverting the series the value of z is found in terms of θ; namely $z = \dfrac{\theta}{\sqrt{(hc)}} + \dfrac{f''\theta^3}{2hc^2\sqrt{(hc)}} + \&c.$

But the second term of this series, being divided by $h\sqrt{h}$, and h being by supposition a large number, is very small in comparison of the first, and may be neglected as insensible. All the succeeding terms of the series are divided by higher powers of h, and may therefore be rejected *a fortiori*. Confining the approximation, therefore, to terms of the order $1 \div \sqrt{h}$, and rejecting all those into which h or its powers enters as a divisor, we have $z = \theta \div \sqrt{(hc)}$, and likewise $dz \div z = d\theta \div \theta$.

From (116) we have also $y = \Sigma r_n = z\Sigma k_n - z^3\Sigma g_n + \&c.$, therefore in consequence of the above transformations, $y = zhk - z^3hg + \&c.$; and on substituting for z its value just found in terms of θ, $y = k\theta\sqrt{(h \div c)} - g\theta^3 \div c\sqrt{(hc)}$, and consequently $y - \psi z = (hk - \psi)\theta \div \sqrt{(hc)} - g\theta^3 \div c\sqrt{(hc)}$. In order to deduce from this an expression for $\cos(y - \psi z)$, let u and v denote any two arcs, then by trigonometry, $\cos(u - v) = \cos u \cos v + \sin u \sin v$. Suppose v to be small, and let its cosine and sine be developed in series and substituted in this equation; it will become

$$\cos(u - v) = \cos u - \frac{v^2}{1.2}\cos u + \&c. + v\sin u - \frac{v^3}{2.3}\sin u + \&c.$$

whence, making $u = (hk - \psi)\theta \div \sqrt{(hc)}$, $v = g\theta^3 \div c\sqrt{(hc)}$, and rejecting as before terms of the order $1 \div h$, we have

$$\cos(y - \psi z) = \cos\left\{(hk - \psi)\frac{\theta}{\sqrt{(hc)}}\right\} + \frac{g\theta^3}{c\sqrt{(hc)}}\sin\left\{(hk - \psi)\frac{\theta}{\sqrt{(hc)}}\right\}.$$

If we now substitute the values of Y, z, dz, $\cos(y - \psi z)$ found in the last three paragraphs in the value of Q (117) we obtain the following expression in which the largest terms omitted are of the order $1 \div h$, and which therefore is more accurate as h is a higher number, viz.

$$Q = \frac{2}{\pi}\int_0^\infty e^{-\theta^2}\cos\left\{(hk - \psi)\frac{\theta}{\sqrt{(hc)}}\right\}\sin\frac{\delta\theta}{\sqrt{(hc)}}.\frac{d\theta}{\theta}$$
$$+ \frac{2g}{\pi c\sqrt{(hc)}}\int_0^\infty e^{-\theta^2}\sin\left\{(hk - \psi)\frac{\theta}{\sqrt{(hc)}}\right\}\sin\frac{\delta\theta}{\sqrt{(hc)}}.\theta^2 d\theta.$$

120. As no restriction has yet been made with respect to the value of ψ, excepting that it is a mean between $\mu\epsilon$ and $\nu\epsilon$, and therefore included between ha and hb (115), let us now assume $\psi = hk$. This gives $\cos(hk - \psi) = 1$, and $\sin(hk - \psi) = 0$; and the equation becomes

$$Q = \frac{2}{\pi}\int_0^\infty e^{-\theta^2}\sin\frac{\delta\theta}{\sqrt{(hc)}}.\frac{d\theta}{\theta},$$

which is the probability that the sum of the observed values of A will fall between $hk \mp \delta$.

121. The last step in this investigation is to reduce the integral now found to a known form, which may be accomplished as follows: Let u be a new variable, then by means of the trigonometrical formula $\cos u = \frac{1}{2}e^{u\sqrt{-1}} + \frac{1}{2}e^{-u\sqrt{-1}}$,

$$\int e^{-\theta^2}\cos u\theta.d\theta = \tfrac{1}{2}\int e^{-\theta^2 + u\theta\sqrt{-1}}d\theta + \tfrac{1}{2}\int e^{-\theta^2 - u\theta\sqrt{-1}}d\theta.$$

But $-\theta^2 + u\theta\sqrt{-1} = -\frac{1}{4}u^2 - (\theta - \frac{1}{2}u\sqrt{-1})^2$; assume therefore, $v = \theta - \frac{1}{2}u\sqrt{-1}$ (whence $dv = d\theta$), then

$$\tfrac{1}{2}\int e^{-\theta^2 + u\theta\sqrt{-1}}d\theta = \tfrac{1}{2}\int e^{-\frac{1}{4}u^2 - v^2}dv = \tfrac{1}{2}e^{-\frac{1}{4}u^2}\int e^{-v^2}dv.$$

When $\theta = 0$, then $v = -\frac{1}{2}u\sqrt{-1}$, and when θ is infinite, v is infinite; therefore, if the integral in respect of θ be taken from $\theta = 0$ to $\theta = \infty$, the integral in respect of v must be taken from $v = -\frac{1}{2}u\sqrt{-1}$ to $v = \infty$.

If we now suppose u to be negative, we shall have in like manner $\frac{1}{2}\int e^{-\theta^2 - u\theta\sqrt{-1}}d\theta = \frac{1}{2}e^{-\frac{1}{4}u^2}\int e^{-v^2}dv$, the limits in this case being from $v = +\frac{1}{2}u\sqrt{-1}$ to $v = \infty$. Hence

$$\int e^{-\theta^2}\cos u\theta.d\theta = \tfrac{1}{2}e^{-\frac{1}{4}u^2}\left(\int c^{-v^2}dv + \int e^{-\ ^2}dv\right).$$

But the sum of the two integrals on the right-hand side of this equation, the first being taken from $v = -\frac{1}{2}u\sqrt{-1}$ to infinity, and the second from $v = +\frac{1}{2}u\sqrt{-1}$ to infinity, is obviously the double of $\int e^{-v^2}dv$ from $v = 0$ to $v = \infty$, or (96) equal to $\sqrt{\pi}$; and we have therefore

$$\int_0^\infty e^{-\theta^2}\cos u\theta.d\theta = \tfrac{1}{2}\sqrt{\pi}.e^{-\frac{1}{4}u^2}.$$

Let both sides of the equation be multiplied by du, and integrated from $u = 0$ to $u = \delta \div \sqrt{(hc)} = u'$; then observing that $\int\cos(u\theta)d\theta = \sin(u\theta) \div \theta$, we shall have

$$\int_0^\infty e^{-\theta^2}\sin\frac{\delta\theta}{\sqrt{(hc)}}.\ \frac{d\theta}{\theta} = \tfrac{1}{2}\sqrt{\pi}\int_0^{u'} e^{-\frac{1}{4}u^2}du.$$

Comparing this equation with that in (110), we find $Q = (1 \div \sqrt{\pi})\int_0^{u'} e^{-\frac{1}{4}u^2}du$. Now, let $u = 2t$, and let τ be what t becomes when $u = u' = \delta \div \sqrt{(hc)}$; then $\frac{1}{4}u^2 = t^2$, $du = 2dt$, $\delta \div \sqrt{(hc)} = 2\tau$, or $\delta = 2\tau\sqrt{(hc)}$, and we have, finally,

$$Q = \frac{2}{\sqrt{\pi}}\int_0^\tau e^{-t^2}dt,\ \text{or,}\ Q = 1 - \frac{2}{\sqrt{\pi}}\int_\tau^\infty e^{-t^2}dt,$$

for the probability that s, the sum of the observed values of A, will be comprised between the limits $\psi - \delta$ and $\psi + \delta$, that is, between $hk \mp 2\tau\sqrt{(hc)}$; or, that the arithmetical mean of all the observations, namely $s \div h$, will lie between $k \mp 2\tau\sqrt{(c \div h)}$.

122. The expression now found for Q is that which in (96) was denoted by Θ, and of which the table gives the values corresponding to the different values of τ. The general result of the investigation is, therefore, that whatever be the nature of the function $\phi_n x$ which represents the law of the facility of the different values of A, if a large number of observations be made, the sum of the values of A, divided by the number of observations, approaches continually to a certain special quantity k (which is the true mean value of A) as the number of observations is increased, and that by multiplying the number of observations, a probability Θ may always be obtained, approaching as nearly to certainty as we please, that the difference between the arith-

metical mean or average of the observations and the true mean value of A, will be comprised within limits which may be made as small as we please.

The analysis employed in the preceding articles, (113 to 121), for the purpose of establishing this very important result, belongs to Poisson, and is given in nearly the same form in the *Recherches sur la Probabilité des Jugements*, chap. iv., and in the *Additions* to the *Connaissance des Tems* for 1832. We have preferred it to the method followed by Laplace in the *Théorie Analytique*, as being somewhat simpler and also more general.

123. In order that the limits $2\tau\sqrt{(hc)}$ may be real, it is necessary that the special quantity c be positive, a condition which has hitherto been assumed. Now, since $c=\Sigma c_n \div h$, it is obvious that c will be positive if $c_n=\frac{1}{2}(k'_n-k^2_n)$ be positive. On writing for k'_n and k_n their values (119) we have

$$2c_n=\int x^2\phi_n x dx-(\int x\phi_n x dx)^2,$$

the limits of the integrals being always from $x=a$ to $x=b$. But it is evident that no change will be made in the values of these definite integrals (the limits continuing the same), by substituting in them any other of the possible values of A, as x'. We have therefore $\int x'\varphi_n x' dx'=\int x\phi_n x dx$, and since in all cases $\int\phi_n x' dx'=1$, the above equation may be otherwise written

$$2c_n=\int x^2\phi_n x dx \int\varphi_n x' dx'-\int x\varphi_n x dx \int x'\varphi_n x' dx,$$

whence $2c_n=\iint\varphi_n x\varphi_n x'(x^2-xx')dxdx'$,

or $\quad 2c_n=\iint\varphi_n x\phi_n x'(x'^2-x'x)dxdx'$.

Adding together the two last equations, there results

$$4c_n=\iint\varphi_n x\phi_n x'(x-x')^2 dxdx',$$

a quantity which is necessarily positive, and can never be zero so long as x can have different values.

124. The special quantity k to which the average of the values of A continually approaches, is connected with the centre of gravity of the area of a curve by the following relation. Let x and y be the co-ordinates of a curve, of which the equation is $y=\phi_n x$; then the element of the area is $\phi_n x dx$. But (116) $\varphi_n x dx$ is the infinitely small probability that the value of A in the nth observation will lie between x and $x+dx$; therefore the element of the area of the curve represents this probability, and the curve itself represents the law of the probability of the different values of A in respect of the nth trial. In like manner, the curve whose coordinates are x and $(1\div h)\Sigma\varphi_n x$, represents the law of the mean probability of A in respect of the whole series of observations. Now, if x_1 be the abscissa of the centre of gravity of any curve whose co-ordinates are x and y, the well known formula of mechanics gives $x_1=\int yxdx \div \int ydx$; therefore, applying this formula to the curve of the mean probability, and making the whole area ($\int ydx$ from $x=a$ to $x=b$)$=1$, the absciss of the centre of gravity is $x_1=(1\div h)\Sigma\int x\varphi_n x dx$. But this is the quantity denoted by k (119); hence the special quantity to which the average of a large number of observations indefinitely approaches is the abscissa of the centre of gravity of the area of the curve which represents the law of the mean chances of A.

125. It has been assumed in the foregoing analysis that A is susceptible of an infinite number of values, increasing continuously from a to b. The results, however, are easily adapted to those cases in which the number of possible values of A is finite. Suppose A to be a thing susceptible of only λ different values, represented by $a_1, a_2, a_3 \ldots\ldots a_\lambda$, and let the chances of these values, which may be different in the different trials, be respectively $\gamma_1, \gamma_2, \gamma_3 \ldots\ldots \gamma_\lambda$ in respect of the nth trial. Now, suppose $\varphi_n x$ to be a discontinuous function, which vanishes for all values of x, of which the difference from one or other of the above values of A exceeds an infinitely small quantity ϵ; then the whole integral $\int\varphi_n x dx$ from $x=a$ to $x=b$, will be made up of a series of λ partial integrals $\int\varphi_n x dx$ taken between the limits $a_i \pm \epsilon$, the sum of which will be unity, since one or other of the values of A must necessarily be given by the trial. But the integral $\int\varphi_n x dx$ between the limits $a_i \pm \epsilon$ is the expression of the chance that the value of A given in the nth trial will lie between $a_i \pm \epsilon$; whence for those limits $\int\varphi_n x dx=\gamma_i$. Now the difference $x-a_i$ must be infinitely small, since it cannot exceed ϵ; we may therefore substitute a_i for x, and a_i^2 for x^2 under the sign of integration, when the limits are $a_i \pm \epsilon$, so that for those limits we have $\int x\varphi_n x dx=a_i\int\varphi_n x dx=\gamma_i a_i$. On writing for i all the different numbers 1, 2, 3……λ, and observing that the λ partial integrals thus formed make up the whole integral $\int x\varphi_n x dx$ from $x=a$ to $x=b$, and that therefore their sum is k_n, we have, in respect of the nth trial,

$$k_n=\gamma_1 a_1+\gamma_2 a_2+\gamma_3 a_3\ldots\ldots+\gamma_\lambda a_\lambda.$$

In like manner, for $k'_n=\int x^2\varphi_n x dx$ (from a to b), we have

$$k'_n=\gamma_1 a_1^2+\gamma_2 a_2^2+\gamma_3 a_3^2\ldots\ldots+\gamma_\lambda a_\lambda^2;$$

so that the two special quantities k and k' become

$$k=(1\div h)\Sigma(\gamma_1 a_1+\gamma_2 a_2+\gamma_3 a_3\ldots\ldots+\gamma_\lambda a_\lambda),$$

$$k'=(1\div h)\Sigma(\gamma_1 a_1^2+\gamma_2 a_2^2+\gamma_3 a_3^2\ldots\ldots+\gamma_\lambda a_\lambda^2),$$

the sums Σ extending to all the h values of n, or to all the trials, the chances denoted by γ_1, γ_2, &c. being supposed to vary in the different trials.

126. When the chances of the different values of A are equal and constant, then $\gamma_i=1\div\lambda$, and the above values of k and k' become

$$k=(1\div\lambda)(a_1+a_2+a_3\ldots\ldots+a_\lambda),$$

$$k'=(1\div\lambda)(a_1^2+a_2^2+a_3^2\ldots\ldots+a_\lambda^2),$$

so that k is the arithmetical mean of the possible values of A, and k' the mean of the squares of those values. On this hypothesis, therefore, k and k' may be computed *a priori*, and consequently the limits determined within which there is a given probability Θ that the average of h observations will fall, the limits being $k\mp 2\tau\sqrt{(c\div h)}$, where $c=\frac{1}{2}(k'-k^2)$.

When the chances of the different values of A are unequal, but constant in the different trials, then $k=k_n$, and $k'=k'_n$, and we have

$$k=\gamma_1 a_1+\gamma_2 a_2+\gamma_3 a_3\ldots\ldots+\gamma_\lambda a_\lambda,$$

$$k'=\gamma_1 a_1^2+\gamma_2 a_2^2+\gamma_3 a_3^2\ldots\ldots+\gamma_\lambda a_\lambda^2.$$

In this case the special quantity k to which the average of the observed values continually approaches, is the sum of the possible values, each multiplied into its respective probability; and k' is the sum of the products of the squares of those values into their respective probabilities.

127. Resuming the consideration of the general formula in (121), we shall now give an example of its application when the function which represents the law of facility of the different values of A is supposed to be known *a priori.*

Of all the hypotheses which may be made respecting the law of facility, the simplest is that which supposes the chances of all the possible values of the thing observed to be equal, and to remain constant during the series of trials. This supposes $\varphi_n x=\varphi x=$a constant; whence $\int\varphi x dx$, between the limits $x=a$ and $x=b$, becomes $(b-a)\varphi x$. But between those limits we have also $\int\varphi x dx=1$; therefore $\varphi x=1\div(b-a)$. From this value of φx it is easy to deduce the special quantities k and k'. On the present hypothesis $k=k_n$ and $k'=k'_n$; therefore, the limits of the integral being $x=a$ and $x=b$, we have $k=\int x\varphi x dx=\int\frac{xdx}{b-a}=\frac{b^2-a^2}{2(b-a)}=\frac{1}{2}(b+a)$, whence $k^2=\frac{1}{4}(b+a)^2$. In like manner $k'=\int x^2\varphi x dx$ becomes $\int\frac{x^2dx}{b-a}=\frac{1}{3}(b^2+ba+a^2)$; whence $c=\frac{1}{2}(k'-k^2)$

$=\frac{1}{6}(b^2+ba+a^2)-\frac{1}{8}(b+a)^2$. Hence by (121) we have the probability Θ that the average value of A given by h observations, or the sum of the values of A divided by their number, will lie between

$$\tfrac{1}{2}(b+a)\mp 2\tau\surd\{\tfrac{1}{6}(b^2+ba+a^2)-\tfrac{1}{8}(b+a)^2\}\div\surd h.$$

128. This formula may be applied to the following question. Of the comets which have been observed since the year 240 of our era, the parabolic elements of 138 have been computed, and the mean inclination of their orbits to the ecliptic is found to be 48° 55′. Now, supposing every possible inclination of an orbit to be equally probable, let the probability be demanded that the mean inclination of 138 orbits will not differ from 45° (the mean of the possible inclinations) more than 5° in excess or defect.

In this case the limits of the possible values of the phenomenon are 0 and 90°. We have therefore $a=0$, $b=90°$, $h=138$, and the above limits of the error of the average, become $45°\mp\tau\times 90°\div\surd(6\times 138)$. In order that the limits may not exceed 5°, we have to determine τ from the equation $\tau\times 90°\div\surd(6\times 138)=5°$, which gives $\tau=\frac{1}{3}\surd 23$; whence $\tau=1{\cdot}6$ very nearly. The tabular value of Θ corresponding to $\tau=1{\cdot}6$ is ·97635, or nearly $\frac{41}{42}$; and the odds are therefore 41 to 1 that on the supposition of all inclinations being equally probable, the mean inclination of 138 comets would fall between $45°\mp 5°$, that is, between 40° and 50°. The mean of the inclinations actually computed falls within those limits (being 48° 45′); there is therefore a very great probability that whatever may be the nature of the unknown causes which determine the positions of the cometary orbits, it is not such as to render different inclinations unequally probable.

If the question had been to assign the limits within which it is as probable that the mean of the inclinations will fall as not, we should have had $\Theta=\frac{1}{2}$, and consequently (from the table) $\tau=\cdot476936$, and the limits would have been $45°\mp 90°\times\cdot476936\div\surd(6\times 138)$, which is found on calculation to be $45°\mp 1°{\cdot}5$. On the supposition, therefore, that all inclinations are equally probable, it is one to one that the mean of 138 inclinations will fall between $43\frac{1}{2}°$ and and $46\frac{1}{2}°$, or at least not exceed those limits.

129. On the same hypothesis of an equal probability of all possible values, if we suppose the mean value of A to be 0, we have then $a=-b$, and φx becomes $1\div 2a$, whence the limits corresponding to a given value of Θ (127) become $0\mp 2\tau b:\surd(6h)$. Let $\Theta=\frac{1}{2}$, whence $\tau=\cdot476936$, and suppose $h=600$. With these values the limits become $0\mp\cdot016b$ nearly; that is to say, it is an even wager that the average of 600 observations will not differ from the true mean value of A more than the sixteen-thousandth part of a or b, what is the greatest possible difference.

130. As a second hypothesis, suppose the chance of a given value of A to decrease uniformly as the magnitude increases from 0 to $\pm a$; then φx will be found as follows: Let $\varphi x=\beta$ when $a=0$; we have then by the hypothesis $\varphi x:\beta=(a-x):a$, whence $\varphi x=(a-x)\beta\div a$, and consequently $\int\varphi x dx=\beta x-\beta x^2\div 2a$, which, from $x=0$ to $x=+a$, becomes $\frac{1}{2}\beta a$. But $\int\phi x dx$ from $x=-a$ to $x=+a$ is 1 (errors beyond those limits being supposed impossible), therefore from $x=0$ to $x=+a$, $\int\phi x dx=\frac{1}{2}$, and consequently $\frac{1}{2}\beta a=\frac{1}{2}$, or $\beta=1\div a$. Hence $\phi x=(a-x)\div a^2$, from which the value of c is easily deduced, that of k being 0, as in the former case.

131. Although the function φx which represents the law of facility of the different values of A is in general unknown, its form may be assigned if we assume that it is subject to certain conditions, which, from the nature of the thing, must be very nearly, if not absolutely true, in most practical cases: 1st, That the chance of an error diminishes as the magnitude of the error increases, and for errors beyond a certain limit vanishes altogether; and, 2d, that positive and negative errors, of equal magnitude, are equally probable. The last condition is equivalent to the assumption that the average of the observed values is the true mean value. For simplification, we suppose the chance of an error of a given magnitude to remain constant in all the trials.

132. Let x, x', x'', &c. be a series of values of A, the sum of which is s, and the number h, and make $m=s\div h$, then m is the arithmetical mean or average, which by hypothesis is the true value of the phenomenon A. Let $x-m=\Delta$, $x'-m=\Delta'$, $x''-m=\Delta''$, &c., so that Δ, Δ', Δ'', &c. are the errors of x, x', x'', &c. Now, the most probable single error is 0; and the probability of obtaining an error of a given magnitude Δ in any observation is obviously the same as that of obtaining a given value of x; therefore $\varphi x=\varphi(x-m)=\varphi\Delta$; so that $\varphi\Delta$ is the probability of a single error being exactly Δ. In like manner, the probability of an error $=\Delta'$ is $\varphi\Delta'$; and if we take P to denote the probability of a given system of errors, Δ, Δ', Δ'', &c., then the errors being supposed independent of each other, we have (7)

$$P=\varphi\Delta\,.\,\varphi\Delta'\,.\,\varphi\Delta'', \text{ \&c.}$$

Let this system be assumed to be the most probable result of the observations, then P is a maximum, and its differential co-efficient zero. Taking the logarithms of both sides of the equation, differentiating, and making $d\log.\varphi\Delta=\varphi'\Delta d\Delta$, and $dP\div d\Delta=0$, we obtain

$$0=\varphi'\Delta+\varphi'\Delta'+\varphi'\Delta''+, \text{ \&c.},$$

an equation which may be otherwise written

$$0=\Delta\frac{\varphi\,\Delta}{\Delta}+\Delta'\frac{\varphi'\Delta'}{\Delta'}+\Delta''\frac{\varphi'\Delta''}{\Delta''}+, \text{ \&c.}$$

This is the conditional equation of the most probable system of errors. But the hypothesis of the average being the true value, furnishes this other equation,

$$0=(x-m)+(x'-m)+(x''-m)+, \text{ \&c.}$$

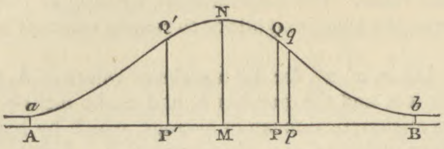
or, which is the same, $0=\Delta+\Delta'+\Delta''+$, &c.; and on comparing this with the above conditional equation, it is evident that they can only be both true simultaneously on the supposition of $\frac{\varphi'\Delta}{\Delta}=\frac{\varphi'\Delta'}{\Delta'}=\frac{\varphi'\Delta''}{\Delta''}=$, &c. Hence it follows that $\varphi'\Delta\div\Delta$ is independent of any particular value of Δ, or is equal to a constant, which we shall call K. We have then

$$\frac{\varphi'\Delta}{\Delta}=\frac{d\,.\log.\,\varphi\Delta}{\Delta d\Delta}=\text{K}.$$

The integral of this expression is $\log.\,\varphi\Delta=\frac{1}{2}\text{K}\Delta^2+$ const., which, making the last constant $=\log.$ H, and passing to numbers, gives $\varphi\Delta=\text{H}e^{\frac{1}{2}\text{K}\Delta^2}$. It now only remains to determine the two constants H and K. With respect to K, as we suppose the most probable value of Δ to be 0, and that $\varphi\Delta$ diminishes as Δ increases, it is obvious that K must be negative. Assume $\frac{1}{2}\text{K}=-\gamma$, and the formula becomes $\varphi\Delta=\text{H}e^{-\gamma\Delta^2}$. For the determination of H we have the equation $\int\varphi\Delta d\Delta=1$, the limits of the integral being $-a'$ and $+a'$, where $a'=\frac{1}{2}(b-a)$, a and b being the limiting values of x. But it is to be observed, that as all values of Δ exceeding the limits $\pm a'$ are supposed to be impossible, or at least to be so improbable that it is unnecessary to take account of them, the value of the integral $\int\varphi\Delta d\Delta$ from $\Delta=-a'$ to $\Delta=+a'$ will not be altered by extending the limits from − infinity to + infinity. We have therefore $\int_{-\infty}^{+\infty}\varphi\Delta d\Delta=1$. Let $\Delta=t\div\surd\gamma$, then $d\Delta=dt\div\surd\gamma$, and $\varphi\Delta=\text{H}e^{-\gamma\Delta^2}=\text{H}e^{-t^2}$, on substituting which in the las equation, and observing that from $t=-\infty$ to $t=+\infty$ we have $\int e^{-t^2}dt=\surd\pi$ (96), we find $(\text{H}\div\surd\gamma)\surd\pi=1$, and $\text{H}=\surd(\gamma\div\pi)$. Whence, finally, $\varphi\Delta=\surd(\gamma\div\pi)e^{-\gamma\Delta^2}$.

133. The general properties of the function now found

may be illustrated by means of a curve line. Let aNb be



a curve of which $\varphi\Delta$ is the ordinate corresponding to the absciss Δ. Let AB be its axis, and MN its greatest ordinate. Suppose the origin to be placed at M, draw PQ an ordinate at any point P, and pq indefinitely near to PQ, and make $MB = a'$, $MA = -a'$, $MP = \Delta$, and $PQ = \varphi\Delta$; then as was shewn in (124), PQqp, the element of the area, represents the chance of an error lying between Δ and $\Delta + d\Delta$, that is, of an error greater than MP but less than Mp. Now, if $\varphi\Delta = \sqrt{(\gamma \div \pi)}e^{-\gamma\Delta^2}$ the function will not be changed by changing Δ into $-\Delta$; therefore $\varphi\Delta = \varphi(-\Delta)$, and the curve is symmetrical on both sides of MN, as it obviously ought to be according to the hypothesis; for on making $MP' = MP$, then positive and negative errors of equal magnitude being equally probable, we must have $P'Q' = PQ$. Again, since $e^{-\gamma\Delta^2}$ diminishes rapidly as Δ increases, the curve at a short distance from MN must approach very near to its axis AB; but as the function only vanishes when Δ is infinite, the curve will not meet the axis at any finite distance from MN. This curve, therefore, can only represent approximately the law of facility, inasmuch as it is supposed that errors beyond a certain limit are impossible; but on account of the rapid diminution of the ordinate at a short distance from MN, the chance of an error exceeding a small value of Δ, as MB, becomes insensible. Hence the limits of the integrals in respect of Δ may be extended without sensibly altering their values from $\Delta = \pm a'$ to $\Delta = \pm\infty$.

134. It is now necessary to find the special quantities k, k', and c. Substituting Δ for x, and observing that as the law of the chances is here supposed to remain constant, we have $k = k_n$, $k' = k'_n$, the formulæ in (119) become $k = \int \Delta\varphi\Delta d\Delta$, $k' = \int \Delta^2\varphi\Delta d\Delta$. Hence on making $\varphi\Delta = \sqrt{(\gamma \div \pi)}e^{-\gamma\Delta^2}$, we have

$$k = \sqrt{\frac{\gamma}{\pi}}\int \Delta e^{-\gamma\Delta^2} d\Delta = \sqrt{\frac{\gamma}{\pi}} \cdot \frac{1}{2\gamma}\int d . e^{-\gamma\Delta^2} = \frac{1}{2\sqrt{(\gamma\pi)}}e^{-\gamma\Delta^2}.$$

When Δ becomes infinite, this becomes 0, therefore from $\Delta = -\infty$ to $\Delta = +\infty$, $k = 0$. This is an obvious consequence of the symmetry of the curve, for the centre of gravity is necessarily in the straight line MN.

With respect to k' we may proceed thus. We have $k' = \int \Delta^2\phi\Delta d\Delta = \sqrt{(\gamma \div \pi)}\int \Delta^2 e^{-\gamma\Delta^2} d\Delta$. But from the principles of the differential calculus,

$$d . \Delta e^{-\gamma\Delta^2} = e^{-\gamma\Delta^2}d\Delta - 2\gamma\Delta^2 e^{-\gamma\Delta^2}d\Delta,$$

therefore, integrating and transposing,

$$\int \Delta^2 e^{-\gamma\Delta^2} d\Delta = -\frac{1}{2\gamma}\Delta e^{-\gamma\Delta^2} + \frac{1}{2\gamma}\int e^{-\gamma\Delta^2} d\Delta.$$

Now, from $\Delta = -\infty$ to $\Delta = +\infty$, the term of this equation which is not under the sign of integration vanishes, and $\int e^{-\gamma\Delta^2} d\Delta = \sqrt{(\pi \div \gamma)}$ (from (96), on substituting t^2 for $\gamma\Delta^2$), therefore $\int \Delta^2 e^{-\gamma\Delta^2} d\Delta = (1 \div 2\gamma)\sqrt{(\pi \div \gamma)}$; and consequently $k' = 1 \div 2\gamma$.

In (119) we assumed $c = \frac{1}{2}(k' - k^2)$; therefore in the present case $c = \frac{1}{2}k'$, whence $c = 1 \div 4\gamma$, or $\gamma = 1 \div 4c$.

135. The expressions which have now been found for the function which represents the probability of an error, and the limits corresponding to an assigned degree of probability, are given in terms of the indeterminate constant γ (or c), which depends on the nature of the observation, and therefore, where instruments are requisite, on the goodness of the instrument and the skill of the observer. This constant is called by Laplace the *modulus* of the law of facility. It cannot, in general, be assigned *a priori*; but if we assume that positive and negative departures from the mean are alike probable, which is the most plausible hypothesis the nature of the thing admits of, an approximation to its value, in respect of observations of a given kind, may be deduced with great probability from the results of a large series of observations of the same kind already made. We now proceed to give the analysis by which this is accomplished, following the method of Poisson. The approximation is carried only to quantities of the order $1 \div \sqrt{h}$; terms having h for a divisor are neglected on account of their smallness, h being supposed a large number.

136. In the expression for Q in (119), suppose $\psi = \delta$, and consequently $\psi - \delta = 0$, $\psi + \delta = 2\delta$, and write also z for $\theta \div \sqrt{(hc)}$; the equation then becomes

$$Q = \frac{2}{\pi}\int_0^\infty e^{-\theta^2}\cos(hkz - \delta z)\sin\delta z . \frac{\delta\theta}{\theta}$$

$$+ \frac{2g}{\pi c\sqrt{(hc)}}\int_0^\infty {}^{-\theta^2}\sin(hkz - \delta z)\sin\delta z . \theta^2 d\theta,$$

and Q is the probability that s, the sum of the values of A given by all the observations, will lie between 0 and 2δ. If therefore, we suppose δ to be variable, the differential of this expression taken with respect to δ, will express the infinitely small chance of the sum of the values being 2δ exactly. Differentiating, and observing that if u and v denote any two arcs, the trigonometrical formulæ give

$$\sin(u - v)\sin v + \cos(u - v)\cos v = \cos(2v - u),$$

$$-\cos(u - v)\sin v + \sin(u - v)\cos v = -\sin(2v - u),$$

we shall find

$$\frac{dQ}{d\delta}d\delta = \frac{2d\delta}{\pi}\int_0^\infty e^{-\theta^2}\cos(2\delta z - hkz)\frac{zd\theta}{\theta}$$

$$-\frac{2gd\delta}{\pi c\sqrt{(hc)}}\int_0^\infty e^{-\theta^2}\sin(2\delta z - hkz)z\theta^2 d\theta.$$

Let t be a variable quantity, and assume $2\delta = hk + 2t\sqrt{(hc)}$, whence $d\delta = dt\sqrt{(hc)}$, and let the corresponding value of $\frac{dQ}{d\delta}d\delta$ be denoted by qdt, we shall have, on substituting these values, and replacing z by $\theta \div \sqrt{(hc)}$, $qdt = \frac{2dt}{\pi}$

$$\int_0^\infty e^{-\theta^2}\cos(2t\theta)d\theta - \frac{2gdt}{\pi c\sqrt{(hc)}}\int_0^\infty e^{-\theta^2}\sin(2t\theta)\theta^3 d\theta.$$

The two integrals in this equation are found from the formula in (121). Writing $2t$ for u, that formula gives

$$\int_0^\infty e^{-\theta^2}\cos(2t\theta)d\theta = \tfrac{1}{2}\sqrt{\pi} . e^{-t^2};$$

and if this last equation be differentiated in respect of t, three times in succession, the result will be

$$\int_0^\infty e^{-\theta^2}\sin(2t\theta)\theta^3 d\theta = \tfrac{1}{4}\sqrt{\pi}(3te^{-t^2} - 2t^3 e^{-t^2});$$

whence, if we make $V = \frac{g}{2c\sqrt{(hc)}}(3t - 2t^3)$, we shall have

$$qdt = (1 \div \sqrt{\pi})(1 - V)e^{-t^2}dt,$$

where V is a quantity containing only uneven powers of t, and of the order $1 \div \sqrt{h}$, so that when multiplied by another of the same order, the product will be of the order $1 \div h$, and will therefore be rejected in the present approximation. This value of qdt is the probability that s will be precisely 2δ or $hk + 2t\sqrt{(hc)}$, or it is the infinitely small probability of the equation

$$s = hk + 2t\sqrt{(hc)}.$$

137. In order to apply this result to the determination of the probable limits in terms of observations actually

made, it is necessary to remark that the analysis by means of which it has been obtained is grounded on the very general supposition that the thing to be measured may be any function whatever of the quantity observed; for the infinitely small chance of a particular value of the function is evidently the same as that of the corresponding value of the quantity, and is consequently $\phi_n x dx$. Let X therefore be a function of x, and let K, C, T, be what k, c, t become when X is substituted for x, the above equation then becomes

$$\Sigma X = hK + 2T\sqrt{(hC)},$$

the symbol Σ including all the h values of X; and the probability of this equation is an expression of the same form as that which is represented by qdt.

138. Hitherto no restriction has been made with respect to ϕx; we now introduce the hypothesis that positive and negative departures from the mean of equal magnitude are equally probable, and consequently that the curve representing the law of facility is symmetrical, but shall suppose the chances of a particular value, or a particular error, to vary in the different trials. Let the origin be transferred to the centre of gravity, the absciss of which $= k$, and let $x - k = \Delta$, $x' - k = \Delta'$ &c. We have then by (132) $\phi x = \phi\Delta$, $\int x\phi x dx = \int \Delta\phi\Delta d\Delta$, $\int x^2\phi x dx = \int\Delta^2\phi\Delta d\Delta$, the integration in respect of Δ being from $-\infty$ to $+\infty$. The special quantities k and k' then become $k = (1 \div h)\Sigma\int\Delta\phi_n\Delta d\Delta = 0$, $k' = (1 \div h)\Sigma\int\Delta^2\phi_n\Delta d\Delta$, whence

$$c = (1 \div 2h)\Sigma\int\Delta^2\phi_n\Delta d\Delta.$$

The object is now to eliminate $\phi_n\Delta$, and determine c in terms of the observations.

139. Let $\lambda_n = x$ be the observed value of A in the nth observation, then $\lambda_n - k = \Delta$ is the true error of the observation. Let the function denoted by X in (137) be $(\lambda_n - k)^2 = \Delta^2$, and the corresponding value of K (since in this case, $K = (1 \div h)\Sigma\int X\phi_n x dx$) becomes $K = (1 \div h)\Sigma\int\Delta^2\phi_n\Delta d\Delta$. Comparing this with the value of c found above, we have $K = 2c$; therefore on substituting these values of X and K in the equation (137), and assuming t' and c' to be the values of T and C when $X = (\lambda_n - k)^2$, we get $\Sigma(\lambda_n - k)^2 = 2hc + 2t'\sqrt{(hc')}$, whence

$$c = (1 \div 2h)\Sigma(\lambda_n - k)^2 - t'U' \qquad (1)$$

(U being a quantity of the order $1 \div \sqrt{h}$); and the probability of this equation is

$$q'dt' = (1 \div \sqrt{\pi})(1 - V')e^{-t'^2}dt',$$

where V' is a function containing only uneven powers of t', and of the order $1 \div \sqrt{h}$.

In the equation (137) suppose $X = x = \lambda_n$, and let t'' and c'' be the corresponding values of T and C, then since on this supposition $K = k$, the equation becomes $\Sigma\lambda_n = hk + 2t''\sqrt{(hc'')}$, whence

$$k = (1 \div h)\Sigma\lambda_n - t''U'', \qquad (2)$$

(U'' being of the order $1 \div \sqrt{h}$); and the probability of this equation is

$$q''dt'' = (1 \div \sqrt{\pi})(1 - V'')e^{-t''^2}dt'',$$

where V'', like V' and V, contains only uneven powers of t'' and is of the order $1 \div \sqrt{h}$.

140. The two equations (1) and (2) may be regarded as two distinct events, having the respective probabilities now assigned to them, and therefore the probability of their being true simultaneously is the product of their respective probabilities, and is accordingly (neglecting the product $V'V''$ which is a quantity divided by h),

$$q'q''dt'dt'' = (1 \div \pi)(1 - V' - V'')e^{-t'^2}e^{-t''^2}dt'dt''.$$

Let the value of k given by equation (2) be substituted in (1), and the expression now given will accordingly be the probability of the resulting equation, namely,

$$c = \frac{1}{2h}\Sigma(\lambda_n - \frac{1}{h}\Sigma\lambda_n + t'U')^2 - t''U''$$

Let $m = (1 \div h)\Sigma\lambda_n$, then m is the average or arithmetical mean of the observed values, and $\lambda_n - m$ the *reputed* error of the observation. The last equation will then become $c = (1 \div 2h)\Sigma(\lambda_n - m + t'U')^2 - t''U''$; or, rejecting $(t'U')^2$ which is of the order $1 \div h$,

$$c = (1 \div 2h)\Sigma\{(\lambda_n - m)^2 + 2(\lambda_n - m)t'U'\} - t''U''.$$

For the sake of abridging let us also assume

$$\mu = (1 \div h)\Sigma(\lambda_n - m)^2, \quad \nu = (1 \div h)\Sigma(\lambda_n - m)t',$$

so that μ is the mean of the squares of the errors, or *mean square* of the errors, and the equation becomes

$$c = \tfrac{1}{2}\mu + \nu U' - t''U'', \qquad (3)$$

the probability of which is $q'q''dt'dt''$.

141. Now, by (121), we have the probability Θ that $s \div h$, or $\Sigma\lambda_n \div h = m$ the arithmetical mean of the observed values of A, will fall within the limits $k \mp 2\tau\sqrt{(c \div h)}$. Substituting in those limits the above value of c, and observing that $(\frac{1}{2}\mu + \nu U' - t''U'')^{\frac{1}{2}} = \sqrt{(\frac{1}{2}\mu)} + N(\nu U' - t''U'') + \&c.$, and that U' and U'' being of the order $1 \div \sqrt{h}$, when divided again by $\sqrt{h}$ are to be rejected, the limits become

$$k \mp 2\tau\sqrt{(\tfrac{1}{2}\mu \div h)}, \text{ or } k \mp \tau\sqrt{(2\mu \div h)},$$

and the probability of these being the true limits is Θ multiplied into the probability of the equation $c = \frac{1}{2}\mu + \nu U' - t''U''$; and is therefore (140)

$$(1 \div \pi)\Theta(1 - V' - V'')e^{-t'^2}e^{-t''^2}dt'dt''.$$

142. The expression now obtained is the infinitely small probability of the limits $k \mp \tau\sqrt{(2\mu \div h)}$ of the average m, in respect of the particular value of s, for which we have deduced the equation (3). But for every value of s between the limits 0 and 2δ, there will be an equation corresponding to (3); therefore, in order to have the whole probability of those limits, the integral of the expression must be found for all values of t' and t''. From the nature of the expressions $e^{-t'^2}$ and $e^{-t''^2}$ as well as the consideration that errors beyond a certain magnitude, though possible, are wholly improbable, it is evident that the integration may be extended without sensible error from $-\infty$ to $+\infty$; and since the functions V' and V'' contain only uneven powers of t' and t'', the terms into which they enter, disappear in the integrations between those limits (See Lacroix, *Calcul Diff. et Integral*, tom. iii. p. 506). Now, from $t' = -\infty$ to $t' = +\infty$ we have (96) $\int e^{-t'^2}dt' = \sqrt{\pi}$; and $\int e^{-t''^2}dt'' = \sqrt{\pi}$; therefore

$$\frac{1}{\pi}\Theta\iint(1 - V' - V'')e^{-t'^2}e^{-t''^2}dt'dt'' = \Theta.$$

The result of the preceding analysis is therefore that on the hypothesis of positive and negative errors of equal magnitude being equally probable, and on rejecting terms divided by h (the number of the observations may be always so great as to render such terms insensible), we may substitute $\frac{1}{2}\mu$ for c in the limits of the error to be apprehended, without sensibly altering the probability, and consequently there is the probability $\Theta = \frac{2}{\sqrt{\pi}}\int_0^\tau e^{-t^2}dt$ that the true mean value k of the phenomenon A will lie between the limits

$$m \pm 2\tau\sqrt{(\tfrac{1}{2}\mu \div h)}, \text{ or } m \pm \tau\sqrt{(2\mu \div h)},$$

which contain only quantities given by observation.

On this hypothesis we have also (138) $c = (1 \div 2h)\Sigma\int\Delta^2\phi_n\Delta d\Delta$, or, supposing the law of facility to remain constant during the trials, $c = \frac{1}{2}\int\Delta^2\phi\Delta d\Delta$, therefore $\mu = \int\Delta^2\phi\Delta d\Delta$; that is to say, the mean of the squares of the actual errors may be taken for the sum of the squares of the possible errors multiplied by their respective probabilities. It is important to remark that as the observations become more numerous, the quantity μ, the mean of the squares of the errors, converges more and more to a constant quantity, and finally becomes independent of the number of observations.

143. The limits now found may be otherwise expressed. By hypothesis, $m=(1\div h)\Sigma\lambda_n=$ the arithmetical mean of the observed values, and $\mu=(1\div h)\Sigma(\lambda_n-m)^2=$ the mean of the squares of the reputed errors. Now $(\lambda_n-m)^2=\lambda_n^2-2\lambda_n m+m^2$, and $(1\div h)\Sigma 2\lambda_n m=2m(1\div h)\Sigma\lambda_n=2m^2$; therefore $\mu=(1\div h)\Sigma\lambda_n^2-m^2$, that is to say, the mean of the squares of the observations minus the square of the mean. Hence the limits, corresponding to a given probability Θ, of the difference between the average of all the observations and the true value, are expressed by either of these formulæ

$$\pm\tau\surd\{(2\times\text{ mean square of errors}\div h\},$$

$$\pm\tau\surd\{2\times\text{ mean square of obs.}-(\text{mean of obs.})^2\}\div\surd h,$$

h being the number of observations, and the relation between Θ and τ being given by the table. Generally speaking, the first of these formulæ is the most convenient for calculation.

144. Let l be the limit of the error to be feared in taking the average of the observations as the true result, then $l=\tau\surd(2\mu\div h)$, and $\tau=l\surd(h\div 2\mu.)$ Now when τ is constant, that is, for a given probability Θ, the determination will be more exact in proportion as l is a smaller number, and the precision will therefore be proportional to $\surd(h\div 2\mu)$. Hence $\surd(h\div 2\mu)$ is called by Gauss the *measure of the precision* of the determination. Suppose two series of observations to have been made for the determination of an element, the comparative accuracy of the results will depend on two things, the number of observations in each series, and the amount of the squares of the errors in each. If the number of observations is the same in both series, the precision of each result will be inversely as the square root of the sum of the squares of the errors, and the presumption of accuracy is in favour of that result with respect to which the sum of the squares of the errors is less than in the other. On the other hand, if the mean square of the errors is the same in both series, then the observations are alike good in both, and their relative values of the two results are directly as the square roots of the number of observations in each series. Hence, in order that one determination may be twice as good as another, it must be founded on four times the number of equally good observations. These considerations are very important, in comparing tables of mean values of whatever kind, for example, of the probabilities of life at the different ages, and in estimating risks which depend upon them.

145. Astronomers employ the terms, *weight*, *probable error*, and *mean error*, of a result, to denote certain functions of μ, the mean square of the errors. The square of the quantity which measures the precision of the result, is called the *weight* of the determination. Denoting the weight by w, we have therefore

$$w=h\div 2\mu=h^2\div 2\Sigma(\lambda_n-m)^2,$$

or the weight is equal to the square of the number of observations divided by twice the sum of the squares of the errors. Substituting this in the expression of the limits, we have $l=\tau\div\surd w$, and $\tau=l\surd w$; that is to say, for a given probability Θ, the limits of the error to be apprehended in taking the average as the true result are reciprocally proportional to the square root of the weight. When observations of different kinds, or results deduced from observation, are compared with each other, their relative weights (supposing the number of observations the same) are inversely as μ, and are expressed numerically by taking the weight of a certain series of observations as the unit of weight.

146. The *probable error* of the determination is that which corresponds to the probability $\Theta=\frac{1}{2}$. For $\Theta=\frac{1}{2}$ we have $\tau=\cdot 476936$; whence $\tau\surd 2=\cdot 674489$, and the formula $m\pm\tau\surd(2\mu\div h)$ becomes $m\pm\cdot 674489\surd(\mu\div h)$; whence

$$\text{probable error }=\cdot 674489\surd(\mu\div h).$$

147. The *mean error* of the result of a large number of observations may be deduced from the general formula in (136) as follows. That formula gives $qdt=(1\div\surd\pi)(1-\text{V})e^{-t^2}dt$ for the probability that the sum of the observed values will be $2\delta=hk+2t\surd(hc)$ exactly. Dividing the sum by h, qdt is also the probability that the average value given by all the observations will be exactly $k+2t\surd(c\div h)$. Now, on the hypothesis that positive and negative departures from the mean are equally probable, and supposing the origin of the co-ordinates to be transferred to the centre of gravity of the curve of mean probability, we have $k=0$, and $qdt=(1\div\surd\pi)(1-\text{V})e^{-t^2}dt$ is the infinitely small chance of the average error being $2t\surd(c\div h)$ exactly. Multiplying therefore this error into the chance of its taking place, and integrating the product from $t=0$ to $t=\infty$, we shall have the *mean* error, or *mean risk* of all the possible average errors affected with the positive sign. Now, observing that V represents a quantity divided by $\surd h$, and therefore when multiplied by $2t\surd(c\div h)$ becomes of the order $1\div h$, and may consequently be rejected, the product of the average error $2t\surd(c\div h)$ into its probability is $2\surd(c\div\pi h)\times te^{-t^2}dt$; and since $\int te^{-t^2}dt=\frac{1}{2}\int d.e^{-t^2}=\frac{1}{2}e^{-t^2}$, which from $t=0$ to $t=\infty$ becomes simply $\frac{1}{2}$, the integral of the above product from $t=0$ to $t=\infty$ is $\surd(c\div\pi h)$. Substituting for c its value (142) $=\frac{1}{2}\mu$, this result becomes $\surd(\mu\div 2\pi h)$; whence on computing $\surd(1\div 2\pi)$ we obtain

$$\text{mean error of series }=.398942\surd(\mu\div h).$$

This is the mean error or mean risk in respect of positive errors alone, or on the supposition that negative errors are not taken into account. But as positive and negative errors are equally likely, the mean error in respect of negative errors is the same quantity, whence the mean error in respect of errors of both kinds is $.797884\surd(\mu\div h)$. This is usually called the *average* error. The mean error differs from the probable error in this respect, that it depends on the magnitude of individual errors, as well as on the proportion in which errors of different magnitudes occur. The probable error is independent of the magnitude.

148. When the quantity μ (the mean square of the errors) has been found from a series of observations, the precision, weight, probable error, and mean error, of a coming observation of the same kind are found by supposing $h=1$ in the above expressions, and are respectively

precision . . $=\surd(1\div 2\mu)$
weight . . $=1\div 2\mu$
probable error $=.674489\surd\mu$
mean error . $=.398942\surd\mu$.

149. The preceding formulæ give the limits of the error to be feared in determining the value of a quantity from a series of observations, when the thing to be determined is that on which the observations are immediately made. We have now to apply the formulæ to the cases in which the quantity sought is not observed itself, but is a function of several others, which are separately determined by observation. The following problem is important:

Let u be a given function of a number of unknown quantities, x, x', x'', &c.; it is required to assign the limits of the probable error in the determination of U, and the weight of the result, when values of x, x', x'', found from observations independent of each other, and respectively affected with the probable errors $\varrho\surd\mu$, $\varrho\surd\mu'$, $\varrho\surd\mu''$, &c. ($\varrho=.674489$) are adopted instead of the true but unknown values of those quantities.

Let $u=f(x, x', x'', \text{&c.})$ be the given function, λ, λ', λ'', &c. observed values of x, x', x'', &c. and make $\lambda-x=e$,

$\lambda' - x' = e'$, $\lambda'' - x'' = e''$, &c. so that e, e', e'', &c. are the errors of observation, supposed to be so small that their squares may be rejected. Make $\frac{du}{dx} = a$, $\frac{du}{dx'} = a'$, $\frac{du}{dx''} = a''$, &c., then a, a', a'', are given quantities; and on substituting $x+e$, $x'+e'$, $x''+e''$ for x, x', x'', respectively, in the equation $u=f(x, x', x'', \&c.)$, and supposing u to become $u+E$ when the substitutions are made, so that E is the corresponding error of u, we have, on expanding u by Taylor's theorem,

$$E = ae + a'e' + a'e'' + \&c.$$

in respect of a single observation of each of the quantities. Taking the square of both sides of the equation, we have

$$E^2 = a^2e^2 + a'^2e'^2 + a''^2e''^2 + \&c. + 2aa'ee' + 2aa''ee'' + 2a'a''e'e'' + \&c.$$

Now since positive and negative errors are supposed equally probable, the sums of the products ee', ee'', $e'e''$, &c. or their mean values, become each $= 0$; therefore

$$\Sigma E^2 = a^2\Sigma e^2 + a'^2\Sigma e'^2 + a''\Sigma e''^2 + \&c.$$

Taking the mean value of each of these sums, and observing that μ the mean value of Σe^2 is independent of the number of observations (142), and assuming M to be the mean value of ΣE^2, we get

$$M = a^2\mu + a'^2\mu' + a''^2\mu'' + \&c.$$

This equation contains the solution of the problem, for all the functions of the error are given in terms of M. The probable error is $\cdot674489\sqrt{M}$.

150. Let W be the weight of the determination, and w, w', w'', &c. the weights corresponding to μ, μ', μ'', &c. then by the definition of weight, w is reciprocally proportioned to μ, and W to M; and we have by substitution,

$$W = 1 \div \left(\frac{a^2}{w} + \frac{a'^2}{w'} + \frac{a''^2}{w''} + \&c.\right).$$

If the weights are supposed all equal, this becomes

$$W = \frac{w}{a^2 + a'^2 + a''^2 + \&c.}$$

Suppose the errors e, e' e'', &c. to be respectively multiplied by numbers proportional to the square roots of the weights, (which is equivalent to supposing all the observations to have the same degree of precision measured by $\sqrt{(\mu w)}$), then the value of M becomes

$$M = a^2\mu w + a'^2\mu' w' + a''^2\mu'' w'' + \&c.$$

But w being reciprocally as μ, we have $\mu w = \mu' w' = \mu'' w''$, &c. $= 1$, therefore

$$W = \frac{1}{a^2 + a'^2 + a''^2 + \&c.}.$$

SECT. X. OF THE METHOD OF LEAST SQUARES.

151. In the determination of astronomical and physical elements from the data of observation, the thing which is actually observed is for the most part not the element which is sought to be determined, but a known function of that element. Thus, if V be a given function of X determined by the equation $V=F(X)$, the quantity observed may be a value of V, whilst the element sought to be determined is X. If the observation could give the value of V with absolute accuracy, then X would also be absolutely known; but as all observations are affected with certain errors of greater or less amount, owing to the imperfections of instruments or of sense, or the ever varying circumstances under which they are made, an exact value of X cannot be found from any single observation; and in order to obtain the utmost precision, it is necessary to employ a great number of observations, repeated under every variety of circumstance by which the result can be supposed to be affected.

152. The observed quantity V, instead of being a function of a single element X, may be a function of several elements X, Y, Z, &c.; for example, V may be the position of a planet, in which case it is a function of the six elements of the orbit, for the determination of which the observation is made. Each observation gives rise to an equation of this form, $V=F(X, Y, Z, \&c.)$; therefore when the number of equations is just equal to the number of unknown quantities, the problem is determinate; and supposing F to be an algebraic function, the values of X, Y, Z, &c. may be found by the ordinary methods of elimination. If the number of equations is less than the number of unknown quantities, the problem is indeterminate; but if greater, it may be said to be more than determinate, inasmuch as the equations may be combined in an infinite number of ways, each distinct combination giving a different value of the elements. It therefore becomes a question of the utmost importance to the perfection of the sciences of observation, to assign the particular combination which gives the most advantageous results, or values of X, Y, Z, &c. affected with the smallest probable errors.

153. As approximate values of the elements are in all cases either already known, or can be easily found, the object of accumulating observations is the correction of the approximate values. Let V be the true value of the thing observed, V_0 an approximate value, however found, X the true value of the element sought, X_0 an approximate value, corresponding to V_0, so that we have the two equations $V=F(X)$, $V_0=F(X_0)$; also, let the observed value of V in any observation be L, and make

$$v = V - L, \quad l = V_0 - L,$$

then v is the true but unknown error of the observation, and l its reputed error, that is to say, the difference between the computed value of the function and the result of the observation. Now if we assume x to represent the true correction of the approximate element, so that $X=X_0+x$, then, on substituting X_0+x for X in the function F, we get $V=F(X_0+x)$; whence, expanding the function by Taylor's theorem, and rejecting terms multiplied by x^2 and higher powers of x, because x is a very small quantity

$$V = V_0 + \frac{dV_0}{dX}x.$$

Let us now denote the differential coefficient, which is a known quantity, by a; then, observing that $V-V_0=v-l$, the equation becomes $v=l+ax$; that is to say, the true error of the observation is a linear function of the correction of the element.

154. In like manner, when there are several elements, X, Y, Z, &c.; on making $\frac{dV_0}{dX}=a$, $\frac{dV_0}{dY}=b$, $\frac{dV_0}{dZ}=c$, &c. a single observation furnishes the equation

$$v = l + ax + by + cz + \&c.,$$

and a series of observations, whose errors are respectively v, v', v'', &c. gives a system of linear equations equal in number to the number of observations; namely,

$$\begin{aligned} v &= l + ax + by + cz + \&c. \\ v' &= l' + a'x + b'y + c'z + \&c. \qquad (1) \\ v'' &= l'' + a''x + b''y + c''z + \&c. \\ &\&c. \end{aligned}$$

and the object is to give such values to x, y, z, &c. that the errors v, v', v'', &c. in respect of the whole of the observations, shall be the least possible. The equations being supposed independent of each other, if their number is just equal to that of the unknown quantities, the errors v, v', v'', &c. can be made all zero; but if, as is usually the case, there are more equations than unknown quantities, it is impossible by any means whatever to annihilate the whole of them, and therefore all that can be accomplished is to find the system of values of x, y, z, &c. which most nearly, and with the greatest probability, satisfies the whole of the equations. If the observations are not all equally good, the equations are supposed to be each multiplied by a number proportional to the square root of the presumed weight of the observation on which it depends, in order that they may all have the same degree of precision.

155. As the question is to find the most probable values of x, y, z, &c. the first thing necessary is to express each of these elements in terms of the observations. Suppose k, k', k'', &c. to be a system of indeterminate quantities, independent of x y, z, &c. and let the first of the above conditional equations be multiplied by k, the second by k', the third by k'', and so on; then adding the products, if k, k', k'', &c. be determined so as to make the coefficient of x equal to unit, and those of y, z, &c. each equal to 0; that is to say, so as to satisfy the equations

$$\begin{aligned} &ka+k'a'+k''a''+\text{\&c.}=1\\ &kb+k'b'+k''b''+\text{\&c.}=0 \qquad (2)\\ &kc+k'c'+k''c''+\text{\&c}=0\\ &\text{\&c.}\end{aligned}$$

we shall then have $x=\mathrm{K}+kv+k'v'+k''v''+$ &c. where K is a quantity independent of v, v', v'', &c. Hence x is found $=\mathrm{K}$, with an error $=kv+k'v'+k''v''+$&c.; and the *weight* of the determination, by the formula in (150), is $\dfrac{1}{k^2+k'^2+k''^2+\text{\&c}}$. The weight of the determination is consequently greater in proportion as $k^2+k'^2+k''^2+$ &c. is smaller; and hence of all the possible systems of indeterminate coefficients, k, k', k'', &c. which satisfy the equations (2), the system which gives the most probable value of x, or the most advantageous result, is that for which $k^2+k'^2+k''^2+$&c. is an absolute minimum.

156. We have now to find, in terms of known quantities, values of the indeterminate coefficients k, k', k'', &c. which satisfy the condition of the minimum. For the sake of abridging, let us denote the aggregate of the products $aa+a'a'+a''a''+$ &c, by $\mathrm{S}(aa)$, that of $ab+a'b'+a''b''+$ &c. by $\mathrm{S}(ab)$, and so on, and also assume

$$\begin{aligned} \xi&=av+a'v'+a''v''+\text{\&c.}\\ \eta&=bv+b'v'+b''v''+\text{\&c.} \qquad (3)\\ \zeta&=cv+c'v'+c''v''+\text{\&c.}\end{aligned}$$

On substituting in these equations the values of v, v', v'', &c. given by the equations (1), there results

$$\begin{aligned} \xi&=\mathrm{S}(al)+x\mathrm{S}(aa)+y\mathrm{S}(ab)+z\mathrm{S}(ac)+\text{\&c.}\\ \eta&=\mathrm{S}(bl)+x\mathrm{S}(ab)+y\mathrm{S}(bb)+z\mathrm{S}(bc)+\text{\&c.} \qquad (4)\\ \zeta&=\mathrm{S}(cl)+x\mathrm{S}(ac)+y\mathrm{S}(bc)+z\mathrm{S}(cc)+\text{\&c.}\end{aligned}$$

a system of equations equal in number to the number of elements x, y, z, &c. and from which, consequently, those elements would be determined absolutely if the observations were perfectly exact, that is, if the errrors v, v', v'', &c. were individually zero, and consequently ξ, η, ζ, &c., were each zero. On eliminating y, z, &c. from the last system, the value of x is given in terms of ξ, η, ζ, and known quantities by a linear equation of the following form:

$$x=\mathrm{A}+f\xi+g\eta+h\zeta+\text{\&c.} \qquad (5)$$

where f, g, h, &c. are co-efficients independent of x, y, z, &c. and also of ξ, η, ζ, &c.

If we now substitute in equation (5) the values ξ, η, ζ, &c. given by equations (3), and also assume

$$\begin{aligned} a&=fa+gb+hc+\text{\&c.}\\ a'&=f'a'+g'b'+h'c'+\text{\&c.} \qquad (6)\\ a''&=f''a''+g''b''+h''c''+\text{\&c.},\end{aligned}$$

we shall have by addition

$$x=\mathrm{A}+av+a'v'+a''v''+\text{\&c.};$$

whence it appears that a, a', a'', &c. are a system of multipliers by which y, z, &c. are eliminated from equations (1); they must therefore satisfy the equations (2), whence

$$\begin{aligned} &aa+a'a'+a''a''+\text{\&c.}=1\\ &ab+a'b'+a''b''+\text{\&c.}=0 \qquad (7)\\ &ac+a'c'+a''c''+\text{\&c.}=0.\end{aligned}$$

Subtracting these from the equations (2) we obtain

$$\begin{aligned} 0&=(k-a)a+(k'-a')a'+(k''-a'')a''+\text{\&c.}\\ 0&=(k-a)b+(k-a)b'+(k''-a'')b''+\text{\&c.}\\ 0&=(k-a)c+(k-a)c'+(k''-a'')c''+\text{\&c.},\end{aligned}$$

on multiplying which respectively by f, g, h, and adding the products, we get by reason of the equations (6),

$$0=(k-a)a+(k'-a')a'+(k''-a'')a''+\text{\&c.}$$

This equation may be put under the form $k^2+k'^2+k''^2+$&c.

$$=\alpha^2+\alpha'^2+\alpha''^2+\text{\&c.}+(k-\alpha)^2+(k'-\alpha')^2+(k''-\alpha'')^2+\text{\&c.}$$

from which it is evident that $k^2+k'^2+k''^2+$ &c. will be a minimum when $k=a$, $k'=a'$, $k''=a''$, &c. Hence it follows that the most probable value of x which can be deduced from the equations (1), is $x=\mathrm{A}$; and by (150) the weight of the determination is $1\div(aa+a'a'+a''a''+\text{\&c.})=1\div\mathrm{S}(aa)$.

This quantity $\mathrm{S}\,(aa)$ is equal to f the co-efficient of ξ in the equation (5); for on multiplying the first of equations (7), by f, the second by g, and the third by h, and adding the products, we obtain by reason of equations (6),

$$aa+a'a'+a''a''+\text{\&c.}=f.$$

157. The method explained in the two last paragraphs of determining the most advantageous combination of a system of linear equations, of the form of those in (154), is given by Gauss in his *Theoria Combinationis Observationum erroribus minimis obnoxiæ*, (Gottingen, 1823). The practical rule to which it leads is as follows: Having given a near value V of a function of several elements, X, Y, Z, &c. and also a series L, L′, L″, &c. of observed values of V, make $(\mathrm{V}-\mathrm{L})\sqrt{w}=v$, $(\mathrm{V}-\mathrm{L}')\sqrt{w'}=v'$, $(\mathrm{V}-\mathrm{L}'')\sqrt{w'}$, $=v''$, &c. and form the equations in (1). From these equations (4) are easily deduced; and from these, again, by elimination, are found the values of x, y, z, &c. the corrections of the approximate elements X, Y, Z, &c., in equations of the form (5), which, for the sake of symmetry, may be thus written:

$$\begin{aligned} x&=\mathrm{A}+(\alpha\alpha)\xi+(\alpha\beta)\eta+(\alpha\gamma)\zeta+\text{\&c.}\\ y&=\mathrm{B}+(\alpha\beta)\xi+(\beta\beta)\eta+(\beta\gamma)\zeta+\text{\&c.}\\ z&=\mathrm{C}+(\alpha\gamma)\xi+(\beta\gamma)\eta+(\gamma\gamma)\zeta+\text{\&c.}\end{aligned}$$

then the most probable values of x, y, z, &c. are repectively A, B, C, &c.; the weights of the determinations respectively $\dfrac{1}{(\alpha\alpha)}$, $\dfrac{1}{(\beta\beta)}$, $\dfrac{1}{(\gamma\gamma)}$, &c.; and the probable errors of the several determinations are $\rho\sqrt{(\alpha\alpha)}$, $\rho\sqrt{(\beta\beta)}$, $\rho\sqrt{(\gamma\gamma)}$, &c., where $\rho=\cdot476936$.

158. The values of x, y, z, &c. now deduced are obtained immediately, by supposing the sum of the squares of the errors of observation to be a minimum. Thus, forming the squares of the equations (1), and making $\Omega=v^2+v'^2+v''^2+$ &c., the differentiation of Ω in respect of each of the variables x, y, z, &c. produces the quantities denoted in (156), by ξ, η, ζ, &c. that is to say, it gives

$$\frac{d\Omega}{dx}=2\xi,\ \frac{d\Omega}{dy}=2\eta,\ \frac{d\Omega}{dz}=2\zeta, \text{ \&c.}$$

therefore if Ω be a minimum, ξ, η, ζ, become severally zero, and the equations (4) give by elimination, $x=\mathrm{A}$, $y=\mathrm{B}$, $z=\mathrm{C}$, where A, B, and C denote the same quantities as above. Now from equation (5) the general value of x is

$$x=\mathrm{A}+(\alpha\alpha)\xi+(\alpha\beta)\eta+(\alpha\gamma)\zeta,$$

and the most probable value being $x=A$, it follows that the most probable values of the corrections x, y, z, are found by making the differential coefficients of Ω equal to zero, that is, by making $v^2+v'^2+v''^2+$ &c. an absolute minimum. Hence this method of combining equations of condition is called the *method of least squares;* and it follows from the preceding analysis, that it gives the most probable values of the corrections, or the most advantageous results.

159. As an example, let us suppose there is only one unknown element X, of which X_o is known to be an approximate value, and L, L′, L″, &c. are observed values, the weights of which are respectively proportional to w, w', w'', &c. and that it is required to determine the most probable value of X from the observations, and also the weight of the determination. Make $(X-L)\sqrt{w}=v$, $(X_o-L)\sqrt{w}=l$, and let x be the correction of X, so that $X=X_o-x$. On substituting this in $(X-L)\sqrt{w}=v$, we have $(X_o-x-L)\sqrt{w}=v$, or $v=l\sqrt{w}-x\sqrt{w}$. Each observation gives a similar equation, and the equations (1) in (154) consequently become

$$v=l\sqrt{w}-x\sqrt{w}$$
$$v'=l'\sqrt{w'}-x\sqrt{w'}$$
$$v''=l''\sqrt{w''}-x\sqrt{w''}, \text{ \&c.}$$

therefore, multiplying each by the coefficient of its own x, we have $\xi=S(lw)-xS(w)$, whence consequently $x=S(lw)\div S(w)-\xi\div S(w)$, that is to say, the most probable value of x is

$$x=\frac{lw+l'w'+l''w''+\text{ \&c.}}{w+w'+w''+\text{ \&c.}},$$

and the weight of the determination is proportional to the reciprocal of $w+w'+w''+$ &c.

Since $X-L=x-l$, we have also

$$X=\frac{Lw+L'w+L''w+\text{ \&c.}}{w+w'+w''+\text{ \&c.}},$$

whence this proposition: If a series of values of an element are found from observations which have not all the same degree of precision, the most probable value of the element is found by multiplying each observation by a number proportional to its weight, and dividing the sum of the products by the sum of the weights; and the comparative weight of the result is unit divided by the sum of all the weights.

If the weights be all equal, and the number of the observations be h, then $X=(L+L'+L''+\text{ \&c.})\div h$; that is to say, the average of a series of equally good observations gives the most probable value. The average may, therefore be considered as a particular case of the method of least squares.

160. To illustrate the method of proceeding when there are several elements to be corrected from the observations, we shall take the following numerical example from Gauss (*Theoria Motus*). Suppose there are three elements, and that three observations, of equal weight, have given the equations $x-y+2z=3$, $3x+2y-5z=5$, $4x+y+4z=21$; and that a fourth observation, of which the relative weight is one-fourth, or its precision one-half, of that of the others has given $-2x+6y+6z=28$. The first step is to reduce this last equation to the same standard of weight with the others, for which purpose it must be multiplied by $\frac{1}{2}$; it then becomes $-x+3y+3z=14$. Now, as x, y, and z cannot be determined so as to satisfy four independent equations, we suppose each observation, or equation, to be affected with an error v, and accordingly obtain the following system of equations, corresponding to equations (1), viz.:

$$v=-3+x-y+2z$$
$$v'=-5+3x+2y-5z$$
$$v''=-21+4x+y+4z$$
$$v'''=-14-x+37+3z,$$

from which the most probable values of x, y, and z are to be deduced. Let each equation be multiplied by the coefficient of its own x, taken with its proper sign, namely, the first by 1, the second by 3, the third by 4, and the fourth by -1; the results added together give the value of ξ, namely, $\xi=-88+27x+6y$. In like manner, let the first be multiplied by -1, the second by 2, the third by 1, and the fourth by 3, the sum of the products will give η. Lastly, let the equations be multiplied respectively by the coefficients of z, and the sum of the products made equal to ζ; we have then the following equations corresponding to the equations (4)

$$\xi=-88+27x+6y+0$$
$$\eta=-70+6x+15y+z$$
$$\zeta=-107+0+y+54z.$$

From these we get by elimination

$$19899x=49154+809\xi-324\eta+6\zeta$$
$$737y=2617-12\xi+54\eta-\zeta$$
$$39798z=76242+12\xi-54\eta+1473\zeta,$$

whence (157) A, B, C, the most probable values of x, y, z, are respectively

$$A=\frac{49154}{19899}=2{\cdot}470,\ B=\frac{2617}{737}=3{\cdot}551,\ C=\frac{76242}{39798}=1{\cdot}916;$$

and the relative weights w, w', w'', are respectively

$$w=\frac{19899}{809}=24{\cdot}6,\ w'=\frac{737}{54}=13{\cdot}6,\ w''=\frac{39798}{1473}=27{\cdot}0,$$

whence the probable errors $({\cdot}476936\div\sqrt{w})$ are respectively ·096, ·129, ·092.

The method of least squares, to which modern astronomy is indebted for much of its precision, was first proposed by Legendre, in his *Nouvelles Méthodes pour la Determination des Orbites des Comètes*, (Paris, 1806,) merely as means of avoiding inconvenience and uncertainty arising from the want of a uniform and determinate method of combining numerous equations of condition, and without reference to the theory of probability. The same method, however, had previously been discovered by Gauss, and a demonstration of it, deduced from the general theory of chances, was given by him in his *Theoria Motus*, (1809.) It may be shewn in various ways, that this method of combination gives values of the unknown quantities affected with the smallest probable errors; but it is to be observed, that all the demonstrations are subordinate to the hypothesis, that positive and negative errors of equal magnitude are equally probable, or that the average of a large number of results gives the most probable value, and consequently that the function which represents the probability of an error has the form assigned to it in (132).

The limits of this article will not permit us to enter into further details respecting the applications of the method of least squares. On the general theory of the probable errors of results deduced from observation, and the most advantageous methods of combining equations of condition, the reader may consult the *Théorie Analytique des Probabilités* of Laplace; the *Theoria Motus* of Gauss; the *Theoria Combinationis Observationum*, and the *Supplementum Theoriæ Combinationis*, &c. (Göttingen, 1828) of the same author; the *Recherches sur la Probabilité des Jugements*, with the two Memoirs of Poisson in the *Connaissance des Tems* for 1827 and 1832; and three masterly papers, by Mr Ivory, in the *Philosophical Magazine* for 1825. In the volumes of the *Berliner Astronomisches Jahrbuch* for 1833, 1834, and 1835, M. Encke has treated the subject at great length, and given a number of formulæ calculated to facilitate the labours of the computer. We may also refer, in conclusion, to a remarkable disquisition on the theory of probable errors, by the celebrated astronomer Bessel, forming Nos. 358 and 359 of Schumacher's *Astronomische Abhandlungen*, Altona, October 1838.

(T. G.)

TABLE of the Values of the Integral $\Theta = \frac{2}{\sqrt{\pi}}\int_0^{\tau} e^{-t^2}dt = 1 - \frac{2}{\sqrt{\pi}}\int_{\tau}^{\infty} e^{-t^2}dt$, for intervals each =·01, from $\tau=0$ to $\tau=3$, with their first and second differences.

τ	Θ	Δ	Δ^2	τ	Θ	Δ	Δ^2	τ	Θ	Δ	Δ^2	τ	Θ	Δ	Δ^2
0·00	0·0000000	112833	22	0·75	0·7111556	63811	962	1·50	0·9661052	11716	349	2·25	0·9985373	698	30
0·01	·0112833	112811	45	0·76	·7175367	62849	961	1·51	·9672768	11367	340	2·26	·9986071	668	30
0·02	·0225644	112766	67	0·77	·7238216	61888	957	1·52	·9684135	11027	332	2·27	·9986739	638	29
0·03	·0338410	112699	90	0·78	·7300104	60931	956	1·53	·9695162	10695	325	2·28	·9987377	609	27
0·04	·0451109	112609	112	0·79	·7361035	59975	952	1·54	·9705857	10370	316	2·29	·9987986	582	26
0·05	·0563718	112497	135	0·80	·7421010	59023	948	1·55	·9716227	10054	309	2·30	·9988568	556	25
0·06	·0676215	112362	158	0·81	·7480033	58075	945	1·56	·9726281	9745	301	2·31	·9989124	531	24
0·07	·0788577	112204	179	0·82	·7538108	57130	941	1·57	·9736026	9444	294	2·32	·9989655	507	23
0·08	·0900781	112025	201	0·83	·7595238	56189	936	1·58	·9745470	9150	286	2·33	·9990162	484	23
0·09	·1012806	111824	224	0·84	·7651427	55253	931	1·59	·9754620	8864	279	2·34	·9990646	461	20
0·10	·1124630	111600	246	0·85	·7706680	54322	926	1·60	.9763484	8585	273	2·35	·9991107	441	21
0·11	·1236230	111354	267	0·86	·7761002	53396	921	1·61	.9772069	8312	264	2·36	·9991548	420	19
0·12	·1347584	111087	288	0·87	·7814398	52475	916	1·62	·9780381	8048	259	2·37	·9991968	401	19
0·13	·1458671	110799	310	0·88	·7866873	51559	909	1·63	·9788429	7789	251	2·38	·9992369	382	18
0·14	·1569470	110489	331	0·89	·7918432	50650	904	1·64	·9796218	7538	245	2·39	·9992751	364	17
0·15	·1679959	110158	352	0·90	·7969082	49746	897	1·65	·9803756	7293	238	2·40	·9993115	347	16
0·16	·1790117	109806	372	0·91	·8018828	48849	891	1·66	·9811049	7055	231	2·41	·9993462	331	16
0·17	·1899923	109434	393	0·92	·8067677	47958	883	1·67	·9818104	6824	226	2·42	·9993793	315	15
0·18	·2009357	109041	414	0·93	·8115635	47075	877	1·68	·9824928	6598	220	2·43	·9994108	300	14
0·19	·2118398	108627	434	0·94	·8162710	46198	870	1·69	·9831526	6378	212	2·44	·9994408	286	14
0·20	·2227025	108193	453	0·95	·8208908	45328	861	1·70	·9837904	6166	208	2·45	·9994694	272	12
0·21	·2335218	107740	473	0·96	·8254236	44467	855	1·71	·9844070	5958	201	2·46	·9994966	260	14
0·22	·2442958	107267	492	0·97	·8298703	43612	846	1·72	·9850028	5757	196	2·47	·9995226	246	11
0·23	·2550225	106775	512	0·98	·8342315	42766	839	1·73	·9855785	5561	190	2·48	·9995472	235	12
0·24	·2657000	106263	529	0·99	·8385081	41927	830	1·74	·9861346	5371	185	2·49	·9995707	223	10
0·25	·2763263	105734	549	1·00	·8427008	41097	822	1·75	·9866717	5186	179	2·50	·9995930	213	11
0·26	·2868997	105185	567	1·01	·8468105	40275	813	1·76	·9871903	5007	175	2·51	·9996143	202	10
0·27	·2974182	104618	584	1·02	·8508380	39462	805	1·77	·9876910	4832	168	2·52	·9996345	192	9
0·28	·3078800	104034	601	1·03	·8547842	38657	796	1·78	·9881742	4664	165	2·53	·9996537	183	10
0·29	·3182834	103433	619	1·04	·8586499	37861	786	1·79	·9886406	4499	159	2·54	·9996720	173	8
0·30	·3286267	102814	636	1·05	·8624360	37075	777	1·80	·9890905	4340	154	2·55	·9996893	165	8
0·31	·3389081	102178	652	1·06	·8661435	36297	768	1·81	·9895245	4186	150	2·56	·9997058	157	8
0·32	·3491259	101526	667	1·07	·8697732	35529	760	1·82	·9899431	4036	144	2·57	·9997215	149	8
0·33	·3592785	100859	684	1·08	·8733261	34769	749	1·83	·9903467	3892	141	2·58	·9997364	141	6
0·34	·3693644	100175	698	1·09	·8768030	34020	740	1·84	·9907359	3751	136	2·59	·9997505	135	8
0·35	·3793819	99477	714	1·10	·8802050	33280	731	1·85	·9911110	3615	133	2·60	·9997640	127	6
0·36	·3893296	98763	729	1·11	·8835330	32549	721	1·86	·9914725	3482	127	2·61	·9997767	121	6
0·37	·3992059	98034	742	1·12	·8867879	31828	712	1·87	·9918207	3355	124	2·62	·9997888	115	6
0·38	·4090093	97292	755	1·13	·8899707	31116	701	1·88	·9921562	3231	120	2·63	·9998003	109	6
0·39	·4187385	96537	769	1·14	·8930823	30415	691	1·89	·9924793	3111	116	2·64	·9998112	103	5
0·40	·4283922	95768	782	1·15	·8961238	29724	682	1·90	·9927904	2995	112	2·65	·9998215	98	5
0·41	·4379690	94986	795	1·16	·8990962	29042	672	1·91	·9930899	2883	108	2·66	·9998313	93	5
0·42	·4474676	94191	807	1·17	·9020004	28370	661	1·92	·9933782	2775	106	2·67	·9998406	88	4
0·43	·4568867	93384	817	1·18	·9048374	27709	652	1·93	·9936557	2669	101	2·68	·9998494	84	5
0·44	·4662251	92567	830	1·19	·9076083	27057	642	1·94	·9939226	2568	99	2·69	·9998578	79	4
0·45	·4754818	91737	840	1·20	·9103140	26415	631	1·95	·9941794	2469	95	2·70	·9998657	75	4
0·46	·4846555	90897	851	1·21	·9129555	25784	622	1·96	·9944263	2374	91	2·71	·9998732	71	4
0·47	·4937452	90046	861	1·22	·9155339	25162	611	1·97	·9946637	2283	89	2·72	·9998803	67	4
0·48	·5027498	89185	869	1·23	·9180501	24551	602	1·98	·9948920	2194	85	2·73	·9998870	63	2
0·49	·5116683	88316	878	1·24	·9205052	23949	591	1·99	·9951114	2109	84	2.74	·9998933	61	4
0·50	·5204999	87438	888	1·25	·9229001	23358	581	2·00	·9953223	2025	78	2·75	·9998994	57	3
0·51	·5292437	86550	896	1·26	·9252359	22777	571	2·01	·9955248	1947	79	2·76	·9999051	54	3
0·52	·5378987	85654	903	1·27	·9275136	22206	561	2·02	·9957195	1868	73	2·77	·9999105	51	3
0·53	·5464641	84751	910	1·28	·9297342	21645	552	2·03	·9959063	1795	72	2·78	·9999156	48	2
0·54	·5549392	83841	917	1·29	·9318987	21093	541	2·04	·9960858	1723	69	2·79	·9999204	46	3
0·55	·5633233	82924	923	1·30	·9340080	20552	532	2·05	·9962581	1654	67	2·80	·9999250	43	2
0·56	·5716157	82001	930	1·31	·9360632	20020	522	2·06	·9964235	1587	65	2·81	·9999293	41	3
0·57	·5798158	81071	935	1·32	·9380652	19498	511	2·07	·9965822	1522	61	2·82	·9999334	38	1
0·58	·5879229	80136	940	1·33	·9400150	18987	502	2·08	·9967344	1461	61	2·83	·9999372	37	3
0·59	·5959365	79196	945	1·34	·9419137	18485	493	2·09	·9968805	1400	57	2·84	·9999409	34	1
0·60	·6038561	78251	949	1·35	·9437622	17992	482	2·10	·9970205	1343	55	2·85	·9999443	33	2
0·61	·6116812	77302	953	1·36	·9455614	17510	474	2·11	·9971548	1288	54	2·86	·9999476	31	2
0·62	·6194114	76349	955	1·37	·9473124	17036	463	2·12	·9972836	1234	51	2·87	·9999507	29	2
0·63	·6270463	75394	959	1·38	·9490160	16573	455	2·13	·9974070	1183	50	2·88	·9999536	27	1
0·64	·6345857	74435	962	1·39	·9506733	16118	445	2·14	·9975253	1133	47	2·89	·9999563	26	2
0·65	·6420292	73473	963	1·40	·9522851	15673	435	2·15	·9976386	1086	47	2·90	·9999589	24	1
0·66	·6493765	72510	965	1·41	·9538524	15238	427	2·16	·9977472	1039	45	2·91	·9999613	23	1
0·67	·6566275	71545	966	1·42	·9553762	14811	418	2·17	·9978511	994	40	2·92	·9999636	22	1
0·68	·6637820	70579	968	1·43	·9568573	14393	409	2·18	·9979505	954	41	2·93	·9999658	21	2
0·69	·6708399	69611	967	1·44	·9582966	13984	399	2·19	·9980459	913	41	2·94	·9999679	19	1
0·70	·6778010	68644	968	1·45	·9596950	13585	391	2·20	·9981372	872	37	2·95	·9999698	18	1
0·71	·6846654	67676	968	1·46	·9610535	13194	382	2·21	·9982244	835	36	2·96	·9999716	17	...
0.72	·6914330	66708	966	1·47	·9623729	12812	374	2.22	·9983079	799	35	2·97	·9999733	...	...
0·73	·6981038	65742	966	1·48	·9636541	12438	365	2·23	·9983878	764	33			...	...
0·74	·7046780	64776	965	1·49	·9648979	12073	357	2·24	·9984642	731	33	3·00	·9999779	...	...

PROBATE of a will or testament, in law, is the exhibiting and proving of last wills and testaments before the ecclesiastical judge delegated by the bishop, who is ordinary of the place where the party died.

PROBLEM (πρόβλημα, from προβάλλω, *I put forward*), a question proposed. In logic, a proposition that appears neither absolutely true nor absolutely false; and consequently may be asserted either in the affirmative or negative. In geometry, a proposition in which some operation or construction is required; as to divide a line or an angle, let fall a perpendicular, &c. In general, any question involving doubt or uncertainty, and requiring further evidence for its solution.

PROBUS, MARCUS AURELIUS, a Roman emperor, was born at Sirmium in Pannonia, and entered the army at a very early age. His rise to eminence was brilliant and rapid. While he was still a mere boy, the Emperor Valerian made him a military tribune, and placed him on the ladder of promotion. As he rose in fortune, he increased in ability. His considerate bearing and judicious discipline won the hearts of his subordinates, and his upright character and professional skill secured the esteem of his superiors. There was not a military duty which this admirable youth did not perform in a manner which demanded the greatest rewards and challenged the highest praise. His personal valour on the field gained bracelets, spears, the mural and civic crowns, and other badges of soldierly merit. His campaigns in Africa, Egypt, Arabia, Scythia, Persia, Germany, and Gaul, raised him high in the estimation of several successive emperors. In the reign of Tacitus especially he was greatly in favour, and was appointed commander-in-chief of all the eastern provinces. At length, on the death of that emperor in 276, he was brought forward as a candidate for the purple; his rival, Florianus, soon fell before him, and he was declared emperor with the united consent of the army, the people, and the Senate.

An arduous task now lay before Probus. He set himself with all his characteristic energy and rapidity to reform and consolidate the empire, which was distracted by discordant elements from within, and impaired by hostile agencies from without. His first measure was to establish peace throughout his dominions. Placing himself at the head of a mighty army, and advancing eastward from the coasts of Gaul, he began to overwhelm all opposition with one sweeping campaign. No foe could resist his impetuous onward march. The barbarian invaders of the Gallic province were cut to pieces before his terrific onslaught, and fled across the borders, leaving 400,000 slain. The enemies beyond the Rhine, catching the rumours of his triumphs as he advanced across the continent, became paralysed with fear. Nine of the most powerful German princes threw themselves down at his feet, and submitted to be hemmed in within their own territories by a line of posts. The power of the vagrant Sarmatians was shattered before him; the Goths upon the Thracian borders were awed into submission; and no hostile tribe was left unsubdued in the whole of Europe. No sooner had that campaign been completed than he hastened to Asia Minor to storm the robber Isaurians in their mountain fastnesses. A long time had not elapsed before he was in Ethiopia, suppressing the rebellion of the savage Blemmyes. He then repaired to Alexandria, and checked the revolt of his own general Saturninus. At length he brought his wars to a conclusion in 280, by quelling the mutiny of his two officers Bonosus and Proculus in Gaul. After Probus had thus effected peace, his next design was to strengthen it by promoting industry. Accordingly a vigorous system of policy was set on foot to encourage honest labour. Predatory tribes were removed into the heart of strange countries, where circumstances might compel them to lay aside their warlike habits, and to have recourse to peaceful pursuits. Lands, cattle, and implements were also given to those who were inclined to follow husbandry. Nor were these measures tried upon civilians alone. The soldiers likewise were subjected to toil, in order that they might preserve their hardihood and discipline. The whole empire in fact seemed to be acquiring internal prosperity when an event occurred which removed the originator and administrator of this peaceful policy. It happened on a broiling August day of 282, that Probus stood urging on the soldiers while they were engaged in the unhealthy and toilsome task of draining the marshes of Sirmium. The drudgery of the work and his severe exactions threw the sweating troops into a ferment of discontent and indignation. All at once they flung down their ignoble tools, seized their warlike weapons, and rose in one wild mass of confusion and mutiny. It was to no purpose that the emperor took refuge in a strong tower. The fury of his soldiers was irresistible; the tower was forced, and a thousand swords were plunged into his body.

PROCACCINI, a family of eminent Italian artists, of whom ERCOLE PROCACCINI was the father. He was born at Bologna in 1720, and practised his profession at Milan. Laborious, careful, and exact, he did not fail to achieve success. His pictures, in spite of a tameness of colouring and an over-minuteness of detail, were notable for their graceful and correct figures, and their freedom from slovenly mannerisms. His mode of teaching was especially painstaking and excellent. Some of the most distinguished artists of the Milanese school issued from his academy. Ercole Procaccini was still living in 1591. His principal works are in the churches of Bologna.

PROCACCINI, *Camillo*, the eldest son of the preceding, was born at Bologna in 1546. The course of training by which he was fitted for his profession was very thorough. In his father's school he was inured to patient and tasteful elaboration. Then repairing to Rome to complete his education for himself, he acquired higher qualifications. The contemplation of the great creations of Michael Angelo kindled his imagination. The study of the graceful heads of Parmigiano refined his taste. His brain became ready and fertile in inventing, and his hand became rapid and felicitous in executing. There was scarcely an artistic accomplishment, in fact, which he did not easily acquire. Camillo Procaccini thus attained to great eminence, and his name became well known in many cities. At Bologna, Ravenna, Pavia, and Genoa, he received as much employment as would have occupied two artists. At Reggio he painted "St Rocco Dispensing the Sacrament to the Plague-stricken Victims" with so much excellence that Annibale Caracci was discouraged when he was commissioned to execute a companion picture to it. At Piacenza he finished a fresco of the "Coronation of the Virgin," which was only eclipsed by an adjacent work of his great rival above mentioned. Nor was his fame less at Milan, his fixed place of residence. At the time of his death in 1626 there were few artists who rivalled him in the estimation of his fellow-citizens.

PROCACCINI, *Giulio Cesare*, was the second son of Ercole Procaccini, and was born at Bologna in 1548. He was studying sculpture when the success of his brother Camillo induced him to enter upon the profession of a painter. The excellence which he soon attained in his new profession was very great. His conceptions were multiform and grand, his design was dignified and correct, and his colouring was rich and harmonious. Pervading all there was an exquisite grace, which was evidently copied from Corregio, and which approached nearer to the style of that great master than any imitations had ever done before. Such a number of estimable accomplishments could not fail to secure for Procaccini an honourable place in the annals of painting. Accordingly, at his death in 1626 he left several pictures which still preserve a high reputation. The most famous of these are at Milan. There are a "Deposition" and the "Martyrdom of St Nazarus and St Celsus" in the church of La Madonna, a "St Carlo" in the church of San Tomaso in Terra Mala, an "Annunciation" and several other pictures in the church of San Antonio, a portrait of Pope Julius III. in the imperial palace, and the "Adoration of the Magi" in the Brera gallery.

PROCACCINI, *Carlo Antonio*, was the third son of Ercole Procaccini, and was born at Bologna in 1555. Although brought up in the school of his father, he spent his life chiefly in painting landscapes, flowers, and fruits. He had a son named Ercole who obtained some repute as an artist.

PROCIDA, GIOVANNI DI, an eminent Sicilian patriot, was born at Salerno about 1225, and became proprietor of the island of Procida. His first appearance on the stage of history was made in 1266, when Charles of Anjou slew Manfredi, King of Sicily, at the battle of Benevento, and seized upon the vacant throne. All his time and fortune were forthwith staked upon an enterprise for restoring the expelled house of Hohenstauffen. To draw the sword in behalf of the stripling Conrad was his first attempt. When that prince was defeated and executed, all his efforts were next directed to the formation of a widely-organized conspiracy against the triumphant usurper. He hastened to Spain to persuade Peter of Aragon to claim the Sicilian crown in right of his wife, the daughter of Manfredi. He returned to Sicily in disguise, to encourage the rebellious spirit among his countrymen, with the promise of assistance from the King of Aragon. He then repaired to the Emperor Michael Palæologus at Constantinople, and brought back money to buy weapons for the disarmed natives. At length he drew the chief of his accomplices to Palermo, and waited until some accident should light the train which he had so artfully laid. That accident soon occurred. It happened on the Easter Monday of 1282 that a mixed procession of citizens and French invaders set out from Palermo to hear vespers at a neighbouring village church. On the way a Frenchman began to be rude to a Sicilian maiden, and was immediately stabbed to the heart by the betrothed of the insulted girl. This desperate deed acted like a firebrand upon the excited tempers of the natives. Their long pent-up revenge burst into a wild explosion; the cry of "Death to the French" rose in the air; each man turned with drawn dagger upon the foreigner that was next him; and before the vesper-bell had ceased to sound, every Frenchman in the company was slain. Nor was their thirst for vengeance slaked with so much blood. They rushed home to exterminate those foreigners who had remained in the city. Neither age nor sex was spared. The carnage raged indiscriminately until 4000 lay weltering in their blood, and the fury of the assassins was suddenly checked for want of victims. This massacre, known by the name of "the Sicilian vespers," decided the fate of Sicily. The revolt spread through the rest of the country; Peter of Aragon landed and received the crown; Charles of Anjou was repulsed in his attempt to regain the island; and Giovanni di Procida, before his death at the beginning of the fourteenth century, had the satisfaction of seeing that through his patriotic exertions the lawful sovereigns of Sicily were seated in undisputed possession of the throne.

PROCIDA (anc. *Prochyta*), an island in the Mediterranean, belonging to the kingdom of Naples, lies between Cape Miseno and the island of Ischia, at the northern extremity of the Bay of Naples. Its form is irregular; and it is 2½ miles from N.E. to S.W., and as much from N.W. to S.E. A strait, 3½ miles broad, separates it from the mainland. The northern extremity of the island terminates in steep and picturesque cliffs; on one of which, Cape Rocciola, the N.E. point, stands a ruined castle commanding a fine view. On the slopes of this hill, towards the south, the town of Procida, with its flat-roofed houses, gardens, vineyards, and orange groves, has a beautiful appearance. Its population is 3400. The island is chiefly occupied with gardens and vineyards; and the people are employed in these and in seafaring pursuits, which are actively carried on,—no fewer than 300 vessels being owned in the island. The chief article of commerce is fruit. The inhabitants are of Greek origin, retaining the costume, and, on festive occasions, performing the characteristic dances of that nation. Procida now belongs to the crown, though it was at one time the property of a family, of which John of Procida, the author of the Sicilian Vespers, was the most famous member. Pop. 14,580.

PROCLAMATION, a public notice given of anything of which the sovereign thinks proper to advertise his subjects. Proclamations form a branch of the sovereign's prerogative, and they have a binding force when they are grounded upon and enforce the laws of the realm. For, though the making of laws is entirely the work of the legislative branch of the sovereign power, yet the manner, time, and circumstances of putting those laws into execution must frequently be left to the discretion of the executive magistrate; and therefore his *proclamations* are binding upon the subject, where they do not either contradict the old laws or tend to establish new ones, but only enforce the execution of such laws as are already in existence, in such manner as the sovereign shall judge necessary.

PROCLUS, surnamed "the Successor" (Διάδοχος), either from his being the successor of Syrianus in the direction of the Athenian school, or, which is much more probable, from his being regarded as the genuine successor of Plato, was the last and one of the most celebrated of the Neo-Platonists. He was born at Byzantium on the 8th of February, A.D. 412, though, as the son of the Lycian Patricius, he frequently regarded himself as a native of Xanthus, where the earlier part of his life was spent. From Xanthus he removed to Alexandria while still young, and was received into the family of Leonas the rhetorician, who introduced him to the leading scholars of the city. Purposing to pursue the study of jurisprudence, he studied grammar under Orion, and applied himself to the Latin tongue. Having visited Byzantium in the company of Leonas, he, immediately on his return, abandoned rhetoric and law for the study of philosophy, and sought the instructions of Olympiodorus. This choice of a teacher, while it could not have been called a happy one for an ordinary man, was eminently so for Proclus. The apparent obscurity of his master, his penetrating intellect rendered luminous; and what he could not fully understand on its delivery, he was enabled to preserve for future study by his prodigious memory. His master was charmed with his genius; so also was his master's daughter; whether or not for his talents, does not appear. Leaving Alexandria at the age of twenty, he chose Athens for a residence. He had the good fortune to make the acquaintance of Plutarchus, the son of Nestorius, who read with him the *De Anima* of Aristotle and the *Phædo* of Plato. On his death, Plutarchus commended him to the care of Syrianus, who employed him as his coadjutor. So great was his industry and so intense his application, that by his twenty-eighth year he had written his commentary on the *Timæus* of Plato. He succeeded Syrianus at his death, continued his school, and seems to have realized a handsome income from the undertaking. From whatever cause, he was compelled to quit Athens for a year, which afforded him leisure to visit the East, and compile a collection of Chaldæan oracles. He opened school on his return; and seems to have disclosed the profounder principles of his philosophy only to his confidential disciples, on whom secrecy was enjoined. In his religious ceremonies he observed a like strictness. He was possessed of great strength and remarkable personal beauty, which numerous matrimonial proposals still attest; but his adherence to fasts and vigils, to labour and asceticism, led him to decline such connections, and bestow his friendship upon Archiadas and others of his disciples. Of his theurgic knowledge and discipline let nothing be said. The reader will find much of that and other absurd matters in the *Vita Procli* of Marinus. Proclus died on the 17th of April 485 A.D.

Twenty-two works or pieces of Proclus are still extant. There is no complete edition of them. That of Cousin (Paris, 6 vols. 8vo, 1820–27) contains the treatises on Providence and Fate, on the Ten Doubts about Providence, and on the Nature of Evil; the Commentary on the Alcibiades, and the Commentary on the Parmenides. The following have been translated into English by Thomas Taylor:—The Commentaries on the Timæus, the six books on the Theology of Plato, the Commentaries on the first book of Euclid, the Theological Elements, the five Hymns, and his Life by Marinus. Besides the works already mentioned, seventeen others have unfortunately perished. Proclus regarded the Orphic and Chaldæan oracles as divine revelations, capable of an allegorical interpretation, whereby he endeavoured to make Plato and Aristotle agree. He elevated faith (πίστις) above science; and strove to demonstrate that there is but one real principle of things—viz., *Unity*, which by its own development produces all things by triads. These triads he considered to be Unity, Duality, which is identical with limitation and boundlessness, and the complex of both, which contains Esse, Life, and Intelligence, the three fundamental dispositions of things. The Divinities he distinguished into Intelligible and Intelligent, Supernatural and Natural. He exalted Theurgy above Philosophy, attributed a supernatural efficacy to the name of the Supreme Being, and was hostile to the Christian religion.

PROCONSUL, a Roman magistrate sent to govern a province with consular authority. The proconsuls were appointed out of the body of the Senate; and commonly, when the year of any one's consulate expired, he was sent as proconsul into some province. The proconsuls decided cases of equity and justice, either privately in their palace, where they received petitions, heard complaints, and granted writs under their seal; or publicly, in the common hall, with the usual formalities observed in the court of judicature at Rome. Their office lasted only a year.

PROCOPIUS, an eminent Byzantine historian, was a native of Cæsarea in Palestine, where he was born in the beginning of the sixth century after Christ. He removed to Constantinople while still young, and rose to great distinction as an advocate and professor of eloquence. He attracted the attention of Belisarius, who in 527 A.D. chose him for his secretary. He accompanied the hero on his different wars in Asia, Africa, and Italy; and in the Gothic expedition he was placed at the head of the Byzantine navy. On his return to Constantinople, his merits were appreciated by the Emperor Justinian, who conferred upon him the title of *illustris*, chose him a senator, and made him prefect of the city in 562 A.D. Procopius died about 565 A.D.

It is a matter of question whether Procopius was a Christian or an adherent of paganism. His chief works are his Ἱστορίαι, in eight books; his Κτίσματα, in six books, which flatters Justinian immoderately; his Ἀνέκδοτα, a *chronique scandaleuse* of the court of Constantinople from A.D. 549 till 562; and his *Orationes*, consisting probably of extracts from his *History*. The works of Procopius have been published in the Bonn collection of the Byzantines, with a carefully-revised text and a Latin version, by Dindorf, 3 vols. 8vo, 1833–38. The *History* has been rendered into nearly all the modern languages of Europe. It was translated into English by Sir Henry Holcroft, Lond. 1653. His *Anecdotes* was likewise translated into English by an anonymous author, under the title of *The Secret History of the Court of the Emperor Justinian*, London, 1674.

PROCRUSTES (Προκρούστης, *the stretcher*), is a surname of the celebrated robber Polypemon or Damastes, who tortured his victims by placing them on an iron bed, which their stature was made to fit by stretching or mutilation. Hence the well-known proverb "the bed of Procrustes." He was slain by Theseus on the Cephissus in Attica.

PROCTOR, a person commissioned to manage another person's cause in any court of the civil or ecclesiastical law.

PROCTOR. See UNIVERSITIES.

PROCURATOR-FISCAL, the public prosecutor in inferior courts in Scotland acting under the instructions of the lord advocate, who is the principal public prosecutor. The procurator-fiscal usually makes the preliminary inquiries as to crimes committed in his district; and transmitting the papers to the lord advocate, that officer, or one of his assistants, either directs the case to be prosecuted at his own instance before the superior court, or leaves it to the conduct of the procurator-fiscal in the inferior court.

PRODICUS, a celebrated sophist, was a native of Iulis in the island of Ceos, and flourished about B.C. 432. He was the contemporary of Democritus of Abdera and Gorgias of Leontium, and he was the disciple of Protagoras, whom he rivalled in eloquence. His talents were so highly appreciated by his fellow-citizens that he was employed on various embassies, and on his arrival at Athens he opened a school, where he was attended by the most distinguished men of the age—Euripides, Socrates, Theramenes, and Isocrates. Xenophon has preserved an apologue of Prodicus (Mem. ii. 1), which is considered as one of the most precious fragments of antiquity; it is known as the "Choice of Hercules." In the *Axiochus* of Plato there is also the analysis of a harangue which Prodicus composed to dissipate all fears of death. According to Suidas, he was at last accused of being a corrupter of youth, and condemned to drink hemlock.

PROFESSOR. See UNIVERSITIES.

PROGRAMME (πρόγραμμα, *a public proclamation*), is an old university term applied to an outline of the orations to be delivered on a particular occasion; but now used in a more extended signification to denote the outline of any entertainment or public ceremony.

PROGRESSION, in mathematics, is either arithmetical, geometrical, or harmonical. Continued arithmetical proportion is, where the terms increase and decrease by equal differences, and is called *arithmetical progression*, thus:—

Increasing, 1, 3, 5, 7, 9, &c.
Decreasing, 18, 15, 12, 9, 6, &c.

Geometrical progression is when the terms increase or decrease by equal ratios, thus:—

Increasing, 1, 2, 4, 8, 16, &c.
Decreasing, 81, 27, 9, 3, 1, &c.

An *harmonical progression* is such, that of any three consecutive terms, the first is to the third as the difference between the first and second is to the difference between the second and third. The reciprocals of the arithmetical series, 1, 2, 3, 4, 5, &c., are $\frac{1}{1}$, $\frac{1}{2}$, $\frac{1}{3}$, $\frac{1}{4}$, $\frac{1}{5}$, &c., which forms an harmonical progression.

PROJECTILES. See GUNNERY.

PROJECTION OF THE SPHERE. See GEOGRAPHY, *Mathematical*.

PROJECTION. See PERSPECTIVE.

PROLATION, a musical term signifying a series of notes, ascending or descending, which are to be sung to one syllable. Anciently the word had a different musical meaning. Thus Morley, in his *Introduction*, page 14, tells us that prolation is the measuring of semibreves by minims, and is either greater or less. The greater prolation is when the semibreve contains three minims. The sign of this is ⊙ or Ͼ. The less prolation is when the semibreve contains only two minims. The sign of this is ○ or C. The old musicians called the ternary measure *perfect*, and the binary measure *imperfect*. (G. F. G.)

PROLEGOMENA, certain preparatory observations prefixed to a book or treatise, and containing something necessary for the reader to be apprised of, to enable him the better to understand the book, or to enter deeper into the science.

PROLOGUE (πρόλογος), in the Greek tragedy, a word employed to designate the introduction to the spectator of the subject of the drama, whether tragedy or comedy. The desired information could be communicated either indirectly in the course of the action itself, or by a direct account given to the audience. The former method being the more agreeable to probability, was that adopted by Æschylus and Sophocles, the latter by Euripides. In the Latin comedy the prologue (*prologus*) was an address of the poet to the audience. The modern prologue is a short discourse addressed to the audience, to inform them of the subject of the piece, and not unfrequently to apologise for the poet. It is generally neither composed nor spoken by the author of the drama.

PROME (called by the Burmese *Pri*, and by the Mohammedans *Pron*), a town in the British territory of Pegu, on the left bank of the Irrawaddy, 113 miles N.W. of Pegu. It is surrounded by a brick wall, palisade, and ditch, about two miles in circuit, and outside of these there are extensive suburbs. South of the town stand many pagodas, on the tops of small but steep hills. The flatness of the ground on which it is built renders the town liable to inundations of the river; and it has also on more than one occasion suffered from fire. By the latter calamity nearly the whole town was destroyed in the beginning of 1856. It has, however, many advantages for its speedy rise, especially as a place of trade. Paper is made here; and the adjacent country is laid out in gardens and rice-grounds. The town was taken by the British in 1825, and again in 1852, on both occasions with hardly any opposition from the Burmese. Pop. 30,000.

PROMETHEUS, the son of Iapetus and Clymene, was the brother of Atlas, Epimetheus, and Menœtius. He was a prince of Mecone (the ancient name of Sicyon in the Peloponnesus), if we may trust the legend told by Hesiod. It is said that the inhabitants were debating with the gods which part of the animal ought to be offered to them in sacrifice, and that Prometheus recommended that the flesh and best parts should be covered with the caul, whilst the bones were enveloped in fat. Jupiter was then requested to make choice of the part he preferred; and, being deceived by the trick of Prometheus, he selected the bones, which were ever afterwards offered upon his altar. Indignant at this proceeding, he deprived men of the use of fire; but Prometheus is said to have again outwitted him, and drawn down fire from heaven, which he presented to man. This is explained by supposing that Prometheus was the first who discovered that fire could be extracted from two pieces of wood rubbed together. By another tradition, we find him making a man of clay, into which he conveys the fire he had stolen from heaven, and for this daring invasion of his privileges Jupiter orders Vulcan to chain Prometheus on Mount Caucasus, where he was visited daily by an eagle, which fed on his liver. Here he is said to have remained thirty thousand years, until Hercules accidentally visited him whilst in search of the gardens of the Hesperides. Prometheus pointed out the way to him, and from gratitude Hercules slew the eagle and released Prometheus. Another tradition represents him as having been released by Jupiter, in return for warning him against marrying Thetis, as it was fated that her son should be more illustrious than his father. He was the father of Deucalion by Clymene or Pandora. (See PANDORA.) There is a very sound explanation of the mythus of Prometheus, as given by Æschylus, in the *Classical Museum*, vol. v., by Professor Blackie of Edinburgh.

PROMONTORY, a point of land or rock projecting into the sea, the extremity of which is called a *cape* or *headland*. (See GEOGRAPHY.)

PROMPTER, in the drama, an officer posted behind the scenes, whose business it is to watch attentively the actors speaking on the stage, in order to suggest and aid them when at a stand, and correct them when at fault.

PRONAOS. See *Glossary* to ARCHITECTURE.

PRONOUN. See GRAMMAR.

PRONY, GASPARD-CLAIR-FRANÇOIS-MARIE-RICHE DE, a celebrated French engineer, was born at Chamelet, in the department of the Rhone, in 1755, and was educated at the École des Ponts et Chaussées. An essay on the *Thrust of Arches*, published in 1783, was the means of introducing him to a long course of public employment. He was engaged under Peronnet in restoring the fort of Dunkirk in 1785, and in erecting the bridge of Louis XVI. in 1787. The laborious enterprise of drawing up the famous *Tables du Cadastre* was entrusted to his direction in 1792. In 1794 he was charged with the professorship of mechanics in the École Polytechnique, and in 1798 he was appointed Directeur-General des Ponts et Chaussées. His success continued after the overthrow of the republic and the establishment of the empire. He was employed by Napoleon to superintend the engineering operations both for protecting the province of Ferrara against the inundations of the Po, and for draining and improving the Pontine Marshes. He was likewise engaged after the restoration in regulating the course of the Rhone, and in several other important works. By the accomplishment of so many laborious undertakings, Prony had gained a high place in the estimation of the patrons of science. The title of baron was conferred upon him in 1828, and that of peer in 1835. He was also, at the time of his death in 1839, a member of the principal academies and scientific societies of Europe.

Among the numerous publications of Prony are the following:—*Nouvelle Architecture Hydraulique*, in 2 vols., 1790–96; *Mécanique Philosophique*, in 4to, 1800; *Analyse de l'Exposition du Système du Monde par Laplace*, in 8vo, 1801; *Recherches sur la Poussée des Terres*, in 4to, 1802; *Recherches Physico-Mécaniques sur la Théorie des Eaux Courantes*, in 4to, 1804; *Cours de Mécanique Concernunt les Corps Solides*, in 2 vols. 4to, 1815; and *Description Hydrographique et Historique des Marais Pontins*, in 4to, 1822–23.

PROOF. See EVIDENCE, and LOGIC.

PROPERTIUS, SEXTUS AURELIUS, a celebrated elegiac poet, who flourished between 31–15 B.C. The exact date of his birth is uncertain; but Clinton brings forward satisfactory reasons for believing that it was about the year 51 B.C., being thus fourteen years younger than Horace, and eight younger than Livy. The place of his birth has also been disputed; but he himself states that he was a native of Umbria, though whether of Mevania, Ameria, Hispellum, or Asisium, is uncertain. He studied at Rome, with the intention of devoting himself to the bar; but his love of poetry seduced him from the dry study of law, and he entirely withdrew from taking any share in the active business of life. He died at an early age, leaving behind him a collection of elegies divided into four books, of which the last is supposed to have been published by one of his friends after his death. Nobbe, a German critic, who has examined the subject with considerable care, thinks that the first book was published not before 29 B.C., and not after 27 B.C.; the second book not before 24 B.C.; the third not before 21 B.C.; the fourth not before 16 B.C.

Many of Propertius's elegies are addressed to his mistress Cynthia, to whom he remains constant, though he suffers much from her cruelty. Her real name was Hostia, and she seems to have belonged to that higher class of courtezans known as ἑταίραι among the Greeks. She herself seems to have been a poetess, besides being skilled in music, dancing, and needlework. The language of his poetry is powerful, and the structure of the verse correct, though not without some peculiarities; as, for example, the close of the pentameter line with a word of several syllables. In comparing the elegies of Propertius with those of Tibullus, we perceive that there is less of tenderness and softness, less of that simplicity for which Tibullus is so eminently distinguished; but, on the other hand, there is more spirit, a greater reach of thought, and more power of expression. He possesses much of the spirit of the lyric poet, and had talents which fitted him for things of greater moment than those upon which he bestowed them. Propertius was a close imitator of the Greek writers; Callimachus and Philetas were the poets whom he more particularly followed, so that he was sometimes called the Roman Callimachus. Like Callimachus, he is fond of displaying his learning, and has frequent allusion to mythological subjects; but this at times is the cause of some obscurity, and detracts from that simplicity which is the soul of true elegiac poetry. One of the best separate editions of Propertius is that of Hertzberg, with a commentary, Halle, 1844–45, 4 thin vols. 8vo, but they are generally published along with Catullus and Tibullus. He has been translated into French, German, and Italian, and into English prose by Gantillon, from the excellent text of Paley. (See Bohn's "Classical Library," 1854.)

PROPERTY (Lat. *proprietas*, ownership), as to its etymology, suggests the notion of a thing being a man's own (*proprius*); a notion, moreover, which is contained in every definition of property. It is defined by a foreign writer as "the right to deal with a corporeal thing according to a man's pleasure, and to the exclusion of all other persons." But this description of property errs by defect, inasmuch as it excludes incorporeal things, which are considered objects of property in English law, and were also regarded as such in Roman law. Property, as here understood, is "that which the positive law of a country recognises as property, and for the protection or recovery of which it gives a remedy, by legal forms, against every person who invades the property or has the possession of it." Property is divided into Things Real and Things Personal. Things Real include lands, tenements, and hereditaments. Hereditaments, again, are divided into Things Corporeal and Incorporeal. The hereditaments, as enumerated by Blackstone (book ii.), are advowsons, tithes, commons, ways, offices, dignities, franchises, corodies or pensions, annuities, and rents. The interest which one has in any land, tenement, or hereditament, is called an estate. (See ESTATE.) Personal property is frequently described by the term "moveables;" but this is inadequate, for certain estates in lands are personal property, and are comprehended under the term Chattels Real. (See CHATTELS.) The legal capacity of persons to transfer and acquire estates in lands and tenements belongs to legal treatises. (*Cyclopædia of Political Knowledge*, 1853; Warren's Blackstone's *Commentaries*, book ii., 1855.)

PROPHECY is a word derived from προφητεία, and in its original import signifies the prediction of future events. As God alone can perceive with certainty the future actions of men and the remote consequences of those laws of nature which he himself established, prophecy, when clearly fulfilled, affords convincing evidence of an intimate and supernatural communion between God and the person who uttered the prediction. (See THEOLOGY.)

PROPONTIS. See MARMORA, *Sea of.*

PROPORTION, the identity or similitude of two ratios. Hence quantities that have the same ratio the one to the other are said to be proportional. Thus, if A be to B as C to D, or 8 be to 4 as 30 to 15, A, B, C, D, and 8, 4, 30, and 15, are said to be in proportion, or are simply called proportionals.

PROPORTION, *Harmonical* or *Musical.* See MUSIC, and TEMPERAMENT.

PROPOSITION. See GEOMETRY.

PROSE, the natural language of mankind, loose and unconfined by poetical measures or restraints; and in this sense it stands opposed to verse or metrical composition.

PROSERPINE, supposed to be derived from φέρειν φόνον, *to cause death*, and is probably corrupted from the Greek, which is variously written Persephone, Phersephassa, Persephassa, Phersephatta, Persephatta, Pherrephassa, Pherephatta, Phersephoncra, and Persephonera. She was the daughter of Jupiter and Ceres, who was carried off by Pluto as she was gathering flowers with her companions. Ceres, disconsolate for the loss of her daughter, after having long sought her, heard where she was, and entreated Jupiter to permit her to return from hell. This request Jupiter granted, on condition that she had not tasted anything in Pluto's dominions. Ceres therefore went to fetch her; but when her daughter was preparing to return, Ascalaphus gave information that he had seen Proserpine eat some grains of a pomegranate she had gathered in Pluto's garden, on which she was sentenced to continue in Tartarus in quality of Pluto's spouse and the queen of those gloomy regions; but, to mitigate the grief of Ceres for her disappointment, Jupiter granted that her daughter should only spend six months in hell together with her husband, and the other six on earth with her mother. Some mythologists imagine that the latter part of the fable alludes to vegetation, which must remain hidden all the winter in order to sprout forth in the spring.

PROSLAMBANOMENOS (Greek προσλαμβανομενος, the term προσλαμβανομενη being found as an exception in Bryennius only) signifies a lower string (χορδη) or sound (φθογγός) added to what was previously the lowest sound of the ancient Greek system of conjunct and disjunct tetrachords. For example, to the sounds BCDE, EFG*a*, forming two conjunct tetrachords in the lowest part of the scale, was added A, an octave below the last of the sounds above named. This formed a series of sounds similar to that of our minor scale when its 6th and 7th are made minor; thus, ABCDEFG*a*, ascending diatonically from A in the lowest space of the stave with bass-clef, to A upon the highest line of the stave with same clef. In this place we may mention that the ancient perfect system, or Immutable System of the Greeks, as it is described by Greek writers on music, appears to have consisted of fifteen sounds comprehended within two octaves, reckoning from the Proslambanomenos above described up to a sound two octaves higher. The order of these sounds, and their ancient Greek names and modern literal names, ascending, are as follows: Proslambanomenos A, Hypate-hypaton B, Parypate-hypaton C, Lichanos-hypaton D, Hypate-meson E, Parypate-meson F, Lichanos-meson G, Mese *a*, Paramese *b*, Tritediezeugmenon *c*, Paranete-diezeugmenon *d*, Nete-diezeugmenon *e*, Trite-hyperbolæon *f*, Paranete-hyperbolæon *g*, Nete-hyperbolæ *ā*. Some of these strings or sounds were called Apycni, Baropycni, Mesopyeni, Oxypycni. Some, too, were *fixed*, and others *moveable.* (For various observations upon Greek scales, and upon certain oriental scales and ecclesiastical scales, see the article MUSIC, and appendix to Graham's *Essay on the Theory and Practice of Musical Composition*, 1838.)

The texts of the ancient Greek writers upon music are so corrupted and so obscure in many respects, and contain so little of a really *practical* or useful nature, that we have purposely refrained from inserting in this work many old

Greek theoretical terms, of which the exact signification is now lost. Attempts to explain these could end in nothing better than vague and useless conjectures. Those who feel any particular interest in the very obscure subject of ancient Greek music, may consult the Greek writers edited by Meibomius and Wallis, and various other ancient writers who treat of music expressly or incidentally; also Hawkins, Burney, Forkel, and others. (G. F. G.)

PROSODY, that part of grammar which treats of the quantities and accents of syllables, and the manner of making verses. This subject, in its various sub-divisions will be found treated of throughout the work.

PROSOPOPŒIA. See PERSONIFICATION.

PROSSNITZ, a town of the Austrian empire, in Moravia, on the Rumza, in the fertile district of Hanna, 11 miles S.S.W. of Olmütz. It contains several churches, a convent, hospital, and military school. Manufactures of woollen and linen cloth, kerseymere, cotton fabrics, and brandy are carried on here; and asparagus is raised in large quantities in the neighbourhood. The largest corn-market in Moravia is held at Prossnitz. Pop. (1851) 11,396.

PROSTYLE. See *Glossary* to ARCHITECTURE.

PROTAGORAS, a celebrated sophist of Abdera, was the son of Artemon or Mæandrios, and flourished 444 B.C. His poverty had compelled him to adopt the humble trade of a wood-carrier, when his countryman Democritus, attracted by the singularly ingenious manner in which he fastened his bundle, admitted him as one of his pupils. After he had profited sufficiently by the instruction of Democritus, he proceeded to Athens, where he opened a school, which was attended by all the most illustrious men of the age. Amongst others, Pericles is said to have been his pupil. Protagoras is said to have been the first who set a price on his instruction, and by this means he was enabled to amass a large fortune. Plato, who was his avowed opponent, is willing to allow that Protagoras possessed a lively and fertile imagination, a wonderful memory, and great eloquence; but he was vain, impudent, and presumptuous; he spoke of his rivals with contempt, and of himself with a degree of confidence which excited the admiration of the vulgar. In the *Theætetus* of Plato we have a summary of the doctrines of this philosopher. He summed up the doctrine of Heracleitus concerning eternal becoming in the well-known proposition: "Man is the measure of the universe, both of that which exists and of that which does not exist." Confutation was accordingly impossible. Protagoras, having in one of his works declared that he could not argue on the nature of the gods because he was not certain of their existence, he was accused of impiety, and condemned to suffer death, or, according to others, banishment. On his passage to Sicily he suffered shipwreck, and was drowned, Frei conjectures, about B.C. 411, and accordingly assigns 480 B.C. as the date of his birth. (See J. Frei's *Quæstiones Protagoreæ*, Bonnæ, 1845.)

PROTECTIONISTS, a name given to that section of the Conservative party which opposed the repeal of the corn-laws, and which separated from Sir Robert Peel in 1846. A "Society for the *Protection* of Agriculture," and to counteract the efforts of the Anti-Corn Law League, gave the name to the party. Lord George Bentinck was their leader from 1846 till his death in September 21, 1848. The administration under Lord Derby not proposing the restoration of the corn-laws, this society was dissolved February 7, 1853. (Haydn's *Dictionary of Dates.*)

PROTESTANT, a name first given in Germany to those who adhered to the doctrine of Luther. In 1529 the Reformed party *protested* against a decree of the Emperor Charles V. and the Diet of Spires, and declared that they appealed to a general council. The same name has now become a common denomination for all those of the Reformed churches.

PROTOGENES, a very celebrated Greek painter, was a native of Caunus in Caria, and flourished 330 B.C., in the time of Alexander the Great, being the contemporary of Apelles. Protogenes lived principally in Rhodes, where he was held in little honour by his neighbours, until Apelles paid him a visit, and declared that Protogenes was only inferior to himself in one particular, that he bestowed too much pains in finishing his paintings. From that moment the reputation of Protogenes was established. (See APELLES.) His finest painting was that representing Ialysus, the grandson of Sol, which he took seven years to finish, having put on it four courses of colour. Having been placed in a temple at Rhodes, when the city was besieged by Demetrius, the painting was in danger of being destroyed, when the conqueror is said to have retired rather than that it should run any risk. It was afterwards carried to Rome and placed in the Temple of Peace, where it was destroyed by fire. There was a dog in this picture, which the painter wished to represent with foam at its mouth; but, after many vain attempts, it is reported he threw his sponge in a fury at the spot, and by a strange accident produced the very effect he wanted. He also painted a satyr playing on the shepherd's pipe, which is said to have been very fine; likewise a portrait of Pythias, the mother of the philosopher Aristotle, a Pan, and portraits of Alexander. According to Suidas, he was the author of two books on painting, now lost.

PROTRACTOR, an instrument for laying down and measuring, with accuracy and despatch, angles upon paper, and by which the use of the line of chords is superseded. This instrument is variously formed, such as the graduated semicircle, the rectangular ruler with graduated edges, and other more expensive contrivances.

PROUT, SAMUEL, a great painter in water-colours, was born at Plymouth in September 1783. His education in art was obtained by a patient and enthusiastic study of nature. He spent whole summer days in drawing the quiet cottages, rustic bridges, and romantic water-mills of the beautiful valleys of Devon. He even made a journey through Cornwall, to try his hand in furnishing sketches for Britton's *Beauties of England.* On his removal to London in 1805, a new scene of activity opened up before Prout. It now became his endeavour to correct and improve his style by the study of the works of the great masters. A great part of his time was also devoted to maintaining himself by means of his art. He painted marine pieces for Palser the printseller. He received pupils, and published many drawing-books for learners. He was likewise one of the first who turned to account in his profession the newly-invented art of lithography. In spite of all this industry, however, it was not until about 1818 that Prout discovered his proper sphere. Happening at that time to make his first visit to the Continent, and to study the quaint streets and market-places of continental cities, he suddenly found himself in a new and enchanting province of art. All his faculties feeling themselves in their congenial element, sprung into unwonted power and activity. His eye readily caught the picturesque features of the architecture, and his hand put them down upon canvas with unsurpassed felicity. The composition of the pictures was exquisitely natural; the colour exhibited "the truest and happiest association in sun and shade;" the delicately-carved remnants of ancient architecture were copied with fond minuteness; and the solemnity of great cathedrals was brought out with striking effect. Encouraged by this success, Prout continued most enthusiastically to pursue that path upon which he had unexpectedly come. At the time of his death, in February 1852, there was scarcely a nook in France, Germany, Italy, and the Netherlands where his quiet, benevolent, observant face had not been seen searching for antique gables and sculptured pieces of stone. In Venice especially there was scarcely a pillar which his eye had not lovingly studied and his pencil had not dexterously copied. (See a Memoir of Prout, by John Ruskin, in the *Art-Journal* for 1849.)

Prout, *William*, a distinguished physician, was born in 1786, and took the degree of M.D. at Edinburgh. Settling in London, he began to apply chemistry to his professional studies. The results of his investigations were published in Thomson's *Annals of Philosophy*, the *Philosophical Transactions*, the *Philosophical Magazine*, and other scientific journals. They also appeared in separate treatises. *An Enquiry into the Nature and Treatment of Gravel, Calculus, and other Diseases connected with a deranged operation of the Urinary Organs*, was produced in 1821. Not long afterwards he published all his discoveries in a collected form, in a treatise *On the Nature and Treatment of Stomach and Renal Diseases.* By these and other labours Prout attained to a position of eminence. He was employed to write a Bridgewater essay on *Chemistry, Meteorology, and the Function of Digestion, considered with reference to Natural Theology.* So successful was his work on *Stomach and Renal Diseases* that it reached a fifth edition in 1848. At the time of his death in 1850, he was a fellow of the Royal College of Physicians of London and also of the Royal Society.

PROVENCE, an ancient province of France, in the extreme S.E. of the kingdom, bounded on the N. by the province of Dauphiné, W. by that of Languedoc, S. and S.E. by the Mediterranean, and E. by Italy. It comprehends the modern departments of Basses-Alpes, Bouches-du-Rhône, and Var; with parts of those of Vaucluse, Drôme, and Hautes-Alpes.

PROVERB (Lat. *proverbium*, i.e., *pro-verbum*), a by-word or saw, has been defined by Erasmus as "Parœmia est celebre dictum scitâ quâpiam novitate insigne" (*i.e.*, a proverb is a well-known saying remarkable for some elegant novelty). Of the numberless attempts at defining a proverb, perhaps the most elegant is that of Cervantes, who describes them as "short sentences drawn from long experience" (*Don Quixote*, part i., c. 39). With the *Opera Moralia* (vol. v., ed. Wyttenbach) of Plutarch, a collection of 131 proverbs are given, with explanations, which may be relied upon as tolerably genuine. To collect and explain such stray portions of the wisdom of the people has engaged the attention of many of the most learned men the world has known. We have the testimony of Laertius, that Aristotle, Theophrastus, and Chrysippus, all engaged in collecting proverbs. Synesius, a writer of the fifth century, quotes from a work of Aristotle, now lost, a description of a proverb: "A proverb is a remnant of the ancient philosophy preserved amid very many destructions, on account of its brevity and fitness for use." Zenobius, who lived in the beginning of the second century, epitomized 552 proverbs of two old writers, Terræus and Didymus; and Diogenianus, his contemporary, made a collection of 775 proverbs. These two collections, with 1400 adages from Suidas, 353 from the Vatican library, and a selection of rhymed adages, were edited by Andrew Schott, 4to, Antwerp, 1612. Michael Apostolius of Byzantium, who lived about the middle of the fifteenth century, collected 2027 ancient proverbs, which were published by the Elzevirs, 4to, Lugd. Batav. 1653. The same house likewise published at Amsterdam, in 1663, a useful epitome of the 4151 adages of Erasmus.

In point of number, originality, and elegance, the proverbs of Spain stand in advance of those of all other countries. They can be traced back to the very earliest times. Many are found in the *General Chronicle*, one of the oldest of Spanish prose compositions; and among them is the happy one on disappointed expectations, quoted more than once in *Don Quixote*:—"He went for wool, and came back shorn." Several occur in the *Conde Lucano* of Don John Manuel, and many in the poetry of the Archpriest of Hita, both of whom flourished in the time of Alfonso XI. Till 1496, when Mendoza, Marques of Santillana, at the request of Juan II., collected for the instruction of Prince Henry a hundred rhymed *Proverbios*, and above 600, "such as the old women were wont to repeat in their chimney-corners," the old and wise proverbs of the language had obtained no settled place in the didactic literature of the country. From that date, however, they began to be turned to account. About the middle of the same century Pedro Valles published an alphabetical list of 4300 old Spanish adages; and Hernan Nuñez de Guzman, the Greek scholar and nobleman, increased the series in his *Refranes* (1555) to above 6000. Mal Lara, a Sevilian, made a selection from this great store of 1000 proverbs, and adding a commentary to each, published them in 1568, under the not inappropriate title of *Philosophy of the Common People* (*La Philosophia Vulgar*). Palmerino, a Valencian, published in 1569 above 200 proverbs appropriate to the table; and Oudin issued a collection of Spanish proverbs for the use of foreigners, at Paris in 1608. Sorapan in 1616–17 issued two collections of medical proverbs; and finally, in 1695, Cejudo, a schoolmaster of Val de Peñaz, gave the world about 6000, with the corresponding Latin adages, where he could find them, and with explanations more satisfactory than had been furnished hitherto. A curious collection of Valencian proverbs was published in 12mo at Valencia, by Carlos Ros in 1733. Notwithstanding the number thus collected, many thousands still remained unpublished, known only among the traditions of the humbler classes, that had given birth to them all. Juan de Yriarte, the king's librarian at Madrid, collected towards the middle of the eighteenth century no less than 24,000; and yet it is supposed he had not nearly exhausted the stock peculiar to the common people of the provinces. There is also a good modern collection of Spanish proverbs in six duodecimo volumes by Repulles. It is, perhaps, not possible to account for the number of proverbs which are found in Spain above any other country in Christendom; but be this as it may, we know they are frequently the most pleasant and most characteristic ornaments of the national literature.

In our own country, among the numerous collectors of proverbs, may be mentioned John Ray the naturalist, who published in 1670 his book on proverbs, which has been frequently reprinted. There is likewise a valuable collection of English proverbs, with lengthened explanations and an ingenious preface by Oswald Dykes, 8vo, London, 1708. In Ray's collection there are, besides English proverbs, Scottish, Welsh, Irish, Danish, Eastern, and Hebrew proverbs. He divides them into various classes, arranges each alphabetically, and winds up by an extensive index to the whole work. The works which Ray consulted were—1. *The Children's Dictionary*; 2. Camden's *Remains*; 3. Clark's Collection; 4. Gent's Collection; 5. Herbert's *Jaculum Prudentum*; 6. Codrington's Collection; 7. Howell's *Parœmiographia.* A new edition of this work has recently (1855) been published by Henry G. Bohn, in which are introduced large additions of proverbs, sayings, sentences, maxims, and phrases, under the title of *A Handbook of Proverbs.*

PROVERBS, The Book of. That Solomon was the author of the Book of Proverbs has seldom been questioned. Some have indeed thought that he composed a part only of the Proverbs included in that book, and collected the others from various sources. It is probable, indeed, that he availed himself of any sayings already current which he regarded as useful and important. Whether he ever made any *collection* of his proverbs in writing is somewhat doubtful. From the twenty-fifth chapter to the end of the book, we are expressly informed, was written out and added to the previous portion, by order of King Hezekiah. The divine authority of the book is sufficiently proved by the quotations made from it in the New Testament (Rom. xii. 16; Heb. xii. 5, 6; 1 Pet. iv. 8; 1 Thess. v. 15). It has in all ages, indeed, been regarded as a great storehouse of practical wisdom. The early fathers were accustomed to call it *πανάρκετος σοφία*. Modern writers have been equally filled with admiration of the profound knowledge of human nature displayed in it, its accurate delineations of character, and the wonderful richness and appropriateness of its instructions.

The Hebrew word rendered *proverbs* (מָשָׁל, *maushal*), is derived from a root which means,—1. *To resemble, to compare;* 2. *To rule;* and signifies primarily *a similitude* or *comparison* of two objects. Many of the proverbs of Solomon are of this nature,—*e.g.*, x. 26; xxv. 11, 12, 13, 14, 18, 19, 20, 25, 26, 28. Hence the meaning of the word may have been gradually extended so as to embrace any apophthegm or brief pithy saying. Or we may consider this meaning to have been derived from the other signification, viz., *to rule;* whence authoritative maxims. The idea of *resemblance*, however, seems to be the prominent one, and may refer to the figurative style common in proverbs, even when no direct comparison is instituted. And as highly figurative language belongs to poetry, it came to pass that *maushal* was used to indicate any composition expressed in a highly ornamented and poetic style. Thus the prophecy of Baalam is called *maushal* (Num. xxiii. 7). The characteristics of the proverbial style (in the more restricted sense of the word) are, according to Bishop Lowth,—1. Brevity; 2. Obscurity; 3. Elegance. The first of these is, however, the only one that can be considered at all universal. We should be rather inclined to name, as a characteristic of the proverb, a pointed and sometimes antithetical form of expression; and this, in addition to brevity or sententiousness, constitutes perhaps the only universal distinction of this species of composition. Conciseness indeed enters into the very essence of the proverb; and this fact is probably indicated by the word itself; *proverbia, for* or *instead of words,—i.e.*, one word for many. From what has been said of the characteristics of the proverbial or parabolic style, it is obvious that it possesses peculiar advantages as a medium of communicating truth. The proverb once heard remains fixed in the memory. Its brevity, its appositeness, its epigrammatic point, often aided by antithesis or paronomasia, not only ensure its remembrance, but very probably its recurrence to the mind at the very time it is needed. The advantages above specified apply to the proverbial mode of writing in any age and among any people. But Solomon must have had other reasons for selecting it, peculiar to the age and country in which he lived. The Hebrews have been called a nation of children. We find this mode of writing employed in the most remote ages; and wise sayings, maxims, apophthegms, constitute a large part of the early literature of most nations. Especially is this true of the orientals. Recent travellers in the East assure us that the reverence for proverbs still exists there; and that nothing gives a man so much advantage in an argument as the ability to quote one of them on his side. We may therefore conclude that the wise king could have found no better mode of impressing truth on the minds of his countrymen than the one he has here chosen.

As to the style of the book of Proverbs, we find it to be marked by those characteristics which distinguish the poetry of the Hebrews from their prose compositions. Of these, one of the most obvious and important is what has been termed *parallelism*. This consists in a certain resemblance or correspondence, either as to thought or form, or both, between the members of a period. The two most simple kinds of parallelism, and the only two we shall notice here, are when the period contains but two members, and the last either repeats the thought contained in the first, or presents an antithetical assertion, beginning generally with the adversative *but*. The first kind of parallelism is called by Lowth *synonymous*, the second *antithetic*. The following passage is a beautiful example of synonymous parallelism:—

> "My son, if thou wilt receive my words,
> And hide my commandments with thee;
> So that thou incline thine ear unto wisdom,
> And apply thine heart to understanding;
> Yea, if thou criest after knowledge,
> And liftest up thy voice for understanding;
> If thou seekest her as silver,
> And searchest for her as for hid treasures;
> Then shalt thou understand the fear of the Lord,
> And find the knowledge of God." (Prov. ii. 1–5.)

As an instance of antithetic parallelism, take these verses:—

> "The fear of the Lord prolongeth days;
> But the years of the wicked shall be shortened.
> The hope of the righteous shall be gladness;
> But the expectation of the wicked shall perish.
> The way of the Lord is strength to the upright;
> But destruction shall be to the workers of iniquity."
> (Prov. x. 27–29.)

It will be perceived that there is a continuity in the former of these passages which does not belong to the latter. In fact the first nine chapters of the book of Proverbs are remarkably distinguished from the remainder, and constitute a sort of proem or exordium to the work. This portion was probably committed to writing, while the disconnected aphorisms which compose the greater part of the remaining portion were only uttered. It is a continuous discourse, written in the highest style of poetry, adorned with apt and beautiful illustrations, and with various and striking figures. The personification of Wisdom in these chapters is universally regarded as one of the most beautiful examples of prosopopœia to be found in the Bible, and possesses an indescribable grace and majesty. At the tenth chapter a different style commences. From ch. x. to ch. xxii. 17 is a series of pithy disconnected maxims, on various subjects, and applicable to the most diverse situations. From ch. xxii. 17 to ch. xxv. a style resembling that of the exordium, though inferior in elegance and sublimity, prevails; and at the twenty-fifth chapter the separate maxims recommence. These compose the remainder of the book, with the exception of the thirtieth chapter, which is ascribed to Agur, and the thirty-first, which is said to be the advice given to King Lemuel by his mother. Who these persons are is not known. The supposition that Lemuel is another name of Solomon does not appear to be supported by proof. The thirtieth chapter affords an example of another species of writing closely allied to the proverb, and equally in favour among the Orientals. It is that of riddles or enigmas designed to exercise the wit and ingenuity of the hearer, and to impart instruction through the medium of amusement. The concluding chapter, containing the counsels addressed to King Lemuel by his mother, needs no elucidation. It presents a beautiful picture of female excellence in an age and country where modesty, industry, submission, and the domestic and matronly virtues were esteemed the only appropriate ornaments of woman.

The literature of the book of Proverbs is contained chiefly in the following works (besides the preliminary dissertations in the various Commentaries):—Melancthon, *Explicatio Provv.* 1555; Mercer, *Comment in Provv. Salom.*; Geiero, *Provv. Salom.* 1669; Schultens, *Proverbia Salom.* 1748; Hirtz, *Vollst. Erklär. der Sprüche Salom.* 1768; Hunt, *Observations on the Book of Proverbs*, 1775; Hodgson, *On the Book of Proverbs*, 1778; Jager, *Observatt.*

in Prov. Salom. Versionem Alexand. 1788; Lawson, *Exposition of Proverbs*, 1821; Umbreit, *Philol. Krit. u. Philosoph. Comm. ü. d. Sprüche Salom.* 1826; and Moses Stuart, 1850. There are also translations, mostly with notes, by J. D. Michaëlis, 1778; Doederlein, 1786; Streunsee, 1783; Kleuker, 1786; Reichard, 1790; Ziegler, 1791; Muntinghe, 1800, 1802; Dahler, 1810; Holden, 1819; Gramberg, 1828; Böckel, 1829; Ewald in his *Poet. Büch.*

PROVIDENCE, a town of the United States of North America, one of the capitals of the state of Rhode Island, on both sides of the Providence River, where it falls into Narraganset Bay, 35 miles from the sea, 43 S.S.W. of Boston, and 175 N.E. of New York. The extremity of Narraganset Bay is formed by an oval-shaped sheet of water inclosed by stone masonry, and lined by a broad public walk with many shady trees. Close to this stand the railway stations for Boston, Stonington, and Worcester, conveniently situated in close connection with each other, and in the middle of the business portion of the town. The river is crossed by several well-built bridges. The plan of the town is irregular, on account of the unevenness of the site, which rises into several hills; and the houses are generally built of wood, though in some more substantial and splendid materials have been employed. Providence contains many large and imposing public edifices. Among these is the Arcade, a granite building with a glass roof, 226 feet long and 80 broad. It is three storeys in height, contains more than eighty shops, and has two fronts, each adorned with a Doric portico. "What Cheer Building," so called from the salutation addressed by the Indians to the earliest settlers here, has recently been erected for the accommodation of the public offices. Besides the State-House, Market-House, and other buildings, the town contains about thirty-five churches, some of which are of considerable architectural merit. Providence is distinguished for the number of literary and academical institutions it contains. Of these, the principal is Brown university, a seminary under the management of the Baptists, founded in 1764, and removed hither in 1770. The edifice, which occupies the highest site in the town, comprises four large and elegant halls: Rhode Island Hall, containing the lecture-rooms and museum; Manning Hall, the library of 19,800 volumes; University Hall and Hope College, the residences of the students, who were, in 1857, 236 in number. There are in all about fifty schools in the town of various grades, from elementary to high schools; and they are attended by upwards of 6000 pupils. The athenæum, founded in 1836, occupies a handsome stone edifice, containing a reading-room and library of 10,000 volumes. The state normal school, which was established here in 1854, had in 1856 an average attendance of 66 pupils. There is also here a reform school for juvenile delinquents, containing, in 1856, 99 boys and 44 girls. Butler Hospital, for the insane, opened in 1848, has extensive grounds, and can accommodate about 145 patients. It contained in 1855, 137. The Dexter Asylum for the poor, occupying a good brick building, with 40 acres of grounds, is another of the benevolent institutions of Providence. The state prison is situated here; and it contained in 1856, 76 prisoners. The manufactures of Providence and its vicinity are many and large, employing a capital of more than L.1,000,000. Hardware, machinery, carriages, furniture, jewellery, woollen and cotton fabrics, are the principal articles produced. The water-power afforded by the river is employed for moving flour and saw mills, and for sawing and polishing marble. Steam-power is also made use of to a great extent. The harbour is safe, and admits vessels of 900 tons. The trade of the port was formerly very extensive, especially with the East Indies and China; but it is at present in a somewhat declining condition. Molasses, sugar, coal, salt, and iron are imported from foreign countries; cotton, flour, grain, hay, &c., from other places on the coast. The total value of the imports from foreign countries in 1852 was L.36,504, and of the exports of domestic produce to foreign lands L.8656. The amount of duties collected at the port was L.8015. The tonnage of the shipping registered 30th June 1852 was 9095; of those enrolled and licensed, 7327. In the year ending at that date there entered from foreign ports 57 vessels, tonnage 7944; and there cleared 60, tonnage 9876. Providence contained, in 1853, 31 banks, and the total bank circulation 19th April 1858 was L.309,005. The town was founded in 1635, and incorporated as a town in 1649. It is now next to Boston among the cities of New England for wealth and population. Pop. (1850) 41,512; (1853) about 47,500.

PROVINCE WELLESLEY, one of the Eastern Straits settlements, belonging to Great Britain, in the Malay Peninsula, bounded on the N. and E. by the native state of Quedah, S. by that of Perak, and W. by the sea; length, 53 miles; breadth, 4; area, 140 square miles. The surface, which is slightly undulating, slopes gradually towards the sea. The soil is in general swampy, but not unproductive, being very suitable for the cultivation of rice. In some places there are narrow strips of sandy ground, where cocoa-nut trees grow well. The geological formation of the district, like that of the island of Penang, is granitic. The climate is hot, but salubrious, the mean temperature being about 80°. When first occupied by the British, this country was covered with a thick impenetrable jungle, haunted by tigers, leopards, rhinoceroses, elephants, and other wild beasts. It has, however, been since that time much improved, and about 120 square miles of the country are under cultivation. Rice is the principal crop, but sugar is also raised in the central and southern portions. The most important of the other productions are indigo (not of the best quality) and cocoa-nuts. Poultry and cattle are sent from this settlement to that of Prince of Wales Island. Province Wellesley was obtained from the King of Quedah for a sum of money in 1802. It is subject to the governor of Prince of Wales Island. Pop. (1855) 51,509.

PROVINCIA (an abbreviated form of *providentia*) seems, as to its original meaning, to indicate a duty, or a matter entrusted to one; but is generally applied to a territory beyond Italy, which had a regular organization and was under Roman administration. The Roman state in its ultimate development consisted of two parts, with a separate organization,—Italia and the Provinciæ. There were of course no provinces in this sense of the word until Rome had extended her conquest beyond the confines of Italy. Sicily was the first Roman province, B.C. 241, and Sardinia was the second, B.C. 235; and Gallia Ulterior, in Cæsar's time, is called in the *Commentaries* simply by the name *Provincia;* whence the modern term Provence.

When a country was conquered it received its provincial organization either from the Roman commander, or from a body of senators assisted by that commander. Prætors were at first appointed to the oversight of provinces; but subsequently they received those governments upon the expiration of their official year at Rome, and were called proprætors. In later times of the republic the consuls were appointed to provinces in a similar way, with the title of *proconsules.* Such provinces received the designation of *Consulares.* Their term of office as governor of the provincia was usually a year, but it was frequently prolonged. There was no pay attached to the office, but certain expenses were provided for out of the Ærarium. A considerable change was made by Augustus on the administration of the provinces. Where a large military force was necessary, he took charge of the province himself, and left the others to the care of the Roman Senate and people. The provinciæ were accordingly divided into *propriæ*

Populi Romani and *propriæ Cæsaris*,—a distinction which was observed till the third century.

The Roman provinces, as enumerated by Sigonius down to the battle of Actium, are as follows:—Sicilia, Sardinia et Corsica, Hispania Citerior et Ulterior, Gallia Citerior, Gallia Narbonensis et Comata, Illyricum, Macedonia, Achaia, Asia, Cilicia, Syria, Bithynia et Pontus, Cyprus, Africa, Cyrenaica et Creta, Numidia, Mauritania. Those of a newer date were, according to the same writer, Rhætia, Noricum, Pannonia, Mœsia, Dacia, Britannia, Mauritania Cæsariensis and Tingitana, Ægyptus, Cappadocia, Galatia, Rhodus, Lycia, Commagene, Judæa, Arabia, Mesopotamia, Armenia, Assyria. Under Augustus, Gallia was divided into the four provinces of Narbonensis, Celtica or Lugdunensis, Belgica, and Aquitania. It should be observed that one marked distinction between the administration of Italy and that of the provinces was, that in Italy the towns had *magistratus* and *jurisdictio*, while in the provinces, except where the Jus Italicum had been granted, the governor alone had *jurisdictio*. Under the imperial rule, however, a greater uniformity was introduced; and ultimately the whole of Italy was under a provincial form of government. (See Sigonius, *De Antiquo Jure Provinciarum*, lib. i.–iii.; the works of Gœttling and of Walter; and a judicious article by George Long in Smith's *Dictionary of Greek and Roman Antiquities*, 1851.)

PROVINS, a town of France, capital of an arrondissement in the department of Seine-et-Marne, on the small rivers Vouzie and Durtein, which unite here to flow into the Seine, 29 miles E. of Melun. This ancient but now decayed place lies between two hills, and consists of an old and a new town,—the former on the upper ground, the latter on the slopes beneath. Its ancient walls, which, with their flanking watch-towers, still exist, inclose, besides the buildings, a wide space of ground laid out in gardens and vineyards. The streets of the old town are for the most part narrow and irregular, its houses ill built and dilapidated; while the new town, on the other hand, contains regular streets and good houses. The most conspicuous object in the former is a large and solid mediæval tower, called the *Grosse Tour de César*, serving as the belfry of the old and massive church of St Quiriace. The new town contains several interesting and curious churches, two hospitals, a market-house, college, school, and cavalry barracks. The rivers are employed to drive many flour-mills, and there are numerous dye-works along their banks. Earthenware, linsey-woolsey, and conserve of roses are also made here. The roses of Provins have for ages been celebrated for their rich crimson colour. They are said to have been brought from Palestine by the Crusaders in the thirteenth century, and are incorrectly called Provence roses. Some trade is carried on in these flowers, as well as in corn, flour &c. Pop. (1856) 6198.

PROVOST (Sax. *profost*, from the Latin *præpositus*, placed before), is a name applied to the chief municipal magistrate in corporate towns or cities in Scotland, and corresponds to the English term mayor. He presides in civic courts, and with the bailies, who are his deputies, determines in all differences that arise amongst citizens. The word is seldom used in England, except when it is applied to the heads of certain colleges, such as Eton, King's College, Cambridge, &c.

PRUDENTIUS, Aurelius Clemens, a Christian poet of some celebrity, who flourished under the reign of Theodosius the Great, was born in Spain in the year 348 A.D. He first followed the profession of advocate, was afterwards a judge, then a soldier, and at length had an honourable employment at court. Nothing more is known about him. A great number of his poems remain; but the style is barbarous, forming a singular contrast to the purity of the Augustan age. The most complete and splendid edition of his works is that of Faustinus Arevalus, 2 vols. 4to, Rom. 1788–9. That of Obbarius (8vo, Tübingen, 1845) will also be found satisfactory. (See H. Middledorpf's *Comment. de Prudentio Theodosia Prudentiana*, 1823–7.)

PRUSSIA.

History.

The Prussian monarchy, at present the smallest among the great powers of Europe, has been formed by the addition of divers portions and provinces of Germany to the country originally called Prussia. The latter country, although it gave its name to the monarchy, and although upon it the royal dignity was conferred, has, however, not served as the nucleus around which the state crystallized into form, this honour being allotted to the marquisate (in later times the electorate) of Brandenburg. With the history of Brandenburg, therefore, particularly since the accession to its rule of the Hohenzollern dynasty, our task will mainly lie, as we attempt to draw a short outline of the rise and progress of the Prussian monarchy.

Ancient history of Brandenburg.

At the beginning of the Christian era we find the territory afterwards called Brandenburg inhabited by German tribes, which, in the succeeding centuries, were carried along by that tide of migration westward and southward that led to Teutonic settlements in all parts of the Roman empire. Their place was soon filled by Slavonic races, gradually advancing as far as the River Elbe, where they remained unmolested until the kingdom of Germany was established by the successors of Charlemagne in the treaty of Verdun, A.D. 843. A kind of military colonies, called *Marches*, were now everywhere founded for the defence of the frontiers. Thus, in 930 we find the North March established by command of the emperor, at present the north-west corner of Brandenburg; and soon after, the East March, which corresponds to the present Nether Lusatia. Meanwhile Otto I., Emperor of Germany, had founded the bishoprics of Brandenburg and Havelberg; and desultory warfare, aided by the labours of an active priesthood, began to extend the boundary of German jurisdiction in those parts. This forward movement found a powerful representative in Markgraf Albrecht the Bear, formerly Duke of Saxony. By his valiant exploits in 1157 against Zazko, a chieftain of the Slavonic tribe called Wends, and by the firm civil and military organization he gave to the greatly-augmented territories under his rule, he became the real founder of the marquisate of Brandenburg. His family, the Ascanians, followed in his footsteps, gradually, in the course of a century and a half, Germanizing the conquered districts by the introduction of German immigrants; establishing new towns, or endowing old ones with considerable privileges; extending their territory by conquests and intermarriages to parts of Pomerania in the north, and to parts of Saxony, Lusatia, and Silesia in the south-east. On the decease of the last of this dynasty, A.D. 1320, anarchy threatened to wipe away for ever the happy germs of civilization in these parts. Feuds among the lords and barons, and devastating inroads of neighbouring princes covered the land for nearly a century with bloodshed and rapine. The Emperor Louis of Bavaria had, on the demise of the last Ascanian, bestowed the Marquisate on his son Louis, not then of age. This Markgraf Louis added the new dignity of Elector of the Holy Roman Empire (Furfürst) to that of *Archicamerarius Truperii* (Erzkämmerer), which his Ascanian predecessors had already held. But this great accession of rank to the German princes did not invest him or his immediate successors with that firm grasp over the unruly nobles, and that protective power against encroaching neighbours which were necessary in so exposed a situation as that of the electorate of Brandenburg. The third of these Bavarian rulers was forced by financial difficulties to cede his territories to the Emperor Charles IV., whose main object seems to have been to turn the Kur-march into a hereditary property of his own family of Luxemburg. First, his eldest son Wenceslas of Bohemia, and afterwards a younger son, Sigismund, then only eleven years old, were created electors of Brandenburg, much to the detriment of this miserable country. Sigismund, as precocious in borrowing money as he was in obtaining dignities, twice gave over his fief of Brandenburg as a mortgage for his debts. The first of these cessions was to his cousin Todorus of Moravia. This prince was more successful in the extortion of money from his impoverished subjects in Brandenburg than in the chastisement of a nobility now entirely masters of a country which they robbed and devastated at random. Fortunately for it, Sigismund was still deeper in debt, when, on the decease of Todorus in 1411, he found himself emperor of Germany, and Brandenburg again at his disposal. Frederick of Hohenzollern, Burggraf or imperial commissioner at Nurnberg, had lent the Emperor Sigismund 400,000 gold florins, and was ready to waive this demand in return for a gift which at that time would have possessed but little attractions to many,—viz., the electorate of Brandenburg. In the year 1415, Frederick having held the lands in pawn during four years, was raised to the dignity of elector, and received the solemn investiture at the Diet of Constance in 1417 with great pomp and ceremony. Providence had graciously ordained that with him this should be no idle and unmeaning pageant, but the commencement of an era of good government, of steadfast progress, and of sober attention to the labours of the state, which, handed down in his highly-gifted family, has gradually and almost insensibly raised that small and poor electorate of Brandenburg into a kingdom of the first order among European powers, and of great promise for the progress of the civilization of the world.

The Hohenzollern family.

A few words will suffice to introduce the reader to the previous history of the Hohenzollerns. Their name is derived from the castle of Zollern or Hohen-zollern in Swabia, and their lineage is traced upwards to a Count Thassilo, who lived in the days of Charlemagne. In the year 1200 the *cadet de famille*, one Conrad, received the appointment of burg-graf of Nurnberg. From him the electoral and royal dynasty of Hohenzollern have descended in an unbroken line, whilst the older branch of the family, being descendants of Conrad's eldest brother Frederick, remained princes of a small territory contiguous to their ancestral castle of Hohenzollern; until in 1851 they gave over their sovereignty to the King of Prussia, and they now reside in the Prussian dominion as princes of the blood. The present (1859) prime minister of Prussia, who is also father of the Queen of Portugal, is one of these princes of Hohenzollern. The Burggrafs of Nurnberg had, before obtaining Brandenburg, become lords of Ansbach and Baireuth, two small territories in Franconia. It may be as well to state here that these territories of Ansbach and Baireuth, after having remained a much-prized property under several hands in the electoral line of Hohenzollern during many centuries, came in 1806 into the possession of Napoleon, who in 1810 incorporated them with Bavaria.

Frederick ., Elector of Brandenburg

From the very beginning of his rule in 1412, Frederick had been assiduously intent upon saving the country from the effects of anarchy. "The towns, harried and plundered to skin and bone, were glad to see him, and did homage to him with all their heart. But the baronage or squirearchy of the country were of another mind. These in the late anarchies had set up for a kind of kings in their own right; they had their feuds, made war, made peace, levied tolls and transit dues; lived much at their discretion in these solitary countries." On their refusing homage, "Frederick was very patient with them, hoped to prevail by gentle methods, but could make no progress in that way." Force was applied; in spite of drawbridges and thick walls, the feudal castles fell before what little artillery Frederick could muster against them, and with their destruction, order and obedience to the laws entered the long-distracted country. He understood the noble art of governing men; had in him the justice, clearness, valour, and patience needed for that. Except in the Hussite wars for Sigismund and the German empire, in which no man could prosper, he may be defined as constantly prosperous. To Brandenburg he was, very literally, the blessing of blessings; redemption out of death into life." Making every allowance for the shortcomings of several individuals in the long list of Hohenzollerns who followed Frederick on the throne of Brandenburg, there has been something in all that reminds the attentive student of the character of this founder of their dynasty: regular and unflinching progress in all essentials of policy without undue attention to externals—moderation in expense and luxury—manly perseverance in their rights—advancement of the country in the arts of peace as well as of war—protection of their people against the insolent bearing and oppression of the nobles.

Elector Frederick II.

Elector Albrecht.

Elector Joachim I.

Elector Joachim II.

Frederick I. bequeathed Brandenburg, with the electorship, to his second son Frederick II., who obtained the title of "Irontooth" by his military prowess. New acquisitions of territory, by conquest, purchase, or intermarriage, mark his rule (1440 to 1470), as well as that of his two successors Albrecht Achilles and John I.; the former of whom becomes important by his famous family-ordinance (*Hausgesetz*, A.D. 1477), in which it was enacted, that for the future the marches should remain undivided in the hands of the elector; also that the Franconian principalities (viz., Ansbach and Baireuth) should never go to more than two heirs. Thus a real state was formed, and a centre of gravitation provided, to which in the then chaotic state of the empire many a floating mass must needs agglutinate itself in the course of time. Albrecht Achilles' family-ordinance was afterwards confirmed and sanctioned afresh by the Elector Joachim Frederick's house-treaty of Gera. Order and progress in cultivation were on the increase throughout the country, colonists flowing into it from other parts of Germany; so that the beginning of the sixteenth century saw the last of the feudal castles fall under the powerful arm of the Elector Joachim I. (1499 to 1535). The first university in the electorate of Brandenburg was founded A.D. 1506 at Frankfort on the Oder, and a supreme and independent tribunal (*Kammergericht*) organized at Berlin. It is strange, indeed, that this wise and intelligent prince should have carefully avoided every contact with the Reformation, which was spreading far and wide among his people, giving a new and higher tone to their tenor of life, and which was destined to become the corner-stone of his state. The noble task of introducing a more evangelical form of Christianity into the Brandenburg possessions was reserved to his son, the valiant fighter Joachim II. (1535 to 1571), called, "Hector" from the Turkish campaigns in which he had been imperial-generalissimo. It was in the year 1539 that Joachim II. solemnly partook of the Holy Communion according to the Lutheran rite. The three bishoprics of Brandenburg, Havelberg, and Lebus were incorporated into the electorate, and their immense revenues applied to the endowment of schools and charitable institutions. One of his political transactions, though little spoken of at the time, was destined to become the germ of one of the greatest wars the world ever saw, viz., a hereditary union (*Erbverbrüderung*) with Duke Frederick of Liegnitz, signed in 1537, by which, in a certain event, the Silesian principalities of Liegnitz, Brieg, and Wohlau, were to become the inheritance of the Hohenzollern family. Our readers will see that we are pointing to the origin of those Silesian difficulties two centuries later, and their effect on the Seven Years' War; which, in the same degree as they redounded to the military glory of their hero, have been up to the present day represented as having sprung from an arbitrary violation of every law, human and divine. Another important step was made by this elector, when he obtained, in 1569, the co-infeftment of the country called Prussia, which had lately changed its semi-monastic character into that of a secular duchy under the feudal seigneurship of Poland, and under the immediate rule of its first duke, who was a prince of the Hohenzollern family. We shall see that, before long, the sudden decay of the ducal family of Prussia led to the complete union of the two countries under the rule of a Brandenburg elector. John George, elector from 1571 to 1598, deserves our notice, because he opened a ready hand of welcome to a numerous class of Dutchmen driven out of Holland by religious intolerance, and assisted them in settling within his dominions; an example which several of his successors have on occasion followed, much to the advantage of the country,—giving protection to refugees, respectable, hardworking, and accomplished in various branches of industry. His was a reign of thrift and order, by which he succeeded, with the help of considerable grants from his *Stände* (*états*, or provincial parliaments), in removing the consequences of his father's financial maladministrations. Considerable acquisitions accrued to his grandson John Sigismund (1608 to 1619), who not only laid the foundation, on the far west, of the now important state possessions on the banks of the Rhine, by obtaining certain portions of the so-called Cleve inheritance; but also (in 1618) united the dukedom of Prussia to his family.

Elector John George.

Elector John Sigismund.

Previous history of Prussia.

Of this Baltic country, whose destinies henceforward remained interwoven with those of Brandenburg, it behoves us now to say a few words, in order to explain how a German commonwealth had sprung up in these distant regions of the N.E. among a Lithuanian population.

The aboriginal Prussians, of a race belonging to the Lithuanian family, were the inhabitants, from time immemorial, of the territory along the coast between the Vistula and the Niemen. Many had been the attempts to introduce Christianity among this heathenish people on the part of the Polish clergy and the Polish kings; but the Prussians believing, for reasons of their own, that these missionary enterprises were but a cover to political annexation, rallied to withstand them, and finally, much irritated by military demonstrations, entered Poland in great numbers. Their inroads became so alarming that the kings of Poland resolved upon calling to their aid the Teutonic order of the Knights of St George, who would, it was thought, in the absence of Moors and Saracens, be found ready to open a crusade upon that heathenish population. The request was promptly acceded to by Hermann von Salza, the then Deutschmeister, or general of the order, who, however, before setting out, obtained from the emperor a declaration by which all the Baltic lands hereafter to be conquered by his Teutonic knights should become a possession of the order. A long, steady, and well-planned war of conquest ensued (1230 to 1283), in which, with a far smaller amount of needless cruelty than was usual in those days of extermination, the whole country of the Prussians was subjected to the order's rule. Castles and towns were built wherever security demanded or commercial advantages seemed to invite. So great a value was attached by the Teutonic knights to this profession, that in 1309 they removed the head-quarters of their order from Venice to their new palace of Marienburg, which is to this day a witness to their refined taste and their regal magnificence. In all matters the order seemed to be prosperous, and to deserve its progress. Not only did its influence and its conquests soon extend beyond the limits of Prussia, but agriculture, commerce, and the fine arts flourished within their dominions; schools were founded, and law equitably administered. At the time of their greatest prosperity, about the year 1400, the Teutonic knights owned 55 walled cities (several of them important centres of commerce), 48 castles, 19,000 villages, and a nett revenue of 800,000 Rhenish guilders (L.65,000), a vast sum in those days. Luxury, however, and insolent bearing had speedily followed wealth and security, and a single defeat in the great battle of Tannenberg, A.D. 1410, lost against the united forces of the King of Poland and the Lithuanian people, sufficed, if not to drive them out of their possessions, yet to break their independent power. As soon as the great individual valour and skill of their master had procured them an honourable peace they fell out among themselves, one party calling in the Poles to their assistance, and reduced their means to such an extent by internecine warfare that, in the year 1466, the western portion of Prussia was entirely delivered over to the King of Poland, and the order must needs be satisfied to retain its hold on the eastern portion as vassals to the king. In this extremity, the knightly commonwealth of the Teutonic order, in order to obtain protection from without, began the system of electing to the office of masters younger sons or cousins of powerful German dynasties. One of these masters, elected A.D. 1511, was Markgraf Albrecht of Brandenburg-Kulmbach, whose additional recommendation lay in his being the nephew of the King of Poland. Albrecht, however, met with no lenient treatment at the hands of his uncle, but was on the first opportunity attacked by an overwhelming army of the Poles. A truce was no sooner concluded in 1521 than Albrecht hastened to Germany to invoke his countrymen's assistance. He was everywhere disappointed. But the power of the Reformation was so forcibly impressed upon his mind that on his return he declared his adherence to its tenets, with the consent of several of his bishops, and under the acclamations of the nobles and the people. After his liege lord's sanction had been obtained in the peace of Krakau, Albrecht, as a consequence upon the dissolution of his religious order, was proclaimed hereditary duke in the secularized country of Prussia in the year 1525. Convinced of the necessity of establishing the Reformation on the firm basis of sound religious and national education, he opened many schools throughout the country, and founded the university of Königsberg, which continues to this day to stand in the vanguard of mental culture towards the East. But Albrecht's dynasty was not destined to last. His son and successor became hopelessly lunatic. A regency had to be appointed, which, after having been in the hands of other relatives, was conducted from the year 1608 by one elector, John Sigismund of Brandenburg, until in 1618, the dukedom falling vacant by the melancholic duke's death, he took possession of Eastern Prussia, the western part still remaining a province of Poland.

We have thus returned to the fortunate Elector John Sigismund, whose matrimonial alliance with his cousin of Prussia, and the co-infeftment bestowed upon his father, combined in procuring his family a permanent possession (although, for a long time to come, under the feudal *suzeraineté* of Poland) in this farthest north-east corner of civilized Europe. But at this point the hereditary good fortune seemed to desert the family of Hohenzollern. Instead of uniting the north and south-west of Germany, Elector George William.

Frederick William the Great Elector.

which was almost entirely Protestant, into a league under its leadership, and thus probably saving the Germans from a terrible war, Brandenburg receded from the foremost rank in the defence of religious liberty, and suffered deservedly from the wrath and contempt of both contending powers. That fearful struggle, "from the effects of which Germany seems only now to be recovering herself,"—the Thirty Years' War (1618–1648) broke out during the latter years of Elector John Sigismund. His successor, George William (1624–1640), the first utterly incompetent ruler in his family, allowed a violent Papist (believed to have been in the pay of Austria), Count Schwarzenberg, to direct his councils. Neutrality seemed the only desire of this despicable prince's heart. Remaining everybody's friend in a time of unequalled fury, he saw his country trampled under foot by all princes and all armies. Forced by Gustavus Adolphus to declare himself in his favour, he very shortly broke his partizanship. Brandenburg, already impoverished and exhausted by the imperial and Bavarian troops, was now regularly fed upon by a numerous Swedish armament for a number of years. Famine and pestilence cut off the population by thousands; so that, at the time of George William's death in 1640, a traveller would see not only a large number of towns and villages utterly ruined, their trade and commerce annihilated, and even agriculture at a stand-still, but, in the literal meaning of the term, uninhabited tracts, miles after miles, of land, without a living soul upon them. To Frederick William, who succeeded in this year to the dominion of Brandenburg at the early age of twenty, the gratitude of his people and the consent of his contemporaries have ascribed the surname of the "Great Elector." Endowed with a powerful and comprehensive mind, and confident in the moral resources of his people, who soon took courage under his rule, he speedily assumed so imposing a position that the Swedes evacuated the country of their Protestant ally, whilst he cleared by armed force his Rhenish possessions. The elector's voice made itself heard again in the cause of religious toleration during the conferences which were opened at Munster and at Osnabruck in the following years. When the peace was at last concluded, Frederick William could congratulate himself on having regained possession of almost all the territories which had escaped the weak grasp of his father. Almost the only exception to his success was the refusal of the emperor to entertain his claims on the above-mentioned Silesian principalities, which had fallen vacant in 1675, during the reign of George William, and were withheld by that potentate.

To heal the wounds of so protracted and inglorious a devastation, and to secure his straggling possessions from encroachment, was no easy task. It did not escape the elector's observation that the German empire, to whose interests his family had loyally been devoted, could not, in its rotten constitution, long retain much vitality, or any protective power whatsoever. He therefore resolved to give to his state as independent a position in Germany as he could. For this state he saw dangers menacing on all sides,—from the West, in the grasping tendencies of France, then fast approaching the Rhine; from the north, in the yet unbroken war-spirit of the Swedes; and from the East, in the feudal *suzeraineté* which Poland held over his duchy of Prussia. Proceeding step by step, he formed a very efficient though small army, which soon made the name of Brandenburghers to sound as well in the ears of military men as any name in Europe. These troops, assisted by an ever adroit and temporizing policy, procured him, during the sanguinary war which Charles Gustavus waged against Poland, the full and unrestricted sovereignty over his portion of Prussia. In A.D. 1660, before the German empire or any of his German compeers had come to his assistance, he sallied forth to recover the Rhenish possessions of his family (Cleves, &c.), which an invading army of Louis XIV. had wantonly occupied, without even a declaration of hostilities, during a war between France and Holland. So skilful was his strategy that the French, in order to deliver themselves from this most strenuous antagonist, offered subsidies to the King of Sweden for an immediate attack upon Brandenburg, left apparently defenceless by the elector's Rhenish campaign. From Pomerania, of which a portion had been consigned to them in the peace of 1648, they broke in upon Brandenburg, and committed such ravages that their name is proverbially held up in terror to the present day. Whilst they thought him still drilling his troops in the south of Germany, he suddenly attacked them, first at Rathenow, and then, following up his success, a few days later gained a decisive victory near Fehrbellin, on the 28th of June 1675, over a force twice his own number, under the best warriors of that day. The elector left them no time to renew their forces by fresh recruits; and in a brilliant campaign conquered Swedish Pomerania, including the island of Rügen. He reduced even the fortress of Stralsund, which the famous Wallenstein had not many years before vainly attacked with his mighty host. It availed the Swedish commanders but little to create a diversion by a descent upon the duchy of Prussia. Frederick William was soon on their track, and his troops, crossing an arm of the sea on sledges in the depth of winter, drove the enemy from a position in which they had deemed themselves unassailable. Meanwhile, however, the emperor had concluded peace with their common enemies; and thus Frederick William, left entirely alone, was obliged to sign the treaty of St Germain-en-Laye, by which almost every legitimate fruit of his labours was lost. Before he placed his signature to this deed, he gave vent to his bitter feelings against the emperor by exclaiming,—"Exoriare aliquis nostris ex ossibus ultor," and desired his chaplain to preach his thanksgiving-day sermon on the 9th verse of Psalm cxvi.—"It is better to trust in the Lord, than to put confidence in princes." Almost the last act of Frederick William's political life has a special bearing upon British history. Negotiations were carried on by him with William of Orange (afterwards King William III.), which led to a promise of active co-operation—"in the interest of the Protestant party in England, and of the liberties of that country," as in the words of one of the elector's despatches. It was stipulated also that Marshal Schomberg should be allowed to quit the Brandenburg army, of which he was at that time commander-in-chief, whenever his services might be required by William.

The Great Elector's civil government became as famous in his day as his military exploits. We must deeply regret that, instead of fostering the remains of parliamentary life that existed in every part of his dominions, he sacrificed them unrelentingly to his one supreme object of state-unity. The *Stände*, or provincial parliaments, consisting everywhere of the representatives of the nobility, of the burghers, and of the peasantry, were deprived, both in Brandenburg and in Prussia, of their inalienable right of voting the supplies. Their resistance was so rudely coerced that (if we pass in silence some futile attempts on their part in the following reigns to regain their lost prestige) we may date the beginning of absolutism in Brandenburg and Prussia from his days,—an absolutism that remained unbroken, or nearly so, until its hold was relaxed in the middle of the present century, when we may hope to see a stronger union of the sovereign and his people, cemented by the free participation of the latter in the rights as well as the duties of citizenship. Frederick William abandoned the old system of military levies and conscriptions in his own states, thus reserving for the use of his country all hands available for cultivation and for trade. His unremitting attention to the different branches of his army, and his wise economy, enabled him, with comparatively small pressure on the finances of his country, to raise the military establishment to the number of 40,000 as effective soldiers as any in Europe. The distribution of taxes was effected more equitably. His own farms were managed with an eye to improvement of every kind. He received with open-handed hospitality a great number of French Protestants driven from their homes by the revocation of the Edict of Nantes, and found himself richly rewarded by the industrious habits and the skill of these new inhabitants. Every active employment in agriculture, in trade and commerce, in arts and sciences, met with encouragement. He ventured upon the foundation of colonies on the coast of Africa, for the defence of which he kept up a small fleet of armed vessels. He was a staunch adherent of the Protestant faith, of which his wife, the pious Louisa Henrietta, was a bright ornament, and he promoted school-education and literature in every way.

We have thus arrived at the close of the first period of Brandenburg history. From a small nucleus of some thousand odd square miles, a firmly-organized state of European importance had arisen, of nearly 50,000 square miles in extent, and with a population of a million and a half. A short summary of dates may serve as a retrospect of this gradual and almost uninterrupted progress:—

About 500.	Immigration of Slavonic tribes.
925.	Henry I. of Germany subdues the Wends west of the Oder; conquest of their city of Brandenburg; foundation of the North March.
1136 to 1320.	*Ascanian Markgraves of Brandenburg.*
1157 to 1170.	Albrecht the Bear.
1230 to 1283.	Conquest of Prussia by the Teutonic Knights.
1324 to 1373.	*Bavarian Markgraves of Brandenburg.*
1356.	Brandenburg becomes an Electorate.
1373 to 1415.	*Luxemburg Electors of Brandenburg.*
1410.	Defeat of the Teutonic Order at Tannenberg.
1415.	Frederick, Burg-graf of Nürnberg, raised to the Electorate of Brandenburg.
1415 to 1701.	*Hohenzollern Electors of Brandenburg.*
1415 to 1440.	Elector Frederick I.
1440 to 1470.	Elector Frederick II.
1466.	The Teutonic Order loses Western Prussia, and keeps Eastern Prussia as vassal of Poland.
1470 to 1486.	Elector Albrecht Achilles.
1486 to 1499.	Elector John Cicero.
1499 to 1535.	Elector Joachim I.
1511.	Albrecht of Hohenzollern-Culmbach, grand-master of the Teutonic Order.
1535 to 1571.	Elector Joachim II.
1539.	Lutheran Reformation in Brandenburg.
1562.	Co-infeftment of Joachim II. for Prussia.
1571 to 1598.	Elector John George.
1598 to 1608.	Elector Joachim Frederick.
1608 to 1619.	Elector John Sigismund.
1613.	The Elector joins the Calvinistic Church.
1618.	Union of the Duchy of Prussia with the Electorate of Brandenburg.
1619 to 1640.	Elector George William; Thirty Years' War.
1640 to 1688.	Frederick William the Great Elector.
1648.	Peace of Westphalia.
1657.	Treaty of Wehlau; Eastern Prussia is freed from its vassalage to Poland.
1675.	The Swedes routed at Fehrbellin.

Prussia a kingdom. Frederick I.

We have seen that the uppermost principle in Frederick William's political life was to raise his state into a position as independent as possible of the Hapsburg-Luxemburg family, who, filling as they did the imperial throne of Germany, seemed nevertheless deaf to all but purely dynastic interests. It was with this same view that Frederick, his son and successor, laboured to raise his extra-Germanic possession, viz., the duchy of Prussia, into a kingdom. After endless negotiations, and the application of munificent bribes at the court of Vienna, the emperor at last, desirous of securing Frederick's well-drilled battalions, assented to his demand. In the year 1701, on the 18th of January, this new European monarchy was ushered in by Frederick's placing the royal crown on his head at the principal church of Königsberg, the capital of Prussia. Not averse to regal pomp and the splendour of courts, Frederick I. on that day established the new order of the Black Eagle, which holds the first rank among the decorations of the state, and is bestowed but sparingly. The promise given to the emperor, of assistance in the forthcoming war, was faithfully kept. Frederick drove the French from their positions of Kaiserswerth and Rheinberg, on the Nether Rhine, and strenuously assisted the Duke of Marlborough in the reduction of other places. His youthful and brilliant captain, Prince Leopold of Dessau (celebrated in much later years as "the Old Dessauer"), led the Brandenburg-Prussian soldiers into Bavaria, where a terrible army had assembled under the French general Villars. Here it fell to their honourable lot to fight under the eyes of Marlborough and of Eugène of Savoy, and to take their due share in the labours and the glory of the great day of Blenheim. It is reported that, when in the very centre of the position the ranks of the allied army had been three times broken, the Prince of Dessau led his grenadiers onward single-handed, and decided the day. The same intrepidity was evinced, and the same success obtained, by the Prussians in the Italian campaign, when Leopold Dessau, under the command of the great Eugène, was the first to storm and to carry the ramparts of Turin, in the battle of the 7th of September 1706. They did acceptable service also in the battles of Ramillies (in the same year), of Oudenarde (1706), and of Malplaquet (1708).

Frederick William I.

Frederick I. left his kingdom in 1713, not inconsiderably augmented by heritages and peaceable acquisitions, to his son Frederick William I., by his second wife Sophia Charlotte of Hanover, sister of our king George I., and the friend and correspondent of many of the first savans of her day. Yet neither the father's taste for the pomp and ceremony of royalty, nor the philosophic elegance of Sophia Charlotte seems to have been inherited by this sturdy prince, who was given to his country to prepare it, during twenty-seven years of unremitting labour (1713 to 1740), for the rough handling it was to go through under the succeeding reign. His name has been handed down to history as that of a mean niggard, of a ridiculous drill-sergeant, and of a cruel, half-mad barbarian. It would be impossible to deny either his parsimony, or his military propensities, or his severity and occasional bursts of impetuous rage. But we are inclined to look more leniently upon parsimonious habits in a king when they are extended to his own requirements as well as those of others, or upon outbreaks of ill-suppressed anger when this anger is the effect of a desire for the *salus rei publicæ*. We would forgive the Prussian grenadiers their faultless regularity, and even the monstrous size of a regiment of giants, when we know that their commander never abused this terrible armament for deeds of aggression and conquest. Punctuality, frugality, and order became through him the rule and heir-loom of his country; the expenditure of an army of 72,000 men pressed not a whit heavier upon its resources than half as much had done under his father's less careful government; and a well-filled and well-guarded treasury secured the means of prompt action in a country of undeveloped resources, and in an age when the improved principles of national economy were unknown. The population of the country made rapid progress, and was increased by a carefully-encouraged immigration, chiefly of Protestants, who had been thrust out of their own countries by the bigotry of their masters. The king's own pleasures lay almost exclusively in field-sports, in parades, and in the company of his drinking and smoking associates (*tabaks-collegium*); and his contempt of books and book-learning went so far that, during many years, the annual expenditure of the royal library did not exceed one guinea for a charwoman's occasional scrubbing of the staircase. Yet he gave proper attention to the

Frederick II., or "the Great."

schools of the poor, and extended the parochial system by liberal endowments. He gave a wholesome stimulus to the prompt administration of justice. Trials for witchcraft were for ever abolished by him. Frederick William I. was ever unwilling to resort to arms. He obtained Gueldres in exchange for the principality of Orange, and held Stettin by a peaceable arrangement with Sweden, until Charles XII., on his return from Turkey, forced him to a trial of arms by the repudiation of this arrangement. Charles XII. in this conflict narrowly escaped being taken prisoner in the fortress of Stralsund, and the King of Prussia remained in undisputed possession of Stettin and the mouth of the Oder. In 1735 he assisted Austria with 10,000 picked men in the war of succession in Poland, but withdrew his valuable assistance when he discovered that his confiding nature had been all along played upon by the court of Vienna, and that Austrian intrigue was at work on every point to oppose the interests of his country. This was the last time Frederick William drew the sword. The internal improvements of his dominions henceforward remained his sole object until his death, in 1740, when he left his kingdom, increased by nearly 5000 square miles of territory, and no less than 900,000 inhabitants, to Frederick, the eldest of his remaining sons. Frederick had never been his favourite. From the years of his boyhood, the heir-apparent seemed to possess none of those qualities which Frederick William respected, to the exclusion of almost all others,—viz., absolute obedience to the head of the family; attention to the prosaic part only of kingly business; scrupulous punctuality in military matters, rather than tactic and strategic ingenuity; strict and undeviating adherence to every dogma of the Calvinistic or "Reformed" Church; and, finally, violent contempt of all unmanly graces of social life, of literature and the fine arts, of foreign principles and manners. After the first attempts of imparting these principles had failed, it would seem that the king formed the resolution, for what he considered the preservation of Prussia from utter ruin, of cutting off the succession of the prince-royal, either by his voluntary abdication or by actual violence. Of the latter method, the world has been filled with accounts little creditable to the character of the stern and unbending father; to the former desire, when it dawned upon the prince's mind as a fixed purpose of his royal master, Frederick opposed this characteristic answer:—"The king evidently wants me to abdicate; I will renounce my right of succession on condition that my father declares I am not his rightful son." The effect of this terrible and cruel apprenticeship on the crown-prince's mind is clearly and tragically perceptible, in the gradual change from a soft, most charming, most affectionate, and open disposition, to that character which his unworthy friend Voltaire describes as "poli et dur comme le marbre;" that coldness which wounded the enthusiastic tenderness of his beloved sister Wilhelmina; that expression of stern melancholy which settled on his brows and marred every enjoyment, even that of his later triumphs; that measured and rarely genuine submissiveness with which he met his father's advances when a reconciliation had taken place. He never lost his true attachment to poetry and the fine arts; or, what is more, his attachment to tried friends, among whom the two Scotchmen, the Lord Marshal Keith and his brother James, held a prominent place to their respective deaths. But his existence remained cheerless,—illuminated with but few rays of light,—devoted to a continued struggle with the difficulties of a government, the responsibility of which he took entirely upon his own shoulders, or of foreign wars which he had commenced in the full flush of youth and wealth, and which must have worn out any but his mind and body, when the continent of Europe combined to chastise his rashness. Beloved in his early youth, feared in his manhood, admired in his old age, he has now recovered in the hearts of his people that intense affection which his youth had inspired; and whilst Europe calls him "the Great," he lives among the Prussians as their "Old Fritz," or as Friedrich der Eingige (the Unique). None of the succeeding sovereigns of Prussia have ventured upon taking, at the time of their accession, the name of Frederick III.

Born 24th January 1712, Frederick was very soon subjected to a strict *régime*, every detail of which had been minutely prescribed in the autograph instructions of the king himself. Contrary to the royal expectations, the boy took to flute-playing, French wigs, and French books, instead of drilling, the grenadier's pigtail, and the catechism. Before long, the headstrong will and rather flighty disposition of the crown-prince, encouraged by unwise associates, by the indulgence of his mother, and by the affectionate caresses of his sister, led to violent altercations with the king, who, likewise urged on by evil councillors, believed that he saw the entire fabric of his state undermined and crumbling into dust by this apparent conspiracy among his own family. Driven to despair by threats and insults, and by the galling sense of constant espionage around him, Frederick resolved to flee from the presence of his father. Several schemes were formed and rejected, when at last, the occasion of a journey to Southern Germany with the king appearing favourable, every preparation was made for a flight to France and thence to England, where he hoped to find an asylum with his mother's brother, King George I. But his guardians kept too close a watch; and the unfortunate youth's chains were rivetted all the faster for his rash attempt at desertion. The king declared his resolution that the young captain must be tried by court-martial, and suffer the penalty of death like any other deserter. In vain did many of the sovereigns of Europe interfere with the modern Brutus in behalf of the crown-prince; among them the Emperor of Germany, whose paid agents in Berlin had contributed but too much towards the embitterment of this animosity. It would appear that the court of Vienna thought of preventing, by means of this family disunion (which they actually did), the intended marriage of Frederick with a daughter of George II., which would certainly have been the result of a reconciliation. A close confinement at the fortress of Cüstrin was the only alleviation to which the king would at last consent. On quitting this, the royal prince was ordered to remain at the town of Cüstrin, and to give his whole mind to the details of state finances and civil government in general. The young man's stubborn mind was curbed, and although with no good grace did he apply himself to these uncongenial labours, yet he frequently reverted in after years with gratitude towards his rude taskmaster, as having laid the foundation of his skill as a governor of the country. In this state of utter prostration and subjection, he was commanded in 1733 to marry a princess of Brunswick, whom he had never seen, and never (it is believed) could have liked. As he would have complied with any command, sullenly but submissively, he married the handsome but insipid princess, in whose praise it must be said that she bore her husband's polite neglect uncomplainingly, and without bitterness of heart. At a distance from the court, although outwardly reconciled and scrupulously attentive to his duties as district-governor and as colonel of a regiment, the prince resided at Rheinsberg during the remainder of the king's life, surrounded by friends of his own choice, and devoted to literature. To this he contributed, among others, a curious treatise called *The Anti-Macchiavel*, in which violent protests are raised against the dishonest principles of the great Florentine master of statescraft.

On his accession to the throne, 31st May 1740, he retained for the most part the wise and salutary enactments of his father, but freeing them from many of their asperities,

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and instilling new life into them. His prodigious activity made itself felt very soon in every department of his administration. The Potsdam regiment of giants was disbanded, and the fighting strength of his army increased. Frederick abolished the rack, simplified the procedures in courts of law, admitted every petitioner to his presence, and declared in his own pithy manner that, in his dominions, everybody should attend to his own soul as he pleased ("Ein jeder kann nach seiner Façon selig werden"), by which perfect religious liberty to all religious denominations was established in Prussia, before any other country.

The death of Charles VI., Emperor of Germany, in 1740, without male issue, opened the flood-gates of political intrigue and ambitious designs. Instigated by France, the Bavarian elector laid unjust claims to Austria proper, leaving to the emperor's only child, the beautiful and virtuous Maria Theresa, nothing but the kingdom of Hungary. The Saxon elector's equally doubtful claims were on Moravia. Frederick II. of Prussia considered the event a favourable opportunity for seizing by force what had been unjustly withheld by Austria from his predecessors since the Thirty Years' War,—viz., the Silesian principalities of Liegnitz, Wohlau, and Brieg. Those predecessors had never desisted in their efforts to obtain them. Devolving by right of inheritance to the Hohenzollern family in 1675, they had been retained, as we have seen, by the then emperor for the augmentation of his own family property. Frederick I., like the great elector, had protested against this, declaring in a state paper,—"As for keeping my word, I must, I will, and I shall do it; the task of enforcing my claims on Silesia I leave to my successors, whom, under these circumstances of injustice, I cannot and will not in any way bind." And Frederick William I. had, on a recent occasion, expressed the hope, "that there stood the man," pointing to his son, "who would revenge the indignities that his house was suffering." Frederick II.'s demands were no sooner despatched to Vienna, than he marched across the frontier of Silesia with 30,000 picked men. Queen Maria Theresa very naturally rejected the demand thus impertinently proffered. But her long-neglected though numerous army proved deficient in every respect. Frederick had the rare good fortune of being permitted to combine his strategic book-learning with a knowledge of the realities of war in a uniform continuance of success, for which he was at first indebted mainly to the perfect organization of his soldiers, and to the leadership of the Prince of Dessau, whom we saw fighting in the battles of Marlborough, and of Field-Marshal Count Schwerin. The latter was a Pomeranian nobleman of high descent, whose great military ability and moral worth Frederick ever appreciated to their full value. Two great battles—of Mollwitz, A.D. 1741, and of Chotusitz, in the following year—mark this his first campaign, which terminated in the peace of Breslau. Nearly the whole of Silesia was delivered into his hands. The numerous Protestants of Silesia hailed their deliverance (as did likewise many years after the Jesuit order, to whom the king gave free access to his dominions, when the indignation of Roman Catholic courts and nations had driven them forth into banishment). Two years after the peace of Breslau, in 1744, Frederick occupied the important country of Ostfriesland, on the German Ocean (at this day incorporated with Hanover), which had fallen to his inheritance by the demise of the last of its princes. But meanwhile the strenuous exertions of the unfortunate Maria Theresa to raise up a Christian European coalition did not allow him to remain inactive. Frederick had declared in favour of Charles, elector of Bavaria, as a candidate for the vacant imperial throne, in opposition to Maria Theresa's amiable husband, Francis of Lotharingia. Accordingly, the former was elected emperor, under the name of Charles VII., by the German Reichstag or Diet, and Frederick, on the strength of an alliance with him and with the King of France and others, opened the second campaign in Silesia in the month of August 1744. Not so uniformly successful as in the former campaign, he yet showed the superiority of his army and of his own ripened military genius by three brilliant victories. At the close of these two first campaigns, which are known in military history as the Silesian wars, Frederick had lost almost every grenadier of his father's training, and spent every thaler that had been collected in his father's treasury. Charles VII. was dead; his rival of Lotharingia (the ancestor of the present Emperor of Austria) had been proclaimed German emperor; and Frederick now acknowledged him in the treaty of Dresden, December 1745, which again confirmed him in the possession of Silesia. Whatever difficulties the course of events might bring, they would henceforward have to be met by the resources of his own mind alone. Although he may never have anticipated to the full the terrible dangers that were destined soon to environ him on all sides, he strained every nerve to make good the years of peace and tranquillity allotted to him. The revenues of the country were increased by financial reforms, which, though very far indeed from being faultless in the light of improved science, yet were calculated to press but lightly on the productive powers of his country. Every encouragement and every device was resorted to in order to develope these productive powers. Whilst instilling new vigour into every branch of his multifarious administration, and also attending with all the zest of early manhood to the enjoyment of literature and of the society of his personal friends, he did not forget to collect, equip, and exercise an effective army of no less than 160,000 men, in the hope, perhaps, of thus preventing his enemy from further attempts to recover her lost province. But a will as energetic as his own lived in the much-tried empress. A formidable coalition between Austria, Russia, and Saxony, which was soon joined by France and Sweden, crowned her untiring exertions. A partition of the Prussian monarchy was the object of this alliance, which promised France an approach to the Rhine, and Russia the possession of Prussia proper, and was to reduce Frederick to the rank of Marquis of Brandenburg. To these secret negotiations Frederick was able to oppose but one alliance, which was destined to become not only most important for him, but also most auspicious as a precursor of repeated and, as it would seem, lasting bonds of amity, viz., with Great Britain. In January 1756 a treaty was signed by both parties for the avowed purpose of "repelling foreign invasions on German soil." Fortunately for Frederick, the treachery of a clerk in the foreign office at Dresden soon disclosed to him the secret transactions of the coalition. He knew from good sources of information that Saxony, in pursuance of the articles of treaty, was filling a camp at Pirna with troops. Unwilling to give his enemies the advantage of further preparations, he left his capital in the autumn of 1756,—not to return for full seven perilous years,—and suddenly appeared before Dresden at the head of 70,000 men. To the astonished world he gave full explanations by publishing *in extenso* the documents in his possession. As for Saxony, it soon became evident that he was resolved, as far as in him lay, to make her fertile plains his centre of operations, and to save his own country as much as possible from the miseries of war. In this plan, carried out with incredible tenacity throughout all the vicissitudes of the war, lies the secret of a fact that would otherwise baffle explanation, viz., that at the close of a protracted warfare, in which Prussia was the chief actor and the sole prize, this country was found to have suffered less in its resources than others of the contending parties. Very few of the battles were fought on

First Silesian war.

Second Silesian war.

Seven Years' War.

Prussian ground: like lions at bay, he and his gallant allies, ever alert on the frontiers, caused the hostile armies to halt in their onward marches that converged towards Berlin from the south, west, east, and north. The aid of Great Britain, both in money and in men, was at first hesitatingly and insufficiently bestowed, but after the battle of Rossbach, in November 1757, large subsidies and an efficient force were willingly granted, and with such unbounded confidence that the king was requested to give to the latter a general of his own choice. This alliance was abandoned by the English court soon after the accession of George III. in 1761, and Frederick was left to cope single-handed with difficulties which were just then of the most crushing nature. Of this memorable contest, which raised Frederick to a post of honour among the great generals of all ages—which brought to light unknown qualities of noble endurance and perseverance, not only in the great leader, but among his people at large—which disclosed the rottenness of nearly all continental states that had not undergone the Spartan training of so severe a taskmaster as Frederick William I.: of this war, a fuller account has been given in another part of this work. We purpose to pass its romantic vicissitudes in rapid survey, pointing to its features rather than to its strategic details. We have already mentioned his sudden march on the capital of Saxony. Dresden was occupied without resistance; the Saxon troops that had collected in the camp of Pirna were inclosed and forced to surrender *en masse;* and, pushing on to attack one of the two Austrian armies before their union, he was led into the most perilous and sanguinary battle of Prague, May 6, 1757, which, but for the heroic devotion of Marshall Schwerin, must have been lost. "The day is ours," exclaimed the king, "but 10,000 of our men are no more, and Schwerin, alas! whom I reckon another 10,000." But his position in Bohemia was lost by the terrible defeat of Kollin; his British and Hanoverian allies were likewise overpowered by the French; and, to make the list of disasters complete, a victorious advance led the Russian generals to Königsberg, where (as the wont is of Russian generals) the province of Prussia was by them, not long after, simply declared to be henceforward an integral portion of the Russian empire. Frederick, who had left his retreating troops in Silesia, joined another detachment of his army which was vainly endeavouring to stop the mighty advance of the French in Saxony. No sooner, however, had the French general, Prince de Soubise, completed (as he thought) the blockade of his enemy by the River Saale on the 5th of November 1757, than Frederick's cavalry and infantry, suddenly descending in an attack of unprecedented hardiness, soon covered the extensive plain of Rossbach with the flying remnants of an army that had been three times as numerous as his own. Not until the wars of the French Revolution had re-established the prestige lost on this famous day did the memory of its shame cease to rankle in the French army. To Frederick the victory of Rossbach gained a far greater accession of fame and power throughout Great Britain and Germany, than ever so many successful exploits against the Austrians could have accomplished; he was regarded in Great Britain as the hero of Protestant independence, and by Germans as their champion against the great invaders of the West. The same year (1757) saw Frederick victorious against the Austrians, commanded by their best general, the cautious and calculating Daun, in the battle of Leuthen, which, fought as it was under every disadvantage of number (in the proportion of 1 to 3), of quality of men, and of place, has ever been considered as among the strongest proofs of a rare strategic genius in the commander, and of the firm enthusiasm of the Prussians fighting under his banners. Both were signally exemplified again in the following (third) year of the campaign (1758), in which Frederick chastised the Russians near the village of Zorndorf for their insolent pillage and spoliation of the country. But soon other and higher qualities than military insight and enthusiasm had to be brought into action by king and people; and it is in these sombre days of adversity which lasted (although not unbroken by brilliant achievements) until 1762, that Frederick I. rises before us in full relief of heroism. Frederick was a great man by a quality which places him infinitely higher in our eyes than that mighty Corsican conqueror who has since been seen standing before his tomb at Potsdam in 1807; and that quality is his entire and absolute devotedness to his country alone. For him the government of Prussia ever appeared as a duty,—the existence and destinies of Prussia as a sacred trust. In this subjection of his individual will and whole existence under a higher and ideal sense of duty, this "chief servant of the state," not in words only, but in reality, stands far above the class of adventurers in the history of the world who sought their own rather than their country's good, and to whom even the throne was a seat of power and of wealth rather than of duty. An autograph letter addressed to his minister of state, Count Finckenstein, containing secret instructions, has been published lately. Its orthography, it is true, is even worse than in other French compositions of his pen, but every word in it is inspired by a patriotism of the highest order. "S'il arrivait," says the king, "que je fusse tué, il faut que les affaires continuent leur train sans la moindre altération et sans qu'on s'aperçoive qu'elles sont en d'autres mains; et en ce cas il faut hâter serments et hommages tant ici qu'en Prusse et surtout en Silésie. Si j'avais la fàtalité d'être pris prisonnier par l'ennemi, je défènds qu'on ait le moindre égard pour ma personne, ni qu'on fasse la moindre réflexion sur ce que pourrais écrire de ma détention. Si pareil malheur m'arrivait, je veux me sacrifier pour l'Etat et il faut qu'on obéisse à mon frère, lequel, ainsi que tous mes ministres et géneraux me répondront de leur tête qu'on n'offrira ni province ni rançon pour moi et que l'on continuera la guerre en poussant ses avantages tout comme si je n'avais existé dans le monde."

The series of disasters between Frederick's victories of Leuthen and Zorndorf and the year 1762 was, as we said before, not without successful interludes, such as the day of Minden, in 1759, by which Prince Ferdinand of Brunswick (the commander whom Frederick's choice had placed at the head of the Hanoverian auxiliaries) drove the French army to seek shelter beyond the Rhine; or the days of Liegnitz and of Torgau, in the same year, under the personal command of the king. But the peril now assumed huge dimensions, and that web was drawn closer and closer which was to stifle the inconvenient, *parvenu* state of Prussia. The Austrian troops were at this time admirably commanded by Generals Daun and Laudon, and fought with genuine attachment to the cause of their empress. In France an able and active minister, Count Choiseul, had succeeded a rule of favouritism in the king's councils, and though public opinion in France expressed itself more strongly every day in favour of Frederick, the numbers and efficiency of the armies sent to annihilate him were greatly augmented. In Russia a strong determination prevailed at the court of the Empress Elizabeth to erase the memory of Zorndorf, and to leave Prussia proper, and possibly more, as a lasting heirloom to the czars of Russia. Spain, towards the close of the period we are speaking of, and even the Pope himself, joined the ranks of his adversaries. To this host, ever growing, as was feared, in energy and numbers, Frederick had to oppose an army consisting more and more of raw recruits, and an empty exchequer, which levies and contributions in the enemy's land lost all power of filling. Lastly, as if to try his powers of endurance to the utmost, his sole ally Great Britain, under the Earl of Bute's administration, left him to his own resources in the hour of his greatest need, A.D. 1761, and withdrew from the war altogether. Frederick's iron will was not to be crushed with adversity; fighting and retreating, or collecting occasionally his army behind unapproachable lines of defence, which his genius in fortification understood how to raise up in forty-eight hours; losing armies and replacing them; never a moment without cares but rarely oppressed by them;—thus the invincible hero struggled along through upwards of three years of disappointment and defeat. He reposed a hearty confidence in his generals (his brother Prince Henry, the Prince of Dessau, Seydlitz, Ziethen), but appeared among them to take the lead in the great and decisive actions. We name the series of lost battles from 1758 to 1761, to show the destructive character of some of them. On the 14th of October of the former year a grand night-attack on his camp at Hochkirch, executed with admirable precision by the Austrians under General Daun, deprived the king of many thousand soldiers, and "of all his guns and ammunition." The next year (1759) saw the most terrible of slaughters in the two days' battle of Kunersdorf, against a combined army of Russians under Soltikoff, and of Austrians under Laudon, which cost him more than half of his effective army, and again "nearly all his guns;" and must have cost him his capital, had not the jealousy of his antagonists prevented the execution of Maria Theresa's orders. First one and then another of his generals were forced to surrender to overwhelming forces; and thus the greater part of Saxony, and all his positions in Silesia, had to be abandoned. The day of Liegnitz saved a few of the latter, and that of Torgau many of the former. Nevertheless his situation improved but little. Daun in the heart of Saxony, and Laudon in the heart of Silesia; the Swedes masters in Pomerania, and the Russians in Konigsberg; 150,000 French on the right bank of the Rhine; the whole of Europe (without exception) united against him or sullenly neutral;—such was the position of affairs on the 5th of January 1761, when the accession of Peter III. to the throne of the czars suddenly transformed a formidable adversary into a useful ally. Unfortunately for Frederick, the life of his eccentric admirer was soon cut short by high-born assassins. But Peter's widow and successor Catherine, although her first acts were hostile to the king, soon relented in her antagonism, and this from a motive which deserves mention—namely, that letters were found in her murdered husband's portfolio in which King Frederick had seriously and repeatedly urged Peter to change his conduct towards the amiable empress his wife. The friendship, and afterwards the neutrality of Russia, coupled with the withdrawal of Sweden from the coalition, rendered Frederick's action unfettered in the north. His generals, victorious everywhere against the non-Austrian troops of the empire, caused one after the other of the German princes to raise loud solicitations for peace at the court of Vienna, and finally to abandon the cause of Austria. The "first military nation of Europe," France, looked with disgust upon the continuance of a war which brought ever fresh humiliation, at the hands of Prince Ferdinand of Brunswick, upon her once so glorious banners. Half broken-hearted with despair, Maria Theresa had vainly hoped that her field-marshals would recover their laurels, lost again and again at Burkersdorf and at Schweidnitz (1762). The cry of Europe became too loud; her own finances were ruined beyond repair—her resources drained to the last; Maria Theresa consented first to an armistice, and then, with long and wailing protestations, to the acknowledgment of Frederick as lord of Silesia in the peace of Hubertsburg, February 21, 1763. It is a characteristic and encouraging sign of the age in which we live, that when in 1856 a proposal was laid before the present King of Prussia, Frederick William IV., for a series of commemorations to be celebrated on each succeeding anniversary of the victories and glorious events in the Seven Years' War, his majesty wrote the following words on the margin of the paper: "With my consent, none of these anniversaries shall be celebrated in Prussia, save and except the 21st of February 1763."

Prussia had now attained a place among the great powers of Europe,—an envied and hazardous position which the scanty natural resources of the country could (and can to the present day) but ill support, without the unremitting attention, real wisdom, and rigid economy of her rulers; without willingness to sacrifices and self-devotion among well-governed and contented subjects; and without the respect of civilized Europe towards the onward mark of mental and moral culture within her dominions. Frederick's labours of peace during the rest of his life, from 1763 to 1786, were unremitting. He applied himself, with the applause, and with the willing support of his people, to the removal of every vestige of the war. His private expenses were moderate: "an absolute king," he said, "is the poorest man in the state; for whilst his subjects can spend their own as they please, he alone must feel in every trifling expenditure that so many thalers are withdrawn from application to matters of public utility." A code of laws, the present Landrecht of Prussia, was prepared (although not published in his days) by his chancellor, Count Karmer. To assist in the improvement of agriculture in his dominions, the king, much interested by Arthur Young's writings, sent over young men to study British husbandry. He attracted, by the bestowal of bounties and privileges, the immigration of many thousands of colonists who seemed likely to introduce improved methods of farming. He filled deserted villages, and built up such as had been destroyed; he opened his well-filled military granaries, founded societies for facilitating loans on deposits and on land, granted temporary freedom from taxation where most needed, and gave occupation to idle or weak hands, by encouraging the manufacture of home-grown silk. Large tracts of bog and morass were reclaimed at great expense; and the country was covered with a net-work of canals. His financial measures were manifold and ingenious, although frequently of so complicated a nature, and (according to our present views) so unsound, that many of them, instead of lightening the burden of the people, acted most oppressively. His *regié* or system of indirect taxation, copied from the French, and entrusted to a host of French place-hunters; his prohibitive duties, and his monopolies, were so many infractions of national well-being, although they filled the coffers of the state in an unprecedented degree. By them, in conjunction with this rigid economy, he was enabled to keep up an effective army of 225,000 men, and to leave to his successor a treasury filled with nearly L.11,000,000 sterling. Many other prejudices of his age, besides the financial ones, did he retain to the last; not all of them as harmless as his dislike to good roads, "by which *he* did not mean to facilitate an enemy's advance in his country," or as silly as his aversion for all offices of state, or in the army, to men of noble birth. The one among his prejudices which has acquired most notoriety, is the subserviency of his mind and manners to French tastes, in language and literature, in many of the chief transactions of the state, and alas! in the terrible obstinacy with which he opposed his reasoning to most of the fundamental doctrines of Christianity. Filled in his early days with dislike to the dogmatic and unedifying religious instruction of his father's chaplains, and then bound up in close literary friendship with Voltaire, he, although a Protestant, assimilated his own views to those of the Frenchman, for whose irreverential sarcasms an excuse (if any were possible) might at least be found in the horrible superstitions and refined mystifications of the Jesuits, then reigning paramount at the court of France. Frederick, it is true, was ready to acknowledge and to honour the serious convictions of others. History tells us that his truly pious comrade in arms, General Ziethen, never had to complain of railleries on his part. It is reported also that one morning, when the king heard a Pomeranian brigade marching towards its appointed post in the battle array, under the solemn sounds of one of those noble ancient hymns ("Gott des Himmels und der Erden"), all devoutly joining in the strain, his eyes filled with tears, and, turning to one of his generals, he said—"Ah, these troops must be invincible!" Yet, into the ferment and turmoil of his soul none of the soothing comforts of religion was ever seen to enter. A true and often gentle friend of his companions, and devoted to his country, for which he was ready to give up his life-blood, he yet enjoyed not the peace of God, which passeth all understanding.

A few words on the prominent events of these years of peace (1763 to 1786) will rapidly lead us to the reign of the next king. Frederick II. joined Russia and Austria in the first partition of Poland, A.D. 1772,—a miserable expedient, in which the Emperor Joseph's as well as his own main purpose seems to have been, to prevent Russia from taking the whole instead of the lion's share of territories so dangerously contiguous to their own capitals. By this partition the king obtained Western Prussia, which the Teutonic order had lost, as we have seen, to Poland in 1466, and some fertile, already semi-German districts on the River Netz. In all, the increase of territory under Frederick's reign, by conquest, inheritance, or otherwise, amounted to 29,313 square miles; the population of the monarchy at his death numbering five and a half million souls. The last act of his political life was the formation of a German league of princes (Deutscher Fürstenbund), intended to prevent the renewal of attempts such as Joseph II. had twice made during the last years,—viz., of incorporating Bavaria or other German states with the vast possessions of the Hapsburg family.

Frederick-William II.

Frederick-William II. disappointed the hopes that had been entertained of him in his uncle's lifetime and on his accession. The long habit of absolute command, and the absence of tender and soothing influence upon a solitary life, had rendered Frederick peevish, capricious, and tyrannical in his latter years, and the exactions of his French excise and custom-house officers embittered large classes of the community. The new king's accession was therefore looked upon with much favour, a feeling which greatly increased when the French excisemen were ordered out of the country, the *regié* superseded, and other burdens removed. Soon, however, the apathy of Frederick-William, his grossly licentious habits, his carelessness of money, his intolerance in religious matters, and, more than all, the serious blunders of his foreign policy, weakened his influence at home and abroad. His army, under Duke Ernest of Brunswick, succeeded with ease in re-establishing the ascendancy of the House of Orange in the Dutch republic against the wishes of that people. Another armed intervention, purposing to prevent Russian and Austrian aggressions against Turkey, had no other result but the exhaustion of his treasury. Urged on by Russian influence, the king promised Austria his support (during a meeting with the emperor at Pillnitz, A.D. 1790) towards the restitution of royal power in France. He accordingly invaded that country with a powerful army in 1792, much against the inclinations of his own people. This invasion hastened the downfall of monarchy in France and the destruction of the royal family. Besides, all military advantages of the campaign were soon lost by an ignominious retreat after the resultless cannonade of Valmy. The shame of Prussia became still more appalling when, after two years of alternate victory and defeat, she admitted the very same republicans of France, against whom that war had solely been directed, to friendly negotiations, and secretly promised them the cession of all lands on the left bank of the Rhine, stipulating for herself and the rest of North Germany absolute neutrality during the forthcoming wars. This was accomplished in the disgraceful treaty of Basle, A.D. 1795. In the Polish difficulties of his reign, Frederick-William's policy, though more successful than on the Rhine, was equally unscrupulous and dishonourable. Poland, at first and during several years his ally, was abandoned by him to Russian encroachment, and then subjected to a second (1793) and a third, final, partition (1795), Prussia's share in these successive plunders consisting of nearly 38,808 square miles of land.

Frederick-William III.

Frederick-William III. succeeded his father A.D. 1797, at a time when religious intolerance and the restrictions exercised against the liberty of the press had spread the seeds of disaffection throughout the country. The moral rectitude, the simplicity and purity of manners, the earnestness of purpose in the youthful king, and the uncommon loveliness of his queen, the Princess Louisa of Mecklenburg-Strelitz, soon restored to the throne the full attachment of the people. His father's hateful edict against dissent, and others instituting a censorship of all printed publications, were speedily rescinded, and the government entrusted to men of tried virtue. Every exertion was made to pay off a debt of L.3,300,000 which Frederick-William II. had bequeathed instead of a well-filled treasury. The king turned to the best account the neutrality which the treaty of Basle imposed upon his states, by attention to peaceful improvements. In the year 1801 the secret stipulations of that treaty were carried into effect in the peace of Luneville; France definitively obtained the king's possessions on the left bank of the Rhine, and Prussia was "indemnified" in 1803 at the hands of the German empire, and at its expense, by a considerable accession of territory, which increased the bulk of her dominions by 4116 square miles of admirably-situated land. But this neutrality did not long protect Prussia from aggression. Our readers will remember the Franconian principalities of Ansbach and Baireuth, which were described above as belonging to a branch of the Hohenzollern family, cousins of the electoral and royal line. These principalities had become a royal possession in 1791. Through that territory Bonaparte ordered a portion of his now imperial army to pass on their march towards the Austrian frontiers, A.D. 1804. In vain did Frederick-William III. remonstrate against this violation of neutrality. He now reluctantly gave ear to the counsels of the war-party at court, which included among its numbers some of the best men of his day,—Barons Stein and Hardenberg, &c., supported by the chivalrous Prince Louis Ferdinand and by the queen herself. The emperors of Russia and Austria prevailed by their entreaties in 1804. Prussia secretly joined the coalition, but was prevented from active co-operation by the conclusion of peace which immediately followed the irreparable defeat at Austerlitz, December 2, 1805. The crafty Corsican induced the king's plenipotentiary, Baron Haugwitz, to accept Hanover in exchange of Ansbach, Baireuth, Cleves, and Neufchatel; which last-named principality, situated on the frontiers of Switzerland, had become a Prussian heirloom in 1707. So great was the terror of Napoleon's name that this base scheme of robbery against the King of Great Britain was ratified and actually carried into effect by Frederick-William III. The insatiable desire after territorial aggrandisement, without regard either to treaties or to old alliances, was soon to receive a salutary chastisement at the hands of the principal accomplice. Swollen in size to 135,545 square miles,[1] or nearly fourteen times as large as the first Hohenzollern Kurfurst had ruled over, Prussia miscalculated her natural power. Napoleon, not satisfied with the advantages accruing to him from Prussia's conflict with Great Britain, insulted and humiliated wherever he could the king, whose character for honesty and fair dealing he had ruined by this complicity. If Frederick-William had decided upon war too late, his resolution was certainly a precipitate one in 1806. Negotiations having been broken off by Prussia, Napoleon hastened to attack her forces before further alliances could swell their number. The very first encounter, near Saalfeld, October 10, 1806, crushed the Prussian vanguard, headed by Prince Louis Ferdinand, who gallantly fell in this action. Four days afterwards, the fate of all the country between the Rhine and the Elbe was decided by the disastrous battle of Jena. The self-sufficiency of Prussian troops, drilled under Frederick II., but not commanded by his genius, received a severe lesson. No line of retreat having been marked out by the commander-in-chief, several detachments of the army were taken prisoners, and the whole country lay open to invasion, and was soon undefended even by fortresses, which overpowered by terror rather than by force, opened their gates to the enemy. The king withdrew far into Prussia proper. His ally, Alexander I. of Russia, attempted in vain to stop the onward march of Napoleon by the sanguinary battles of Eylau (7th and 8th February 1807) and of Friedland (14th of June). A personal meeting of the three sovereigns was arranged at the town of Tilsit, near the easternmost boundary of Prussia, which led to the conclusion of a most disastrous peace (9th of July 1807). Frederick-William lost all his possessions on the left bank of the Elbe (more than half of his kingdom), and was candidly assured that if he did not lose all instead, it was done out of deference to the Emperor Alexander's "wishes." Even this small remnant of territory was farther deprived of the duchy of Warsaw (now given to the King of Saxony), and of Dantzic, which was declared a republic; it was further made to raise war contributions to the enormous amount of L.22,500,000, was to pay for French garrisons in some of its fortresses, and to assist the emperor in all coming wars. And yet the prediction of that gallant Prussian, General Blucher, expressed on the morrow of the defeat at Jena, in his own uncouth language, that "matters would look up again soon, and that now more enlightened principles would put their foot into the stirrup," was fulfilled in a manner very creditable to king and country. A complete remoulding of the state commenced, proving the fallacy of the wide-spread opinion, that reforms must not be attempted in times of war and distress. Frederick-William, who, with his queen, made every sacrifice of royal state, and even common comforts, gave his confidence to Baron Stein, the best German statesman of the day, a man of high and noble birth and independent wealth, an upright, sagacious, and powerful reformer. The offices of state were simplified, the remains of feudal vassalage abolished, the sale and purchase of land set entirely free, many burdens raised that lay exclusively on the lower classes, the trades liberated from mediæval shackles, and the towns left to manage their own affairs without government interference. Stein was preparing a re-construction also of the ancient parliaments on a new basis of unity and equality, when the rage and threats of Napoleon forced him to resign his post in 1808, since when he became one of the prime movers of resistance against the usurper,—first in Austria, then at St Petersburg, and later again triumphantly in Germany. His work of internal reform was meanwhile carried on in his sense and with energy by Baron Hardenberg, the king's state chancellor. Laws were promulgated for the more equitable distribution of taxes and the abolition of privileges. Most of the civil disabilities of the Jews were abolished. In spite of the exhausted state of his finances, the king founded and endowed a university at Berlin. There was a new hope and cheerful energy called forth by these reforms in Prussia and throughout oppressed Germany. Young men of all classes quietly joined the few regiments which the treaty of Tilsit permitted Prussia to keep on foot, and as quietly left them after having undergone the necessary training and drilling; thus deluding the vigilance of French spies. Commissions in the army were given, without consideration of birth or lineage, to all duly qualified men of education. It was during these years of deepest humiliation that the plan of general armament was formed by Scharnhorst and others which came to light in 1813, and which has rendered Prussia one of the most powerful military countries, for defensive purposes, in the world. By this military institution, all young men from eighteen to twenty-six years old are expected to enter the ranks of the army during three years, such only being privileged to serve one year instead of three as give proof of a superior education, and are able to equip themselves. Between the ages of twenty-six and thirty-two the privates, sergeants, and officers thus trained are liable to be called out from their civil occupations in case of need. This is the First Aufgèbot, or levy of the landwehr. The second, consisting of men between thirty-two and thirty-nine, is subject to the same regulations, but only in case of great danger. Finally, a third Aufgèbot, called Landsturm, comprises all men above that age who are expected to fight only for the immediate defence of house and home during an invasion. It was known throughout the country in those years that the king would break the bondage as soon as circumstances admitted. He visited St Petersburg to prepare a defensive and offensive alliance in 1808, and took cognisance, though not ostensibly, of the secret "league of virtue" (Tugendbund) in which most patriotic Germans joined for the expulsion of their hateful oppressors. Still, however, he refrained from hostilities against Napoleon. It was ordained by Providence that the secret powers of nature, rather than the will of man, should break asunder the tyrant's colossal power. Repeatedly victorious against the court of Vienna in the campaign of Wagram (1809), and married to a "daughter of the Cæsars," Maria Louisa of Austria, standing, as it were, on the summit of his earthly glory, he was now thought to rest his feverish thoughts on the firm establishment of a hereditary empire in favour of his son, the King of Rome. Instead of this, he meditated an unprovoked attack upon Russia, and, inverting the direction of Attila's great migration of warriors thirteen centuries before, he swept the whole of trembling Europe with a host of half a million of men, to which even Austria and Prussia were constrained by treaties to add their quota. When the disasters of an early and terrible winter overtook his retreat from Moscow, and it was long before Europe was fully informed of the utter destruction of his army, the Prussian general York, who held a command on the French army's left wing in Kurland, was the first to see with his own eyes. Left without instructions from Berlin, he concluded an armistice with the pursuing Russians on the 30th December 1812, near the frontier town of Tauroggen, and speedily applied himself to the organization of a landwehr in Prussia proper (*i.e.*, the province of Prussia), assisted by Baron Stein and Count Dohna. On the 3d of February 1813 King Frederick-William, who had a short time before left Berlin, published an energetic decree calling his people to arms. In an incredibly short time the enthusiasm of the people not only filled the ranks of his army, but also contributed largely to improve the exhausted condition of his finances. An alliance was concluded with Great Britain and Russia, and a declaration of war issued on the 27th of March. Napoleon had lost no time in collecting an army far superior in numbers to the allied Prussians and Russians at that

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[1] The present size of Prussia is only 111,154 square miles, or 24,391 less.

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time in the field. His first encounters, at Grossgörschen and Bautzen, with the raw battalions of his enemy were crowned with success, although his generals could well discern "le commencement de la fin." Even after Austria had joined her troops to those of Russia and Prussia, the first great battle of Dresden, August 26, 1813, again ended in a defeat of the allies. But meanwhile the Prussians had found time to increase and improve their armaments in a manner which deserves the admiration of all ages. Napoleon had the chagrin to hear of four considerable defeats sustained by his generals within eighteen days,—by Marshals Ney and Oudinot on their march towards Berlin, at Grossbeeren and at Dennewitz; by Marshal Macdonald on the banks of the River Katzbach in Silesia; and by General Vandamme at Culm in Bohemia. The last-named victory of Culm, gained principally by the admirable steadiness of the Russian guards, redounded much to the credit of the Prussian general Kleist, and even more to that of King Frederick-William himself, who had acted as commander-in-chief on the occasion, and without whose urgent personal representations the battle would never have been fought at all. The other battles at once raised the names of Blucher, York, Gneisenau, and Bülow to great renown. And now the crisis was fast approaching. On both sides all available forces were collected into a huge mass of combatants in the plains round Leipsic. On a number of adjoining but separate battle-fields the French army of 180,000, directed by Napoleon's iron will, fought with great intrepidity against nearly 300,000 enemies intent upon a final deliverance of Europe, on the 14th, 16th, 17th, 18th, and 19th of October. How great was the slaughter of those days may be measured from the fact, that the Prussian list of casualties alone showed a number of 14,000 killed. Napoleon at last was utterly defeated, and his army dispersed. Blucher, in advance of the other allies, followed its flight, and crossed the Rhine near Caub on New Year's-day 1814. When the diplomatic and military manœuvres of Napoleon threw confusion into the headquarters of the allied army, Blucher again resolved all difficulties by a daring march direct upon Paris. There, after a last bloody struggle on the heights of Montmartre, the cause of Europe was crowned with success by the occupation of the capital and the banishment of the usurper. King Frederick-William and Blucher, following an invitation of the prince-regent, came to England, and were received with great courtesy,—Blucher became, in fact, the hero of the day. At the Congress of Vienna, which assembled soon after, Prussia met with great opposition when she demanded for herself the whole kingdom of Saxony, on the ground of its having proved the most obnoxious to the cause of liberation. This demand, together with the divergence of opinion on the restitution of Poland, and almost every other point that required settlement, frequently endangered the temper of the congress to such a degree that Napoleon, founding his hopes on a general disunion, ventured upon a return to France. This immediately restored harmony and concord; Bonaparte, again the military master of France, but formally outlawed by Europe, was to be crushed without delay. The first in the field, favoured by geographical proximity, and still more by military readiness, were Great Britain and Prussia. Against the Duke of Wellington, therefore, and Field-Marshal (now Prince) Blucher, the army of Napoleon was forthwith set in motion, and an immediate attack upon each of them resolved upon in order to prevent their union. The first onset of the infuriated Corsican threw back the Prussians at Ligny, June 16. Confident that Blucher's defeated army must retreat in the direction of Namur, and intent upon pursuing his advantage, Napoleon prepared a concentrated attack upon the British and allied troops, whom he found in a strong position near Waterloo, but not apparently strong enough for continued resistance. Never was general more mistaken. The British army never quailed a moment before his terrible attack, nor was the duke disappointed in the firm confidence he reposed on Blucher's promise. Without giving his troops any rest after the sanguinary conflict of Ligny, through soaking roads and through an opposing French corps under Marshal Grouchy, the veteran soldier pursued his onward march, and suddenly appearing in the rear of the French lines, opened a galling fire of artillery just when the decisive moment had arrived. The battle won, Blucher and his hussars knew of no rest in their vehement pursuit, which transformed the retreat of the French army into a mad and hopeless flight. The Duke of Wellington and Marshal Blucher, whom the commemoration medal represents under the figures of Castor and Pollux, entered Paris together. In the ensuing negotiations of peace the Prussian plenipotentiary demanded that the two purely German countries which intrigue and violence had wrested from the empire in the seventeenth and eighteenth centuries should now be re-united with the Germanic Confederation. This attempt at recovering for Germany its really "natural" boundaries (strictly speaking, there are none other but the Vosges and the Ardennes mountains) remained unsuccessful; France was obliged to surrender those only among her acquisitions which she had made since 1790. Soon after the conclusion of peace the labours of the Congress of Vienna were resumed, from which Prussia received that extent of territory which, with some very slight modifications, she now possesses.

The remaining years of Frederick-William III.'s reign were passed in comparative tranquillity. The king was to the end an attentive governor of his country, much respected and beloved, but not independent enough from the influence of Russia and Austria to persevere in the progress of liberal institutions that had effected such a salutary change in 1807 and the following years. His promise of a parliamentary constitution, repeatedly given in the days of adversity, was not fulfilled in those of prosperity. He thought it unsafe to go beyond the re-organization of the provincial parliaments, or *Stände*, which he effected by an edict of the year 1823, re-assembling, with a slight modification, the old Stände over again, as described above,—viz., a representation of the nobles, the burghers, and the peasants, each separately charged to occupy themselves with provincial matters only, and those of the most restricted nature. Although the disaffection caused by this tergiversation never led to serious collisions with his people, yet the educated classes in the country had an ever-growing sense of injustice committed and rights withheld, and conceived a hearty dislike of the close political intimacy between their court and the despotic rulers of Austria and Russia. Throughout his life the king remained a staunch adherent of the principles of the "Holy Alliance," a treaty concluded at Paris in 1815 between the sovereigns of Russia, Austria, and Prussia, which, if divested of its religious wording (honestly meant, we are convinced, at least by Frederick-William) had no other object but to uphold at any cost, and by every means, the "divine right" and the absolute power of princes throughout Europe. These principles gave a peculiar bias to his behaviour in all European congresses, and somewhat alienated him on several important occasions from the policy of Great Britain. He was blind to the Russian encroachments on the rights of unfettered commerce, which had been guaranteed by treaty to the provinces of Prussia conterminous with Russia. Nor did he awake to a sense of his powerful neighbour's treacherous intentions even when it became known that the Emperor Nicholas had secretly promised to the court of Paris in 1829 the acquisition of all Prussian possessions on the left bank of the Rhine. In spite of these shortcomings in the king's internal and foreign policy, Prussia continued progressing during this relaxation from war. The administration of the country, though far too active and meddling, was throughout a conscientious and vigorously honest one. Justice was administered with complete independence from court or any other influence. The duty of parents to give a proper education to their children, and to send them to a public school, if unable to do so at home, was proclaimed as a fundamental principle in 1816. Another duty resulted from this,—viz., that of the parishes to endow schools, and of the state to assist in this endowment where the parishes were incompetent. A series of laws gave effect to the declaration of these duties; and they have undeniably rendered the practice of reading and writing a more general accomplishment than in any other country. Frederick-William's government, although an almost parsimonious one, never stinted public educational institutions. Normal schools or seminaries for training village schoolmasters were founded in every province. During his reign no less than seventy new gymnasia or Latin schools were founded and adequately endowed. The material interests also received every attention at the hands of government. A tariff of *ad valorem* duties on foreign merchandise, based on liberal principles, was published in 1818. It proved very beneficial to the interests of the people as long as it lasted. But its principles were unfortunately exchanged at a later period for more and more protective duties, in proportion as the Zollverein or German customs-unions (founded in the years from 1819 to 1836) extended farther to the south of Germany, and as its protectionist influence gained an ascendancy over the free-trade propensities of the north.

King Frederick-William occupied himself much with a settlement of the Protestant Church, to which his family and majority of his people belonged, and attempted also the still more difficult task of regulating the relations of his state with the Roman Pontiff as head of the Roman Catholics. In both directions he was but partially successful. The division of German Protestants into Lutherans on one side, and Calvinists (or *Reformirte*) on the other, though it had lost many of its asperities, was still an impediment to good feeling, or to the creation of a national church. Frederick-William, after earnest deliberation, pronounced his desire that each of these Protestant communities, whilst retaining its distinctive dogmas, might nevertheless admit the other into Christian fellowship, and, in order to give the example of brotherhood, he partook of the sacrament at a Lutheran Church, although himself a Calvinist (or *Reformirter*), on the 31st of October 1817, the third anniversary of the Reformation. Like him, the Protestants in several cities of Germany united in worship on that day. Henceforward the name "Evangelic Church" was used officially, instead of the distinctive appellations formerly in use. This union of the several Protestant churches was founded by the king in a real spirit of Christian charity, and with distinct provisos that no individual or congregation should in any way be compelled to adhesion. Unfortunately, when many strict Lutheran congregations objected to the union and to the *Agende* (or Book of Common Prayer), published by command of the king in his capacity of *summus episcopus*, acts of force were applied, and the liberty of conscience infringed. For these gross acts of injustice the greater share of blame falls on the persons entrusted with the execution of the royal will; much, however, remains to be attributed to the king's own impatience of opposition or dissent. Far graver complications met his attempts at an adjustment of his relations with Rome. A concordate having been agreed to between Prussia and the Pope in 1821, by which the former acknowledged a regular Roman Catholic hierarchy, consisting of two archbishops and six bishops, and undertook to pay a fixed sum annually towards the endowment of that church, everything seemed to progress smoothly by mutual forbearance. But after a time difficulties arose. In 1837 the Archbishop of Cologne, Baron Droste-Vischering, declared that he would henceforth allow no marriages between Roman Catholics and others to be consecrated by priests of his diocese, except under the distinct promise, that all children should be brought up in the Roman Catholic religion. He was in vain reminded of the promise he had himself given in writing previous to his accession to the archiepiscopal see, faithfully to obey the laws of the country and the arrangements entered into by his predecessor. He obstinately refused compliance. At length the Prussian government, losing all patience, directed his forcible removal from his see as a state-prisoner, on the ground "that he had broken his word, violated the laws of the kingdom, and excited the minds of the people under the influence of two revolutionary factions." This transaction led to endless discussions, which might have been terminated more satisfactorily had the government resolved at once upon placing the archbishop on his trial on the above grounds in a public court of law.

The following is a summary of events since the elevation of Brandenburg-Prussia into a kingdom:—

1701.	The Elector of Brandenburg and Duke of Prussia declared King of Prussia.
1701 to 1713.	Frederick I.
1713 to 1740.	Frederick-William I.
1740 to 1786.	Frederick II., or the Great.
1740 to 1742.	First Silesian War.
1744 to 1745.	Second Silesian War.
1756 to 1763.	The Seven Years' War.
1772.	First partition of Poland.
1785.	The German League of Princes.
1786 to 1797.	Frederick-William II.
1792.	Invasion of France.
1793.	Second partition of Poland.
1795.	Third partition of Poland.
1795.	Peace with the French Republic concluded at Basle.
1797 to 1840.	Frederick-William III.
1801.	Peace of Luneville.
1806.	The German Empire ceases to exist.
1806.	Battle of Jena.
1807.	Peace of Tilsit.
1807 to 1808.	Reforms in Prussia.
1812.	Napoleon's march against Russia; General York concludes an armistice with the Russian general.
1813.	The War of Liberation; battles near the Katzbach, Kulm, Grossbeeren, Dennewitz, Leipsic.
1814.	First peace of Paris.
1815.	Napoleon's return; Battle of Waterloo, or of "Belle-Alliance."
1817.	Union of the Lutheran and Calvinistic Churches in Prussia.
1819 to 1836.	The German Zollverein gradually extends itself.

Frederick William IV.

On the accession of Frederick-William IV. to his father's throne, the long-suppressed desire of the people for a direct parliamentary participation in public matters was loudly and loyally expressed. The hopes throughout the country were great, as the crown-prince had been known to entertain views opposed to the all-powerful influence of Prussia. A brilliant power of speech, mildness of disposition, and the manifold kindness to such as had latterly suffered from persecution or neglect, all combined to produce expectations of reform far beyond what the new sovereign had ever intended. Given to mediæval studies, and at the same time an admirer of English institutions, he was, it is true, averse to the severe regularity of Prussian bureaucracy and red-tapeism, and would have liked to see a brilliant assemblage of peers and knights around his throne, as in olden days; but he proved to be over-sensitive to the slightest infringement of royal prerogative, and abhorred the idea of parliamentary bodies that would have or show a will contrary to his. The consequence was a disappointment and mistrust on the part of the people, and on his a gradual relinquishment of the leniency and liberalism of his first years, a tedious, inactive, and undecided course of

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policy. A number of years of peace and tranquillity, of waiting and patient obedience, were allowed to pass away before any reform of the country's institutions was attempted. To the people the uncontrolled and even increased power of red-tape bureaucracy, of what was termed the police-state (*Polizeistaat*), became less endurable as the years advanced. And when at last, in 1847, a royal decree summoned together the members of all provincial parliaments to a combined sitting in Berlin, their power was so limited, and the tenure of this power so precarious, that the assembly, although animated with very loyal sentiments, and containing a totally unexpected amount of talent, effected none but negative results. The fulfilment of a promise of nearly forty years' stand[illegible] was insisted upon; and the grants of money, even for public works of undoubted utility were refused, until a real representation of the people should be established. Nevertheless, a general belief existed, that by this important "first step" of 1847 a series of reforms was inaugurated which must lead, if not rapidly, at least surely and peaceably, to a full victory of parliamentary principles. The loyalty of the people to their Hohenzollern dynasty, and the spread of education throughout all ranks, seemed to preclude the possibility of this progress being interrupted by sanguinary conflicts; also, the finances of the state were in so flourishing a condition, the general administration of the country so free from the taint of corruption, and on the whole so just, that it seemed unnecessary for this state to pass through violent storms of revolution. But it was decreed by Providence that these fair hopes of king and people should be destroyed. The year 1848 shook the foundations of the Prussian state, together with those of the entire continent of Europe. A time of anarchy intervened. And although its upshot was a constitution (of 1850) as liberal in all essentials as any in Europe, it gained so little vitality during the remainder of the king's reign (to 23d of October 1858), that the country seemed on the whole to have moved backward in this respect rather than forward since the assembly of 1847.

As in this particular question such was the king throughout. Amiable, willing to conciliate, and unfortunately possessing a *half-insight* into the requirements of his age, he was apt to give just enough to produce a craving for more, not enough for permanent gratitude and satisfaction. He showed attainments of no ordinary character; and among his personal friends are numbered some of the most enlightened men of his age and country. Yet the liberty of speech, and that of the press, were never more cramped than it was after the halcyon days of his first popularity. The king's orthodoxy in religious matters has proved inoffensive, and always tolerant to the belief of others. Yet his policy in this direction was influenced more and more by men of the narrowest and most exclusive opinions.

The first part of Frederick-William IV.'s reign (1840 to 1848) was one of rapid development in all arts of peace, in manufacture, in trade, commerce, and navigation. A comprehensive system of turnpike-roads (for the most part made and kept up by the state), on which his father had bestowed much attention, was brought to completion. Railway companies and other associations for most branches of industry spread over the whole country, and commenced to change its aspect. Prosperity seemed to keep pace with the labour of man. Yet, nevertheless, the spirit of sullen discontent was brooding over the country when the news arrived in February 1848 of a complete *bouleversement* in the neighbouring state of France. Its effect throughout Germany was, in the first moments, simple and patriotic. Cries of "*A la frontière*" had been frequently heard in the streets of Paris; and the first spontaneous burst of sentiment therefore, created by a vivid recollection of long years of invasion and oppression, was expressed in the cries of "Defence against the common enemy," "Close alliance of all German states," "Recovery of the unity of Germany, lost since 1806." This agitation, though most violent in the smaller states, broke forth actively, and at first beneficially, in Prussia. But soon, and almost together with it, a very different pulsation appeared to pervade the people. In France the masses had obtained their will, and were apparently all-powerful. The same then was attempted by the masses in Germany. Every class of labourers and workmen combined for a settlement of their real or imagined grievances. At that time, had the governments possessed the full confidence of the middle classes, all who had anything to lose would have rallied round the thrones to ward off the common dangers of society; but that confidence was gone. The middle classes demanded reforms, on the whole, it may be said, of a moderate nature. With scarcely any resistance, these were accorded in the smaller states. Men of liberal opinions were called to offices; but the danger proceeding from the lower classes was on the increase. There appeared but one hope of protecting society,—viz., if the King of Prussia would declare his assent to the same reforms, and promise to use his best efforts towards a more efficient defensive union of Germany. Delegates from all the minor governments, including the Bavarian, proceeded to Berlin in the beginning of March to implore the King of Prussia, who had as yet experienced comparatively small pressure at the hands of his subjects. The king's scruples were at last overcome after the arrival of the astounding news of Prince Metternich's fall at Vienna (15th March). A royal proclamation, eloquently expressing all that had been demanded, was prepared, signed, and published, on the morning of the 18th, to the great joy of the Berliners, who assembled before the palace to express their satisfaction. Then suddenly two shots, fired nobody knows by whom, produced a commotion. French and Polish *barricadiers*, who were everywhere in great numbers in those days, raised a hue and cry after arms throughout the city, and in a short time all the elements of confusion of a populous town were in readiness, two hundred thoroughfares stopped by barricades, and the masses in conflict with the king's troops. A street fight ensued. The combat lasted through the night, and ended towards morning, when nearly all the barricades were evacuated by the insurgents. In this juncture of affairs an unexplained, and in fact inexplicable, command to the troops was issued from the palace early in the morning, ordering them to march out of the capital. The effect was such as might have been supposed. The insurgents came forth victorious, parading through the streets the bodies of those who had fallen; galling insults were heaped upon the king and queen; complete anarchy was triumphant. All hopes of protection from this quarter were now abandoned. Revolution had full sway, and ran its course during a time; not a bloody one on the whole, yet so subversive, that the higher and a great part of the middle classes abstained from its doings altogether. Its effects have not been salutary. It brought to light a hidden animosity of all classes against each other. In Prussia, as in most other German states, it led in the end to restrictive measures, which, in their turn, overshot the mark, and have rendered the easy comfortable rule of past years almost an object of regret to the people at large.

King Frederick-William IV. had called the leaders of the former liberal party to his councils. They willingly came and did their best. The old parliament was for the last time convoked in April, to give its sanction to general elections for a new one, which was to frame a constitution in conjunction with the king's government. The result of the ultra-democratic elections was discreditable to so educated a country as Prussia. After committing every kind of extravagance, and baffling the attempts of divers sets of ministers, this so-called constituent assembly was dissolved in October 1848 by a new cabinet, which, had the worthy general Brandenburg (an illegitimate son of King Frederick-William II.), and a man of not so stainless a reputation, Baron Manteuffel, among its leading members. The king, in dissolving the assembly, published a constitution of the monarchy, and issued writs for the election of another parliament, with a view to its revision and final settlement. Everything had changed meanwhile. A directly opposite class of members now filled the benches,—*i.e.*, noblemen and *employés*,—quite as eager to protect their interests, and, if possible, to restore the old condition of things, as the former members had been to diminish their power in the state. Thus Prussia was thrown from the hands of silly democrats into those of an aristocratic clique and of partizans of the divine right of kings, so well known in the history of our own Restoration. Under the general dread of revolution and anarchy which pervaded the possessing classes, and with a king more and more averse to liberal measures, this party of nobles and zealots became the most powerful in the country, and has remained so during the succeeding years.

We had occasion to mention the defensive and unitary movement throughout Germany on the first outbreak of the third French revolution in 1848. Under the influence of an unruly democracy, this movement, when all danger of French invasion had passed over, took the shape of a fixed plan for proclaiming a German republic, after an overthrow of in all thirty-three German sovereign thrones. The opposite extreme to this was a desire (entertained by very few at that time) that matters should remain as they had been since 1815, viz., thirty-three monarchies and four free cities, independent in their action, and bound together by a federal tie—a constitution which had shown, as must be confessed, little or no vitality except for the suppression of liberty in the different states. A third party, which gradually numbered among its members nearly all men of moderate views, and some even among the German sovereigns, proposed to re-establish the German empire without removing the landmarks of any of the single states; leaving every sovereign and every city intact in all except the common affairs of Germany, namely, war, diplomacy, customs. These common affairs were to be directed by the new emperor with an imperial ministry responsible to a national parliament. The main difficulty of this patriotic scheme, that in fact which would alone have necessitated its failure, was the existence of two such states as Austria and Prussia within the German Confederation. Of Austria it was said that her interests were entirely of a European, not of a German character. The kingdom of Prussia, on the contrary, had no non-German population (with the exception of about a million Poles) or interests, and accordingly that party looked to Prussia as containing the most appropriate dynasty for the future German empire. The leaders of the German constituent assembly, which proceeded from general elections, and met at Frankfurt-am-Main on the 15th of May 1848, were mostly of this opinion, and so were the leading men in most governments of Germany at the time, including also (although, strange to say, not prominently) the Prussian cabinet. By the time they had finished their long-winded debates on secondary matters, most sovereigns in Germany had sufficiently recovered from their terror to dismiss their councillors, and to oppose the inconvenient scheme of unity. At length, on the 28th of March 1849, the party thought their labours crowned, by carrying the election of the King of Prussia to the headship of the new German empire. The king's answer to the deputation sent to offer him this new dignity was to the effect, "That he could not accept it without the free consent of all German sovereigns; that it lay with these sovereigns to consider whether the proposed constitution was conclusive to the welfare of each individually, and of all collectively, and whether it would enable him to direct the destinies of Germany with a firm hand." In the evening Schiller's play of "The Robbers" was acted in the royal theatre, to which the members of the deputation were *ex officio* invited. Little edified either with his majesty's refusal or with those theatrical insinuations, the deputation returned to Frankfurt. On their report, resolutions of "standing by" the new constitution were passed in the assembly. But the fatal motto of those days, the "trop tard!" again showed its truth. The Prussian members, as well as the Austrians, were revoked by royal command, and the remainder, a kind of "rump parliament," having withdrawn to Stuttgardt, were soon finally dispersed. Instead of simply leaving the matter alone, King Frederick-William IV. committed the incredible folly of attempting a more united organization of part at least of Germany, "with the free consent of its sovereigns!" The failure of these attempts, at a time when princely prerogative was again in the ascendant, and all feeling of immediate danger had passed away, was inevitable. Backed by the middle states of Germany (Bavaria, Hanover, Würtemberg, and Saxony), Austria advanced to oppose these Prussian half-measures, which were but despondingly supported by the nation at large, and a complete humiliation of Prussia was the result. All further attempts have ceased since the convention of Olmütz, 29th of November 1850. The confederation is again just what it was; its old assembly of delegates (Bundestag), convoked again in its former composition by Austria in 1850, was acknowledged by Prussia in 1851. Its influence has again shown itself only in recommending the suppression of liberal constitutions in Germany. Still it deserves attention, as the only acknowledged bond of union among the totality of German states.

The Prussian constitution fared somewhat better. Its paragraphs were carefully revised, and the king took the prescribed oath on the 6th of February 1850. Numerous modifications in it have taken place since, under the influence of violent "legitimist" majorities. It would be vain also to say that the king and his government were rendered less absolute by its provisions than they had been before,—such was the apathy of the country following the revolution of 1848. Yet it is an advantage to Europe that we can still name Prussia among the constitutional countries where no money can be spent, no law promulgated, without the assent of a representation of the people; in which every grievance must find a hearing, even if it does not always find redress. This is perhaps the chief gain to Prussia of the turbulent years of 1848 and 1849. Another gain, and not of smaller benefit perhaps, is the abhorrence now existing among Prussians, and in fact throughout Germany, against political and social theories, ever since their entire failure in 1848. Yet another advance, which it would be difficult to explain, is the greater activity imparted to all industrial and commercial undertakings within the years 1850 to 1858, which (to give only one example) has more than doubled the production of native Prussian iron within five years. It would seem as if the country had tried to forget, in this busy trading and commercial activity, the intense chagrin which maladministration was everywhere engendering. All the faults of the *régime* previous to 1848 were now exaggerated tenfold. The court-party ruled the king and his ministers, and crept into all places of importance in the state; hypocrisy in religious and political matters was rewarded by distinctions and employment; religious dissent was repressed and punished by disabilities; even bribery and corruption, from which Prussia had been pre-eminently free, began to assume the functions of a regular principle of government; the police exerted a kind of discretionary power; the servants of government in the provinces seemed to imitate the example of French *préfets;* the elections were ruled by intimidation, and brought into the Chamber of Representatives an incredible number of men in the pay of, and dependent upon, government.

In foreign politics the king's disposition was directed through life to the maintenance of peace. He visited England at the invitation of Queen Victoria to stand sponsor to the Prince of Wales in 1842, and ever professed a great admiration for British institutions. He made an exception to his peaceful policy, in 1848, when he attacked a Danish army by order of the German Confederation, to protect the duchy of Holstein, which is one of the states of that confederation. On account of these proceedings, the king has been suspected of ambitious motives, and of a desire to annex that duchy, and its closely-united neighbour Schleswig, to his own dominions. Of this he was innocent. The truth seems to be, that a deep-rooted animosity of the German population, both in Holstein and Schleswig, led them to an untimely attempt at separation from the Danish monarchy, instead of waiting for an opportunity which time must have brought, viz., the extinction of the male line of rulers in Denmark, and, contingent upon this, the accession (by the Salic law) of a separate dynasty in the duchies. The war has embittered the sentiments on both sides to an irremediable extent, without any redress of grievances, and has brought upon Prussia and the Germanic Confederation the profound humiliation of having created hopes, sent armies and generals (in 1848 and 1849), and then (1850) pusillanimously abandoned those whom they had declared to be in the right and had undertaken to protect. Another short but bloody war was forced upon King Frederick-William by an insurrection among his Polish subjects, the explosion of which had been adroitly prevented by the government in 1847, but which broke out and assumed rather formidable dimensions in the disastrous spring of 1848. It was suppressed, but not before a series of sanguinary combats had proved to the Polish insurgents how unavailing scythes are against rifle-balls and shrapnells. A considerable Prussian army marched into South Germany in the summer of 1849, at the request of the Grand Duke of Baden, whom a wide-spread mutiny among his own troops had forced to abandon his country to a clique of republicans and their besotted followers. Baden and the Rhenish possessions of Bavaria (also in the power of insurgents) were occupied after a short resistance; and similar outbreaks in Würtemberg and Bavaria proper prevented by this timely aid. In the oriental war (1853 to 1855) Prussia abstained from military co-operation; and was admitted to the Congress of Paris only when its work was finished and all but ready for signature. The territory of Prussia underwent no important changes during this king's reign, excepting that the provinces of Prussia proper and Posen (the latter so far as its population is German) were formally introduced into the Germanic Confederation in 1846, and as formally replaced on their old footing in 1850, it being gravely asserted by the politicians of the day, that the position of Prussia as a European power depends in a degree upon her possessing lands without as well as within the said confederation! Another change, implying a trifling loss, must be transitorily mentioned, viz., the resolution of the little canton of Neufchâtel in 1848 to belong henceforward to Switzerland alone, independent of the King of Prussia, who had inherited it, and very mildly exercised his sovereignty. The king set a great value on the recognition of his right, and all European powers gladly recognised them; but when he threatened actual warfare, to back the attempts of the royalist party in the canton (A.D. 1856), the same powers interposed, and the canton was amicably left to itself and to Switzerland early in 1857.

In the autumn of the same year the king was visited by several strokes of apoplexy, which impaired his power of speech, and in part also his reasoning capacities. The sympathy with this melancholy downfall of a highly-gifted and amiable sovereign was general among all classes of the people. But their indignation was soon kindled by the artful intrigues of the court party, who caused the unfortunate monarch nominally to retain the government, merely desiring his eldest brother William (who had borne the title of "Prince of Prussia" ever since the late king's death, as heir-apparent to the throne) to conduct the affairs of state "in accordance with his (the king's) known intentions." The meaning of this was absolute power concentrated in the hands of the then cabinet, under the presidency of Baron Manteuffel, whom to dismiss would have been, on the prince's part, to overstep his instructions. Fortunately for Prussia, no European event of grave import occurred in this first year of the king's malady; and the country, although without a ruler, and oppressed by the host of ministerial police, passed through this agonizing twelvemonth, outwardly at least, unharmed. On the expiration of that term in October 1858, the king, in accordance with a paragraph of the constitution which makes provisions in case of a king being "lastingly incapacitated," signed an order conveying to his brother the full and unrestricted powers of regency, and left Potsdam soon after to pass the winter in a southern climate. Since then public matters in Prussia seem to take a more favourable turn. A new cabinet, containing the leaders of the opposition, is ably supported by the majority of a newly-elected Chamber of Representatives. Divers practices of the former administration have been simply dropped, and bills introduced to prevent their recurrence. Reforms are firmly demanded, and will be honestly granted. The prince shows no precipitation in his actions, but gains confidence rather by well maturing his plans. Many are they who would fain hope that Regent William will prove a worthy follower in the footsteps of his namesake, our William of Orange; and that the children of the Princess-Royal of Great Britian may reign over a country blessed with the same institutions as our own, and governed by that obedience to the laws which has rendered our island prosperous and mighty beyond all nations of the earth.

Position. The Prussian monarchy is composed of three territories, very different from each other in size. The first or eastern portion extends from nearly the centre of Germany to the frontiers of Russia and the Baltic. The second or western portion, smaller in extent, and divided from the former by a stripe of land between 30 and 40 miles in width, begins on the frontier of Holland, Belgium, and France, and reaches the course of the River Weser. The third portion consists of the small principalities of Hohenzollern on the Danube, which have belonged to the royal line of that family only since 1850, inclosed within the states of Baden and Würtemberg. The two first and principal portions are situated between 55. 52. and 49. 7. N. Lat., and 6. and 22. 50. E. Long. Its greatest extent is from the French to the Russian frontier, a line, though not quite unbroken, of nearly 800 miles. **Frontiers.** The principal frontier is the Baltic Sea, washing the shores of Pomerania and of Prussia proper, about 520 miles in extent. A waste stripe of coast (the Jahde-port) having being purchased from Oldenburg in 1855 for the construction of a naval port, the Prussian state now has access also to the German Ocean. The land frontiers are,—1*st*, Of the eastern portion, Russia and Poland, on the east; Austria, Saxony, and Thuringia, on the south; Hanover, Hesse-Cassel, Brunswick, Mecklenburg, on the west. 2*d*, Of the western portion, Holland and Hanover, on the north; Lippi, Brunswick, Hanover, Hesse-Cassel, Waldeck, Hesse-Darmstadt, Nassau, and Rhenish Bavaria, on the east; France on the south; Luxemburg, Belgium, and Holland, on the west.

Size. In point of size, Prussia, as at present constituted, nearly equals the area of Great Britain and Ireland. The King of Prussia's territory comprises 111,154 square miles, compared to the 121,050 square miles of the United Kingdom.

Statistics. (For the size of each of the above-mentioned provinces, see Table III.)

Outward configuration. The western portion, including Hohenzollern, is mountainous; the other (with two exceptions, viz., Upper Silesia, and the country bordering on Thuringia) belongs to that interminable plain which characterizes Eastern and North-Eastern Europe. In Brandenburg, Pomerania, and Prussia proper, the plain goes down lower and lower as it approaches the Baltic, against whose ravages it is in many parts protected only by natural or artificial sand-banks. Over this monotonous plain a few small lines of hills are seen stretching along. The land, in part sandy, in part extremely fertile, is intersected by some powerful rivers, large lakes, morasses, and forests of pine and fir. The highest point of this country is the island of Rügen, famous for its white chalk cliffs, which remind the traveller of Dover. Upper Silesia contains a mountainous district separating that province from Bohemia. It bears the names of Waldenburger-Gebirge, Glatzer-Gebirge, and, raised above the rest, the Riesen-Gebirge: the Schneekoppe, its highest point, measures 4931 feet, which is more than the height of any non-Alpine mountain in Germany. Parts of the Thuringian hills are Prussian ground, and likewise a part of the Harz Mountain, with its ghost-haunted Blocksberg or Brocken. The western portion also begins with flat country in the north; soon, however, the Weser hills rise above the plain, followed to the westward by the Teutoburgwald, and farther on by the Westerwald, which ends where it touches the Rhine in the picturesque Sieben-Gebirge, 1429 feet high, and its marked promontory the Drachenfels. The hilly countries to the left of the Rhine are divided into groups by its tributaries,—viz., the Hohe Venn (a part of the Ardennes), between Maass and Mosel; then the volcanic Eifel, north of the Mosel; and the Hundsrücken, south of it. The Hohenzollern country forms part of the Swabian Alps, and is crowned by the ancestral castle of the family on the summit of the Zollern hill (2663 feet high).

The sea. The Baltic Sea is too shallow to offer any first-rate ports; there are, however, good roadsteads along its shores. Its commerce is carried on mainly by the following Prussian towns,—viz., Memel, Königsberg, Pillau, Elbing, Dantzic, with Weichselmünde, Swinemünde, Stettin, and Stralsund, some of which are obliged to send their merchandise along the shallow waters of a haff. These haffs (the Kurische, Frische, and Stettiner) are broad lakes or river-outlets formed by the streams on their sluggish exit into the sea, and so close to the shore that there remains only a narrow stripe or *Nehrung*, through which the river then finds its way out. The water of the Baltic contains five times less salt than the Atlantic. It is ice-bound during three or four, and sometime five, months of the year.

Lakes and rivers. The number and extent of lakes is considerable: there are 389, of more than 200 acres each, which occupy in all an area of 775 square miles. The hand of man has reclaimed by drainage, and turned into splendidly fertile land, immense tracts of bog and morass. These bogs derive their names from the rivers whose course they accompany: thus the Oder-Bruch, most effectually drained by Frederick the Great; the Warthe Bruch, now almost entirely a fertile district 60 miles in length by 10 in width; some 60 square miles of the Obra-Bruch, in the province of Posen, are at present under operation. All great Prussian rivers flow into the Baltic or into the German Ocean, excepting the Danube, which in its upper course traverses Hohenzollern. Beginning from the last, the principal rivers of Prussia are the following,—1. The Niemen or Memel, which enters the Baltic near the town of Memel, after traversing the Kurische Haff, the northernmost of those mighty river-outlets mentioned above. On its banks lies the famous town of Tilsit. 2. The Pregel, which passes into the Frische Haff 5 miles below Königsberg, and into the sea near Pillau. 3. The Weichsel or Vistula, 13 feet deep in the Baltic port of Weichselmunde, near Dantzic, but mostly shallow higher up; its width is 2850 on its entrance into Prussian territory, and increases to 5000 feet. Two other branches of the river (one of them called the Nogat) flows into the Frische Haff; its course is defended by the fortresses of Thorn, Kulm, Graudenz, and Dantzic. 4. The Oder, a mighty stream of 625⅓ miles in length, 583⅓ of which belong to Prussia, collects its waters from no less than 52,267 square miles of land. Silesia, Brandenburg, and Pomerania are traversed by the Oder; among the towns on its banks may be mentioned Oppeln, Breslau, Frankfurt, and Stettin. Its principal tributary is the Warthe, coming from the eastward, 600 feet wide near the fortress of Cüstrin, where it joins its waters with those of the Oder. Another tributary has become famous in history, viz., the Katzbach, which flows from the westward. 5. The Elbe, an important landmark, inasmuch as it separated, and to a certain extent even now separates, the purely Germanic population on its left from a country gradually re-conquered, colonized, and Germanized, after a great immigration of Slavonic races. Having crossed Bohemia and Saxony, it enters Prussia as a navigable river 6 to 10 feet deep, passes the fortified cities of Torgau and Wittenberg, and then flows into Mecklenburg territory. The waters of the Saale, from the left, and of the Havel, combined with the Spree, from the right, swell the stream of the Elbe, which measures 1000 feet after the junction with the Havel. 6. The Weser, a small part of whose course, that which passes the town of Minden, belongs to Prussia, 3 to 6 feet deep, and 140 to 200 feet wide. 7. The Ems must, like the former, be called a Hanoverian river; it has, however, a course of 112 miles in Prussian Westphalia. 8. The Rhine washes Prussian soil from Bingen to the frontier of Holland, a distance by water of 233 miles, or nearly one-third of its entire length, which is 816 miles. Its fall within these limits is no less than 226 feet. Near Bingen it has a width of 1608 feet, which is diminished to 840 feet near Unkel, and then widens out again gradually to 2544 feet near the Dutch frontier. Its principal tributaries are,—from the west, the Nahe, which passes by Kreuznach; the Mosel, with its many cities; and the highly romantic Ahr: and from the east, the Lahn, the Wupper, the Ruhr, and the Lippe,—all four now rising into great importance by the mining and manufacturing activity of its valleys.

Canals. It was a matter of just pride among the Prussians in former times that they possessed a large net-work of canals, connecting their principal rivers and lakes between the Elbe and the Niemen. They are, however, now losing much of their value by the competition of railways.

Climate. The climate of Prussia is on the whole temperate and healthy. In Königsberg the mean temperature shows 43°·52; in Berlin, 40°·2; in Aachen, 48°·875; in Bonn and Treves, 50°. The thermometer does not anywhere rise above 100°, or fall lower than 25° below zero. In the provinces of Prussia proper and Pomerania the winter lasts seven months; there the middle of May is usually considered the beginning of spring; whilst the sun of the Rhine ripens the grape, the almond, and the chestnut. The eastern portion, on the other hand, has more constancy of weather both in summer and in winter. The fall of rain in some of the principal localities of the monarchy, beginning from the east, is as follows:—

	Inches.		Inches.
Tilsit	19·743	Berlin	20·795
Dantzic	18·140	Halle	18·094
Posen	18·863	Münster	25·226
Breslau	15·818	Cleves	27·018
Frankfurt-on-the-Oder	20·055	Cologne	24·190
Stettin	18·376	Treves	25·702

The average annual fall of rain throughout being 21·002 inches.

Statistics.

Population

I. *Population of Prussia at the close of each Reign, since the beginning of the eighteenth century.*

Sovereigns.	Population.	Square Miles.	Average per Sq. Mile.
Frederick I. (1713)	1,731,000	45,080	38·4
Frederick-William I. (1740)...	2,486,000	47,911	51·8
Frederick the Great (1786)....	5,430,000	77,224	70·3
Frederick-William II. (1797)..	8,700,000	121,128	71·8
Frederick-William III. (1840)	14,928,501	110,980	134·5
In the year 1855	17,202,831	111,154	154·8

II. *Increase of Population since* 1816.

Year.	Total Population.	Increase during Three Years.	Average Increase in each of these Three Years.	Yearly Increase in per cent. of the Population.
1816	10,349,031	...	...	...
1819	10,981,934	632,903	210,967$\frac{2}{3}$	1·93
1822	11,664,133	682,199	227,399$\frac{2}{3}$	1·95
1825	12,256,725	592,592	197,530$\frac{2}{3}$	1·60
1828	12,726,110	469,385	156,461$\frac{2}{3}$	1·23
1831	13,038,960	312,850[1]	104,283$\frac{1}{3}$	0·80
1834	13,509,927	470,967	156,989	1·16
1837	14,098,125	588,198	196,066	1·39
1840	14,928,501	830,376	276,792	1·85
1843	15,471,084	542,583	180,861	1·17
1846	16,112,938	641,854	213,951$\frac{1}{3}$	1·33
1849	16,397,448	284,510[2]	94,836$\frac{2}{3}$	0·56
1852	16,935,420	537,972	179,324	1·05
1855	17,202,831	267,411	89,137	0·53

The increase from 1853–55 is thus accounted for:—

		For the 3 Years.	Annual Average.
Excess of births over deaths......... (In Berlin this excess amounts annually to 3053$\frac{2}{3}$.)		353,195	117,731$\frac{2}{3}$
Immigration		8,650	2,883$\frac{1}{3}$
		361,845	120,615
Registered emigration	65,735		
Non-registered emigration.	28,699		
		94,434	31,478
		267,411	89,137

III. *Present Population of Prussia.*[3]

Provinces.	Extent in Square Miles.	Proportion of Extent to that of the Monarchy.	Population in 1855.	Proportion of Population to that of the Monarchy.
Prussia proper	25,654	...	2,636,766	...
Posen	11,678	...	1,392,636	...
Brandenburg	15,990	...	2,254,305	...
Pomerania	12,560	...	1,288,964	...
Silesia	16,154	...	3,182,496	...
Saxony.................	10,034	...	1,861,535	...
Eastern portion...	92,070	0·828	12,616,702	0·7335
Westphalia	8,014	...	1,527,252	...
Rhineland............	10,605	...	2,983,305	...
Western portion...	18,619	0·168	4,510,557	0·2620
Hohenzollern	460	0·004	63,316	0·0040
Bay of Jadhe	5	...	227	...
Troops in garrison at Mainz, &c......	...	...	12,029	0·0005
Prussian monarchy..	111,154	...	17,202,831	...

Statistics.

In 1855 the population of Berlin amounted to 447,483; of Breslau, 121,345; of Cologne, 106,852; of Königsberg, 83,593; of Magdeburg, 77,997; of Dantzic, 71,995; of Aachen (Aix-la-Chapelle), 54,373; of Stettin, 52,252; of Potsdam, 32,725 inhabitants.

The density of population varies much according to soil, climate, and occupations. On the whole, however, as will be seen by the following table, the western portion shows a decided preponderance, relatively to its size, in point of numbers. We give these calculations according to departments (*Regierungsbezirke*) rather than provinces, because the former represent, to a certain degree at least, a community of interests and occupation:—

IV. *Relative Population of Departments.*

Name of Department (*Regierungsbezirk.*)	Forming part of the Province of	Number of Inhabitants on every Sq. Mile.	Increase on every Sq. Mile from 1852–55.
Dusseldorf	Rhineland, W.	470	23
Cologne..................	Rhineland, W.	332	7
Erfurt	Saxony, E.	262	1
Aix-la-Chapelle........	Rhineland, W.	265	8
Breslau....................	Silesia, E.	227	...
Minden....................	Westphalia, W.	222	...
Coblenz	Rhineland, W.	216	1
Arnsberg	Westphalia, W.	207	9
Oppeln	Silesia, E.	192	2
Merseburg	Saxony, E.	190	4
Trier (Treves)..........	Rhineland, W.	179	1
Liegnitz	Silesia, E.	172	...
Potsdam, with Berlin..	Brandenburg, E.	161	4
Magdeburg	Saxony, E.	159	3
Münster...................	Westphalia, W.	151	2
Siegmaringen	Hohenzollern.	140	...
Dantzic....................	Prussia, E.	131	4
Posen	Posen, E.	130	...
Frankfort (on the Oder)	Brandenburg, E.	119	2
Stettin	Pomerania, E.	117	3
Stralsund	Pomerania, E.	114	2
Potsdam, without Berlin	Brandenburg, E.	108	3
Bromberg	Posen, E.	106	6
Königsberg	Prussia, E.	101	1
Gumbinnen	Prussia, E.	99	...
Marienwerder	Prussia, E.	95	1
Cöslin	Pomerania, E.	86	3
The Prussian monarchy		154·8	4
Eastern portion (E.)........................		143	2
Western portion (W.)		255	6
Hohenzollern...............		140	...

Besides Germans, there are in the Prussian dominions at present 2,230,000 inhabitants of divers Slavonic races, Poles, Wends, &c.; also 150,000 Lithuanians, 20,000 French colonists (12,000 of these in Berlin), 10,000 Walloons, and nearly 235,000 Jews. In Silesia, the German population is four-fifths of the whole; in Prussia proper, two-thirds; and in the province of Posen it is a constantly increasing moiety, as more and more land is sold to Germans, and the trade and commerce of cities becomes almost exclusively German. The Polish population amounts to 840,000.

There are 2,809,220 women living in wedlock in Prussia. The average number of children to each family is 3,—a good deal more than France, which has an average of 2$\frac{1}{3}$. In 1855, 131,911 couples were married, 83,053 of which belonged to Protestant churches, and 46,997 to the Roman Church. The number of births in the same year was

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[1] In 1831, the cholera year, the actual increase was only about 28,000.

[2] Years of revolution.

[3] No official accounts having yet been published of the last triennial census, which was taken in the autumn of 1858, we are obliged to give the numbers of 1855.

Statistics.

617,817—*i.e.*, 317,823 boys, and 299,994 girls; or 17,829 more of the former. This preponderance of males goes on increasing up to the seventeenth year, when it diminishes so much as to leave the male population of the whole monarchy in a minority altogether of 47,695.

The proportion of illegitimate children to those born in wedlock has not varied very much since the year 1816, when we have the first perfectly reliable information. For every 100 legitimate children born in that year there were 8 illegitimate ones; in 1828, only $6\frac{9}{10}$ths to every 100 legitimate children; and in 1852, a little above 8. Illegitimate births vary therefore between 1 to 15 and 1 to 12 in proportion to legitimate ones.

Of the 550,460 persons who died in 1855, there was 1 case of death to every 32 Protestant inhabitants; 1 to every 29 Roman Catholics, and only 1 to every 51 Jews. The rate of mortality averages about 1 to 31 living inhabitants. Still-born children average at 5 per cent. of all deaths, and at $3\frac{3}{4}$ths per cent. of all births. One-fourth of all deaths in a year are of children under one year of age. The number of suicides has increased in a frightful proportion in the period from 1816 to 1855. In the former year there were registered 700, or about 1 to 15,000; and in the latter, 2351 suicides, or about 1 to every 7000 inhabitants.

Classes, or *Stände.*

We find three classes usually distinguished in the population of Prussia, as in that of all continental countries; albeit their distinctions seem greatly to evanesce, viz.:—1*st*, Nobles; 2*d*, Burghers; 3*d*, Peasants. The title of nobility is inherited in Prussia, as it is throughout the Continent, by all members of the family alike; the property, however, if any there be, customarily goes to the eldest son. The law acknowledges as belonging to the high nobility (*hohe Adel*) the heads of those princely houses which enjoyed a kind of sovereignty during the German empire, sixteen in number. These are considered as of equal rank for purposes of intermarriage, &c., with the sovereign houses; they are exempt from military service in Prussia, and enjoy other privileges. Several other great families of Fursten (princes) and counts are by courtesy reckoned among the high nobility, and some fifty families, which take precedence over others in virtue of certain hereditary dignities. All other counts, barons, and simple nobles (*Herrn von*) belong to what is called the lower nobility. The number of these families in the monarchy is 20,000. The nobility is most numerous among the Poles, where 1 out of every 100 is reckoned a noble; it is *least* numerous in the Rhenish province. Many noble families possess very large estates; yet the property, where not fettered by *majorats* (similar to those in Scotland), has changed hands a good deal. Thus we find that in 1855, out of 11,714 ancient *Rittergüter*, or seigneurial estates, entitling their owners to a representation in the old provincial parliaments throughout Prussia, only 7025 still remained in the hands of noble families.

The second class of towns-people, or *Bürger-Stand*, is by far the most intellectual, as well as the most wealthy, in the country. To the higher Burger-Stand belong the *employés* (*i.e.*, those among them who are not born "noble"), the clergy, judges, teachers, all *studierte Leute* (*i.e.*, who have enjoyed university education), artists, merchants, manufacturers, &c. The lower Burger-Stand comprises trades-people, artizans, and towns-people owning land. The third class, or *Bauern-Stand*, are inhabitants of the villages and hamlets (32,000 in number), and of separate farmsteads not belonging to any village (also nearly 30,000). This class numbers more than twelve millions (71·2 per cent. of the population), living in nearly 1,400,000 dwelling-houses. Many of these are proprietors of land, and all equally attached to their property, from the substantial Westphalian *Bauer* of 400 or 500 acres, down to the Rhenish labourer, who cultivates in leisure hours his own acre of land.

Statistics.

Religious denominations.

The majority of Prussians, viz., 10,534,754, belong to one or other of the Protestant churches; the rest are for the most part Roman Catholics (6,418,310 in number, or about $\frac{3}{8}$ths of the entire population), some Mennonites, a few of the Greek Church, and, finally, 234,248 Jews. Protestantism is greatly dominant in the provinces of Pomerania, Brandenburg, Saxony, and the eastern part of Prussia proper, and is in a majority in the Silesian departments of Liegnitz and Breslau, in the Westphalian departments of Minden and Arnsberg, and in the western part of Prussia proper. The Roman Catholics prevail in Hohenzollern, in Rhineland and Posen, in Upper Silesia, and in the department of Münster. Under the head of Protestants are comprised—1*st*, The members of the United or Evangelical Church, which may be considered as the national church; 2*d*, The so-called Old Lutherans, who have their separate establishment; and 3*d*, The Moravian Brethren. The Mennonites derive their name from a certain Menno, a mild Anabaptist reformer, whose efforts, from 1536, when he left the Church of Rome, to his death in 1561, had been to unite all those who were in favour of adult baptism into one church of saints, living at peace with all men. His followers, like the Society of Friends, reject the use of arms and decline taking oaths; and the state grants them dispensation from both, a certain income-tax of about 3 per cent. being fixed in lieu of their military duties, and their solemn affirmation being accepted in courts of law wherever an oath is required from others. The Jews are most numerous in the province of Posen, where every eighteenth inhabitant belongs to that religion. In Berlin they are as 1 to 38, in Rhineland as 1 to 95, and in the province of Saxony as 1 to 355. The last remnant of their civil disabilities has legally ceased altogether since the promulgation of the constitution of 1850; nevertheless they remained practically excluded from several employments, such as the office of judges; but henceforward the law is to be carried out to its letter, which undoubtedly excludes them from no dignity in the state whatsoever.

The number of churches and other places consecrated for divine worship was, in 1855, 9203 belonging to Protestants, and 7622 to Roman Catholics; which is an unfavourable proportion on the Protestant side; for, whilst their numbers in the country are, roughly speaking, as 5 to 3 compared to those of the Romanist persuasion, their places of worship are not quite as 4 to 3. A similar disproportion exists as regards the ministers of each church, the Protestants numbering 6199, and the Roman Catholics 5796. There are 30 Mennonite meeting-houses, 3 Greek churches, and 928 Jewish synagogues.

The outward government of the Protestant United Church belongs, as in England, to the king, as *Summus Episcopus*. His attributes of power are now entrusted to a supreme council (*Ober-Kirchenrath*), consisting of clerical and lay members, appointed by him, and responsible only to himself. Those points alone in which a contact is established between the state and the church fall under the cognisance of one of the king's responsible ministers,—of public instruction, &c. Each province has a board similarly constituted, called *Consistorium*,—the special control over the clergy, and their doctrine, being entrusted to superintendents-general, one for each province, and superintendents, of which every province has several. The nomination to a cure of souls (subject always to the candidates having duly qualified themselves by examination) belongs in some places to the king, in others to country gentlemen, in others to the municipal authorities, in others, again, to the free election of each congregation. This last-named method forms the rule among the Protestants of Rhineland and Westphalia, who have a presbyterian constitution similar to that of the Established Church of Scotland. They have synods and general synods, in which clergy and laity are equally represented, and manage their local government also in a peaceable alliance of the lay with the clerical element. It is believed that similar representative institutions and local self-government will in time become general in Prussia and in the rest of Protestant Germany.

The Roman Church has eight episcopal sees in Prussia, which do not correspond to the eight provinces of the state. Two of these sees—viz., that of Cologne and that of Gnesen and Posen—are governed by archbishops; the see of Breslau by a "prince-bishop;" the "exempt" see of Ermland, extending over the east of Prussia proper, by a bishop; and so likewise the rest of the sees,—viz., Culm (containing parts of Prussia proper and Pomerania), Münster, Paderborn, and Treves, by bishops. The Archbishop of Cologne exercises jurisdiction over the sees of Treves, Münster, and Paderborn, as well as his own immediate diocese; and likewise the Archbishop of Gnesen and Posen over that of Culm. In the sees immediately committed to their care the archbishops are assisted by *Weih-Bishöfe.* The prince-bishop of Breslau and the bishop of Ermland, whose sees are therefore called "exempt," receive their orders direct from Rome.

Agriculture.

Prussia is essentially an agricultural country. More than two-thirds of her population are devoted exclusively or principally to the cultivation of the soil. Whilst the manufacturing industry, on a larger scale at least, is of modern growth in this country; several districts have ever been exporters of grain, rape-seed, flax, &c. Still Prussia has not attained to that degree of excellence for which she seems to be peculiarly fitted, by the fair conditions of climate and of soil, and by the general intelligence of her inhabitants. In nearly all districts of Prussia the production of grains is so much the one object of agriculture that the art of breeding and fattening cattle suffers from neglect. Meat being sold by weight mainly, and not sorted according to quality, fat cattle are not profitable property. Instead of large outlay and large crops on a small surface, we meet on the whole with oversized farms, costing little and producing little. There is an expenditure generally on extensive and massive buildings out of all proportion to the cost of everything else, and to the disposable capital.[1] The nobles, although they possess very large estates, and although many of these are under their own management, contribute but little to the progress of agriculture. After all the shackles of vassalage and serfdom have been removed, there were, until lately, two principal causes retarding agricultural progress: first, the scarcity of good roads and other means of communication; and, secondly, the scarcity of ready capital. Both causes of inferiority to other countries are now disappearing, and Prussian agriculture will, it may be anticipated, speedily rise to the first place on the continent of Europe. The improvements of Scotch and English agriculture have been carefully watched, and to a considerable degree introduced. Farms of moderate size, with appropriate rotations of crops, with good buildings and implements, using guano and other purchaseable fertilizers largely, are becoming more and more general. Breweries, sugar-factories, and distilleries are to be found on many of these farms, raising the value of the raw produce of the land, and delivering over immense quantities of food for the fattening-stall and the cow-house. Out of the number of about seventeen millions of acres which represented the uncultivated area of the monarchy in 1849, nearly three millions were reclaimed by the end of 1852; and these three millions of acres have become principally grazing land. The fertile province of Saxony stands highest in agricultural improvement generally. It is followed by Brandenburg, which is almost the poorest by nature. The rest can be ranked as follows:—Rhineland, Silesia, Westphalia, Pomerania, Prussia proper, and Posen.

Brandenburg and Silesia are the principal sheep-breeding provinces. Every possible care and refinement are brought to bear on the production of wool, which is the finest in the world, but scarcely any on that of mutton, which is very bad.

Farms.

Large farms are the rule in Prussia. With the exception of the Rhine-valley and the Eichsfeld (on the borders of Franconia), where land is subdivided to a very minute degree, farms varying from 400 to 1200 acres form the majority. They are usually let to tenants. The cultivation of estates in the hands of the proprietor himself, however, is by no means rare, and becomes almost the rule in some districts, in the same measure as the taste for agricultural pursuits increases among the higher classes of society. The provinces of Rhineland and Posen contain the largest number of let farms; there are few such in Saxony, and scarcely any in Pomerania. As regards the duration of leases, they are restricted to nine, six, or even three years, on the Rhine and in Posen; show an increase in Westphalia, where nine to twelve years form the rule; and are longest in the eastern provinces (Posen excepted), viz., twelve to twenty-four years. The rental averages L.1, 7s. per acre in the fertile and much-subdivided valley of the Rhine; and in the sugar districts of the Saxon province, where even L.4, 10s. and L.5 rent per acre is not unfrequently paid. On the dreary hills of the Eifel and of the Westerwald (Rhineland) you meet with farms that are let at 5s. to 7s. an acre. The average rental in the eastern portion of the monarchy (excepting Saxony) may be estimated at from 9s. to 18s. for large farms, and from 12s. to 24s. for smaller holdings. In speaking of the price of land, we necessarily include meadows and woods, with the arable portions. From L.7 to L.12 per acre may be taken as a fair average price of land in Prussia. In the Saxon province, however, the average cannot be rated lower than from L.12 to L.18. The greatest extremes in the value of land may be observed in Rhineland; here estates are sold for L.1 to L.5 an acre along the hills of the Westerwald, Eifel, and Hundsrück, whilst in the valley of that noble river the price varies from L.18 to L.35 an acre for large farms, and from L.40 to L.100 for single fields.

Leases.

Rental.

Price of land.

Prussia proper.

The extensive meadows in the districts of Gumbinnen and Königsberg offer an excellent opportunity for the breeding of horses. Accordingly, most proprietors keep private studs. The principal stud of the monarchy is Trakehnen, in this province, formerly belonging to the royal family, and now to the state, with 1300 brood-mares, and a farm of 9363 acres adjoining. From this immense establishment the royal stables are provided with carriage and saddle horses, and the rest sold in great annual auctions to buyers from all parts of the world. There are two other great studs in the kingdom, viz., Neustadt in Brandenburg, and Graditz in Saxony. Eight less extensive studs, with 1050 stallions, are distributed over the country. Wheat, peas, and potatoes form the principal produce of this province. In the district of Ermland there is also a considerable cultivation of flax. Emancipation from bare fallow, and from the miserable implements of the country, is traceable everywhere. But owing to its commercial disadvantages, viz., its inconvenient and ice-bound harbours, and the exorbitantly high protective duties imposed by Russia; owing also to the sluggishness of its Slavonic and Lithuanian inhabitants, that progress is but slow.

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[1] The proportion of cost of farm-buildings to the whole capital invested in an estate is calculated at 15 to 20 per cent. in Great Britain, and at 30 to 40 per cent. in Prussia.

[2] There were 167,395 cwt. of wool sold altogether in Prussia in 1858, at prices varying from L.17, 5s. down to L.4, 19s. per cwt.

Posen. A marked difference exists between the eastern districts of the province of Posen, where proprietors as well as cultivators of land are Poles, and its northern and western parts. In the latter an improved system of occupation and cultivation has been introduced by German purchasers, and their imported foremen and labourers. In the Polish districts the rule of letting a farm for three years prevails, and with it the most slovenly and exhausting practices of husbandry. Rye in the first year, and oats in the next, and occasionally a crop of peas in the third or fallow year; that is the rule of Polish farms, large or small.

Brandenburg. Mr Albert Thaer, whom the Germans proclaim as the great regenerator of their husbandry, has left a lasting memorial of his practice and theory in the present high condition of farming in Brandenburg, where his example and teaching (1804 to 1828) were most closely observed and followed, and where sandy deserts are since his days covered with abundant crops. Careful cultivation of the potato, very extensive sheep-breeding, and marling of the soil, are characteristics of Brandenburg agriculture. Barley and rye are the principal grains produced. The soil possesses too little solidity for wheat and mangel-wurzel, and the climate is too dry for turnips. Mr Albert Thaer's sheep produced wool of such exquisite delicacy that they attained the highest prices yet known; and this pre-eminence has been strenuously kept up by his followers. The wool of the province of Brandenburg is reckoned the best in the world. In its turn, the stimulus given to sheep-breeding could not but improve the general condition of the land. If the number of sheep has doubled since 1816, the appearance of this sandy desert has also been completely transformed. The state keeps a model herd at Frankenfelde.

Pomerania. The system of farming in Pomerania consists, like that of Mecklenburg, in laying down the land to grass during three out of every seven years. The farms are mostly very large, and cultivated in a steady, old-fashioned manner.

Silesia. Silesia has the most extensive sheep-breeding in Prussia. Taking the whole acreage of this province, 1⅞ sheep is reckoned to every acre. Above 70,000 cwt. of wool (second only to that of Brandenburg) and L.3000 worth of rams are sold annually. Prince Lichnowsky's herds in Kuchelna are the largest and best of all. The old staple produce of Silesia, viz., flax, has almost ceased to exist. The linen had been manufactured for export, principally to Spain; but the King of Prussia having declined to acknowledge Queen Isabella, because her majesty had been raised to the throne by a revolution, the Prussian commerce with Spain lost all the privileges it had formerly enjoyed; and with that the cultivation of flax first slackened, and finally all but ceased. Wheat, rye, rape-seed, and tobacco are grown with advantage, and better modes of cultivation are gradually supplanting the rule of fallow, or the still more frequent absence of all rule.

Saxony. Prussian Saxony owes its agricultural fame principally to the careful production of, so to say, non-cereals, viz., the beet-root for sugar, poppies, chicory, mustard-seed, cumin, anis-seed, tobacco, flax—all very extensively cultivated. The necessity of improved appliances for their production has raised the standard of husbandry in this province generally. There are some farms here (that of Herr Rimpau in Schlanstedt, and Herr Nathusius at Hundisburg) which are conducted with as much order, economy, and intelligence, as any in Great Britain. Of beet-root, the average of a yearly crop has lately been three million cwt. There is very little cattle or horse breeding in this province, the requisite quantity being imported mostly from Oldenberg, and of horses also from Hanover. The ravages of the pneumonia or lung-disease among cattle were more extensive in this than in any other portion of the monarchy; the disease is giving way, however, to innoculation. The wool is inferior to that of Brandenburg and Silesia; but attempts have been effectually made of late to improve the wretched mutton of the country by crossing the wool breed with our Southdowns and Leicesters.

Westphalia As their Saxon forefathers of old, the present cultivators of Westphalia continue growing white crop after white crop, with the slightest possible attention to root crops or to improved implements. Immense farm-buildings, in which nearly all the labourers are lodged and fed, help to preserve to this country its peculiar semi-patriarchal aspect and *régime.* The farmer, whether tenant or proprietor, is mostly too careful of his expenses to fall into actual poverty; but in consequence of the habit of allowing his savings to stagnate in strong boxes, instead of being invested in securities, he never, or very rarely, acquires wealth. A very favourable exception to this general character may be found in the district of Siegen, measuring less than 300 square miles, in which the best systems of irrigating meadows have been carried on with ingenuity for the last thirty years. The same district is remarkable on account of the "Heuberge," a peculiar system of wood-culture, according to which the plantations, after standing eighteen or twenty years, are cut down, the soil first burnt, and then sown with rye; in the following year the young trees are sure to shoot up again of themselves in great abundance, and then are allowed to grow as before for eighteen or twenty years. Westphalia pigs, like all other cattle, are sadly neglected as to nicety of breeding or feeding. Nevertheless, the hams enjoy a world-wide reputation, for which they are indebted to a peculiarity of the farm-houses, the smoke of their immense wood fires, instead of finding its exit through a chimney, being forced along the roof of the spacious hall before its exit, and thus enveloping innumerable hams that are suspended along its rafters.

Rhineland. Agriculture has remained stationary on the borders of the Rhine. It stood highest, perhaps, three centuries ago. But whoever reads Dr Heresbach's amusing book *Rei Rusticæ*, liber iv., published in 1571, giving an account of his Düsseldorf farm, will be struck with the close similitude between what was then and is now the rule. The Code Napoleon, which continues to be law on the left bank of the Rhine, has strengthened the habit of equally subdividing the soil among all the children of the testator; a habit which seems to belong to the Franconian race everywhere, and which that law has sanctioned rather than created. In the hilly districts bare and exhausting fallows are adhered to; in the plains a continuance of as exhausting white crops. More attention begins to be paid to the cultivation of wheat. Rape-seed, flax, tobacco, cardoons, and latterly also the sugar-beet, are cultivated for sale and manufacture. Drainage and the creation of new meadows is changing the aspect of the country; and although this province keeps a larger stock of cattle in proportion to its acreage than any other, yet on the whole but little attention is paid to breeding.

Farm distilleries. In the dry and light soil of Brandenburg and other eastern provinces, the potato is undoubtedly a better root-crop than either turnips or mangel-wurzel. For any over-production of potatoes a distillery seemed to offer the only advantageous employment; and hence the number of private distilleries. No less than 20,000,000 cwt. of potatoes are used for distilling every year. The excise-duty on distilled liquors produces about L.750,000 a year.

In Saxony, Silesia, and a few other localities, many farmers devote their best fields to the production of the sugar beet-root. There were 101 sugar factories in 1851, using 11,109,728 cwt. of beet-root; and latterly that number has increased by about one-fourth. It is intended to raise the present excise-duty of 7½d. to 9d. per cwt. of beet-root. When this increase will have been effected, the protection afforded to home-grown sugar against the competition of colonial sugars will be but trifling. Those among the owners of sugar factories who have a sufficient command of capital, declare that they do not fear that competition any longer.

Woods and forests.

About one-fifth of the entire acreage of Prussia, viz., 14,406,945 acres, is covered with wood. Of this number, again, two-fifths belong to the state, and the rest to private individuals or corporations. The former are in admirable preservation; large tracts of the latter class have suffered much by the greediness and maladministration of their owners. A law for the better protection of woods and forests is now in preparation. A good deal of unproductive land has of late years been converted into green forests by means of a special fund voted by parliament. The proceeds from the state forests were very trifling until lately, if we take the average of the whole country, viz., only 2s. 3½d. per acre; but the rapid development of the mining industry, of railways, &c., begins to improve the value of wood property. Rhineland possesses the greatest amount of woodland, and next to it Silesia.

General Board of Agriculture.

As in England in former days, a board of agriculture, presided over by a member of government (*Landwirthschaftliches Ministerium*) conducts the agricultural affairs, so far as they regard the state. One of its principal cares is the improvement of agricultural education throughout the country. For this purpose, five agricultural colleges for gentlemen, managers, and large farmers have been founded, viz., Möglin in Brandenburg (commenced by Mr A. Phaer, and the property of his family), Eldena in Pomerania, Proskan in Silesia, Waldau in Prussia proper, and Poppelsdort in Rhineland; the latter four being entirely endowed by the state. Besides these, there are 23 agricultural schools for smaller occupiers of land.

V. *Land Cultivated and Uncultivated in* 1855.

PROVINCES.	Gardens, Orchards, and Vineyards.	Land under Tillage.	Meadows.	Pasture Land.	Woods and Forests.	Uncultivated Land.	Total.
	Acres.	Acres.	Acres.	Acres.	Acres.	Acres.	Acres.
Prussia proper	215,807	7,323,380	1,652,682	1,470,385	2,655,762	3,559,384	16,877,400
Posen	114,437	3,856,444	544,704	536,441	1,424,750	1,209,757	7,686,533
Brandenburg	101,653	4,297,931	842,362	657,792	2,310,005	2,308,190	10,517,933
Pomerania	60,085	3,670,946	647,395	1,129,425	1,436,883	1,317,932	8,262,666
Silesia	133,028	4,418,522	571,330	214,201	2,313,402	2,976,383	10,626,866
Saxony	70,487	3,343,736	424,701	394,597	962,177	1,403,702	6,599,400
Westphalia	84,815	2,046,900	363,249	601,458	1,272,193	903,118	5,271,733
Rhineland	163,687	2,888,320	526,540	730,295	2,031,773	638,585	6,979,200
Total	943,999	31,846,179	5,572,963	5,734,594	14,406,945	14,317,051	72,821,731

VI. *Cultivators of Land, classified* (1855).

PROVINCES.	Number of Persons whose chief Occupation is the Cultivation of Land.				Number of those with whom the Cultivation of Land is a Secondary Object.
	Proprietors.	Their Families.	Their Servants.	Their Labourers.	
Prussia proper	137,022	611,439	199,323	189,010	299,119
Posen	74,916	336,293	100,475	85,441	110,051
Brandenburg	85,271	377,548	100,989	64,070	251,186
Pomerania	47,911	214,690	76,978	[1]86,836	164,959
Silesia	179,967	774,774	190,785	27,333	444,652
Saxony	80,240	311,141	86,561	74,830	301,974
Westphalia	74,466	323,096	85,159	51,396	304,502
Rhineland	195,873	694,652	108,649	74,294	423,552
Hohenzollern	9,149	28,125	2,913	1,086	15,864
Prussian monarchy	884,815	3,671,758	951,832	754,296	2,316,759

VII. *Size of Separate Holdings of Land.*

PROVINCES.	Holdings of and above 400 Acres.		200 to 400 Acres.	20 to 200 Acres.	3½ to 20 Acres.	Under 3½ Acres.	Sum-total of all Holdings of Land.
	Number.	Average Size.					
Prussia proper	3943	1457	4241	83,477	42,554	46,418	180,633
Posen	2630	1409	1086	45,457	31,118	21,850	102,141
Brandenburg	2263	1943	2085	48,646	45,609	65,318	163,921
Pomerania	2549	1698	1463	26,398	27,409	31,992	89,811
Silesia	2932	1436	1157	46,232	104,588	115,958	270,867
Saxony	1160	1285	1450	40,014	63,557	105,761	211,942
Westphalia	676	1120	1414	46,352	73,250	115,376	237,068
Rhineland	1431	990	1547	49,475	202,833	537,874	793,160
Hohenzollern	91	919	38	1,690	7,216	11,579	20,611
Prussian monarchy	17,675	1479	14,481	387,741	598,134	1,052,126[1]	2,070,157

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[1] It would be an error to suppose, on account of the large numbers in this column, that each of these Lilliputian plots really represent the property of a man. In the Land-Register (or *Kataster*) a separate number is given to every plot of land which belongs to a different proprietor from the surrounding ones, without reference to the circumstance, that ten or twenty or more of these different plots may belong (as they usually do) to one owner. Yet it is a striking fact, that two-thirds of all pieces of land in the Rhenish province should be under 3½ acres, and that the average size of all other holdings in the same province put together does not reach 20 acres.

VIII. *Number of Horses and Cattle in* 1855.

Provinces.	Horses.		Horned Cattle.		Sheep.		Pigs.	
	Number.	Proportion to Population.	Number.	Proportion to Population.	Number.	Proportion to Population.	Number.	Proportion to Population.
Prussia proper	461,504	5·71	987,023	2·67	2,642,268	0·99	520,512	5·06
Posen	153,442	9·07	481,418	2·89	2,199,977	0·63	163,258	8·53
Brandenburg	193,531	11·64	618,605	3·64	2,343,969	0·96	285,255	7·90
Pomerania	150,241	8·57	450,637	2·86	2,651,030	0·48	182,992	7·04
Silesia	190,647	16·69	965,643	3·30	2,431,687	1·30	127,058	25·04
Saxony	152,485	12·20	522,380	3·56	1,838,946	1·01	332,490	5·59
Westphalia	121,259	12·59	548,908	2·78	461,046	3·31	242,647	6·29
Rhineland	122,511	24·45	889,789	3·36	492,364	6·08	242,283	12·36
Hohenzollern	5,224	12·12	40,739	1·55	10,058	6·29	9,495	6·66
Bay of Jahde	35	...	143	...	80	...	...	...
Prussian monarchy	1,550,879	11·09	5,505,285	3·12	15,071,425	1·14	2,106,013	8·16

IX. *Average Price of Beef and Pork,* 1852–55.

Provinces.	1852.		1853.		1854.		1855.	
	Beef.	Pork.	Beef.	Pork.	Beef.	Pork.	Beef.	Pork.
	d.	*d.*	*d.*	*d.*	*d.*	*d.*	*d.*	*d.*
Prussia proper	2·8	4·0	3·1	4·8	3·9	5·7	4·3	5·5
Posen	3·3	4·3	3·6	4·8	4·1	5·6	4·6	6·0
Brandenburg	3·7	4·4	3·8	5·1	4·3	5·9	4·8	6·2
Pomerania	3·1	4·4	3·4	5·3	3·9	5·9	4·3	5·8
Silesia	3·0	4·4	3·6	5·0	3·9	5·6	4·1	5·9
Saxony	3·8	4·5	4·0	5·1	4·4	6·0	4·7	6·2
Westphalia	3·3	4·4	3·4	4·9	4·0	5·7	4·5	6·2
Rhineland	3·8	4·9	4·0	5·6	4·7	6·4	5·0	7·0
Prussian monarchy.	3·3	4·4	3·6	5·1	4·1	5·8	4·5	6·1

X. *Average Price of the four principal sorts of Grain in the different Provinces of Prussia, in the year* 1858.

Provinces.	Wheat.		Rye.		Barley.		Oats.	
	s.	*d.*	*s.*	*d.*	*s.*	*d.*	*s.*	*d.*
Prussia Proper	37	10	21	11	20	3	15	7
Posen	40	5	24	6	21	2	18	0
Brandenburg	40	7	25	6	24	0	19	3
Pomerania	40	0	26	1	22	0	17	10
Silesia	42	2	26	0	22	5	18	7
Saxony	39	7	31	2	26	0	20	7
Westphalia	42	11	30	6	27	4	21	9
Rhineland	41	10	31	5	28	6	22	2

XI. *Average Price of the four principal sorts of Grain in the Prussian Monarchy during the last Ten Years.*

Year.	Wheat.		Rye.		Barley.		Oats.	
	s.	*d.*	*s.*	*d.*	*s.*	*d.*	*s.*	*d.*
1849	32	11	16	11	13	8	9	8
1850	31	3	19	6	14	11	11	0
1851	33	7	26	8	19	11	16	5
1852	41	10	32	11	24	11	16	0
1853	45	11	36	3	27	2	18	0
1854	57	10	44	5	32	6	21	6
1855	63	9	48	10	34	0	21	11
1856	60	7	45	4	33	4	20	11
1857	46	1	29	5	25	11	17	8
1858	40	9	27	2	24	0	19	2

Vineyards. The grape ripens occasionally in the neighbourhood of Berlin. There are vineyards also, producing very sour wine, in Silesia and the Saxon province. But the principal production of wine takes place in the Rhenish province, where 30,902 acres of land are devoted to this laborious cultivation along the banks of the Rhine, the Ahr, the Moselle, the Nahe, and the Saar. In the years 1857 and 1858 the vintage was both excellent and plentiful, after nine years of continued disappointment. The number of hogsheads of white and red wine, in the vintage of 1857, is officially given at 260,259⅗.

Minera The mineral wealth of Prussia is immense, particularly in Silesia and Rhineland, but cannot be said to have been more than touched upon as yet. The increase of production during the last years alone, since capitalists have been induced to turn their attention towards its development, would show the capabilities of this branch of industry. There existed, at the close of 1857, 89 mining companies with a paid-in capital of L.15,600,000, 50 of them working foundries and mines generally, and 39 coal-mines alone: 499 coal-mines were in activity. The quantity of coal produced in 1851 was 4,413,000 tons, and in 1857 it reached 9,003,817 tons. Besides coals, lignite, or *Braunkohle*, is extensively found in the tertiary formations of Brandenburg and Saxony. This lignite (being a bituminous vegetable mass less completely carbonized) has a heating effect equal to one-third of that of coals. Applying that ratio to the produce of lignite in 1857,—viz., 3,467,500 tons,—we receive an addition of 1,155,833⅓ to the above quantity of coals extracted from the earth. This would give us 10,159,650⅓, or a little more than one-seventh of the production of coal in Great Britain. In spite of this enormous difference, the rapid progress of the last years has already raised Prussia to the second rank among coal-producing countries.

Iron. The increase has been yet more rapid in iron ore,—viz., from 2,820,000 cwt. in 1851 to 18,939,844 cwt. in 1855, and 28,739,936 cwt. in 1857. The demand, however, being even greater than the supply, foreign iron came in abundantly,—viz., 2,600,000 cwt. in 1855, and nearly double as much, viz., 4,161,357 cwt., in 1857.

Zinc, lead, copper, &c. Almost all zinc manufactured in the world is of Prussian, and especially of Silesian origin: 4,377,789 cwt. of zinc ore were obtained in 1857. The lead-mines of Commern in Rhineland promise one day to become the most productive in Europe; at present (1858) their produce is 648,183 cwt.[1] Westphalia and Silesia also contain some lead-mines of no importance. Copper is found most in the Saxon province; its entire production does not exceed 1,308,465 cwt.

Value o mineral produc The entire production of coals in the year 1857 represented a value (taking the average price paid at the mouth of the pit) of L.3,522,802; that of lignite, L.393,330; of iron ore, L.359,605; zinc ore, L.457,808; lead ore, L.257,662; copper ore, L.93,614; other minerals, L.27,000;—sum total,

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[1] This sum represents the *entire* produce of lead in Rhineland; about 25,000 cwt. must be deducted from it for a few very insignificant mines besides Commern.

L.5,111,821. The value of mineral produce had increased 63 per cent. from 1854 to 1857; 113,134 miners were employed in extracting the above mineral produce in 1857, to 89,254 in 1854. And what is more curious still, each one of them, in the former year, produced on an average the value of L.45; whilst in 1854 the value of each workman's labour had only amounted to L.35. The number of women and children finding employment was 195,930.

Salt. The production of salt is 2,771,720 cwt., four-fifths of which are produced from works belonging to the state. Besides the above, beds of rock-salt begin to attract much notice,—one at Stassfurth, 7 miles from Magdeburg, discovered a few years ago, already produces 250,000 cwt. of nearly pure salt.

Precious stones, &c. Amethysts, chrysoprases, and agates are found in Silesia; alabaster in Saxony; marble principally in Silesia and Westphalia; excellent porcelain near Halle; fossil amber among the lignite or *Braunkohle;* and sea-amber on the coast of the Baltic between Dantzic and Memel, partly washed on the shore during the storms together with the sea-weed, partly pulled up with long hooks, and partly dug out of the earth. About 600 cwt. is the yearly produce of sea-amber.

Mineral springs. Prussia contains 108 mineral springs, among which Salzbrunn and Warmbrunn in Silesia, and the sulphur-baths of Aix-la-Chapelle, are most famous.

Iron-works, &c. There are about 265 high furnaces now in operation. The production of raw iron amounted to 5,858,072 cwt. in 1855, and to 7,072,766 in 1856; cast-iron amounted to 2,265,827 in 1855, and to 2,354,649 in 1856; bar-iron and sails to 4,810,000 in 1855, and to 5,333,730 in 1856. It may be interesting to compare the average price of British iron on its arrival in Prussia with that of Prussian iron at the works, during the three years 1865–57:—

			Zollverein Duty.		Total.	
	s.	*d.*	*s.*	*d.*	*s.*	*d.*
Scotch raw iron on its arrival in Prussia	5	$1\frac{2}{5}$	1	0	6	$1\frac{2}{5}$
Prussian raw iron at the works	...		...		6	$2\frac{2}{5}$
Welsh bar-iron on its arrival in Prussia	10	$10\frac{9}{10}$	4	6	15	$4\frac{9}{10}$
Prussian bar-iron at the works	...		...		15	$5\frac{3}{10}$
British sheet-iron on its arrival in Prussia	14	$10\frac{1}{5}$	9	0	23	$10\frac{1}{5}$
Prussian sheet-iron at the works	...		...		21	$11\frac{1}{2}$

The chief rcason for this comparative cheapness of British iron is briefly this: that in one only out of ten or more cases in Prussia are coal and iron met with together, and in all others they require an expensive carriage to and fro.

Silver is not found anywhere in a pure state, but extracted out of its accompanying metals (lead and copper), particularly in the mines near Eisleben, Luther's birthplace. Those among our readers who have travelled in Prussia may remember occasionally coming upon thaler-pieces with the inscription, "*Segen des Mansfelder Bergbaues.*" The entire native production does not exceed L.122,190 worth of silver. Gold is similarly extracted to a trifling amount (L.867).

The value of all iron-works,—lead, copper, silver, gold, brass, smelt, nickel, arsenic, antimony, alum, and vitriol works put together,—was L.11,971,658: the number of men employed in these works, 59,510; of women, 124,441.

Manufactures. The centres of manufacturing industry in Prussia are,—Berlin, which may be considered at present as the second among the manufacturing towns on the Continent; parts of Westphalia and the Rhenish department of Dusseldorf, and some districts in Silesia.

The manufacture of iron occupies above 40,000 persons in Prussia. In steel, especially cast-steel, the Prussians bid fair to surpass all other nations: we name the towns of Solingen, Essen, Hagen, Remscheid, and the districts of Siegen, whose admirable spath-ironstone offers advantages enjoyed by no other steel factories. Sword and knife blades and guns are manufactured in Solingen and in the Thuringian city of Suhl; guns also in Potsdam. Berlin has risen to celebrity by the neatness of its cast-iron mouldings, and yet more latterly by its engine-foundries, one of which, that of Herr Ad. Borsig, sold 500 locomotive engines for railways in four years.

The manufacture of cotton goods has found its way into Prussia only within the last few years, and does not nearly suffice for home consumption. In 1857, 701 factories occupied 76,700 workmen on 2061 hand-looms, and 16,827 looms worked by machinery. That of linens, on the contrary, has an old-established fame. Spinning flax continues a favourite occupation in the winter evenings, and produces more yarn on an aggregate, even now, than spinning-machines. Of hand-looms also, worked in leisure hours, there are still 300,000, against 204 weaving establishments provided with machinery. Silesian linen is considered the best in the world for lightness and elegance of design; Westphalian or Bielefeld linen for its strength. Excellent damask is also made in the Saxon provinces. Wool has now almost ceased to be worked by hand. There were nearly 60,000 spindles at work in 1857; also 796 cloth factories, with 8227 workmen. Rhineland, Silesia, and Brandenburg are prominent in this branch of industry, the export of the former being principally to the United States. To render Prussia, a silk-producing country was, as our readers already know, one of Frederick the Great's favourite ideas, and it is now again a hobby of modern economists; but German summers being usually too short for a double crop, the raw material of other countries must needs continue to be cheaper. Accordingly, almost all silk is imported for manufacture. Eleven and a quarter millions of yards of silk, of mixed articles, and of velvets, make up the amount of annual exportation; and twelve millions are sold for home consumption. The principal factories exist in Rhineland, producing about six-sevenths of the above quantity; others in Berlin. The capital also contains the largest silk-dyeing establishments. The art of dyeing in Turkish red is an important branch of industry in the two sister cities of Elberfeld and Barmen, averaging 90,000 lb. a week. In Rhineland, principally along its western frontier, raw leather is extensively prepared. Taw-factories are to be found in the neighbourhood of Magdeburg. The glove trade was introduced by French Protestant immigrants at the end of the seventeenth century, and continues to flourish among their descendants in Berlin. The paper factories of Rhineland and Westphalia have lately begun to export largely. Among the 115 glass-works in Prussia, two are justly famed,—one of Zechlin in Brandenburg for chemical apparatuses, and that of Count Schaffgotsch at Schreiberhau in Silesia for what is so universally admired under the name of Bohemian glass, now in a great measure the produce of this excellent establishment. The beer of Prussia, as German beer altogether, is lighter, and more appropriate perhaps to that climate, than that produced in Great Britain. There were no less than 7226 breweries in 1855,—a number, alas! even exceeded by that of distilleries, viz., 8006; of which, however, 1665 are employed in the distillery of spirits of wine. There are 22 houses in the city of Cologne all pretending to distil the famous *eau-de-Cologne,* besides that of its original inventor, Jean Marie Farina, 23 Zülichsplatz. The sugar-factories on farms were mentioned before. Among the sugar-refineries, one,—viz., that of Messrs Vom Rath, Joest, and Carstanjen at Cologne,—is considered the most extensive on the Continent; and the different charges to the state, in the shape of customs, excise, taxes, &c., are rated at L.150,000 a year. The consumption of home-grown and imported tobacco is very great, and can be but inadequately represented by the number of tobacco and cigar factories, viz., 711. German printing used to excel more by quantity than by quality; but Berlin (with Leipzic) has retrieved the honour of the country which first invented that noble art. Berlin also excels by its lithographic establishments, furniture, and general upholstery, and its wool-mosaic, which has rendered Berlin wool a subject of considerable trade to foreign parts. Berlin porcelain also preserves its ancient reputation,—the largest factories being those of Schumann and the royal one. As a general rule, and with very few exceptions, Prussian manufactures are dependent upon Prussian capital. One of these exceptions is the grand plate-glass and mirror factory of Aachen (or Aix-la-Chapelle), which belongs to a French company called St Gobain.

Commerce and navigation.

In all commercial affairs Prussia has almost entirely ceased to exist as a separate state, her special interests having blended in those of the Zollverein, under which head all matters relating to export and import will be fully treated. Only a portion of goods being objects of trade enter the Prussian dominions, or leave them by Prussian seaports, or along the frontiers touching upon countries not belonging to the Zollverein. Again, a portion only of the imported articles remains in Prussia, the rest travelling across the country into foreign or Zollverein states. Generally speaking, the Prussian seaports export corn and timber, and import coals, iron, and salt. According to the best sources of information, the amount of all more notable goods imported into Prussia in 1857 (although not of course for Prussian consumption only) may be calculated as follows:—

	Cwt.
Coals	12,040,338
Raw-iron generally	4,161,357
Wrought-iron, steel, &c.	1,852,809
Copper and brass, unprepared	92,671
Flax, hemp, and tow	390,755
Hemp-seed, linseed, and rape-seed	1,111,155
Aloe, gall-nut, resin, &c.	526,136
Logwood	391,407
Soda	107,598
Potash, &c.	114,978
Oil in casks	208,197
Cocoa-nut oil, palm oil, and spermaceti	288,244
Train oil	106,517
Pitch, tar, &c.	138,652
Hides	217,223
Charcoal	186,276
Salt	959,959
Wool	251,661
Raw cotton	327,205
Cotton yarn, wadding, &c.	393,756
Linen yarn and linen	69,514
Tobacco in leaves	213,834
Unrefined sugar	315,334
Coffee and cocoa	704,243
Tea	21,161
Rice	440,098
Wine, cider, &c	165,269

The total amount of the above goods, together with divers others not here enumerated, was 27,025,669 cwt. Also,—

	Bushels.
Wheat	3,200,285
Rye	3,371,052
Oats, buckwheat, and spelt	600,009
Barley and malt	339,897
Beans, pease, &c.	177,285

The following list gives the number of sea-going vessels which entered or left the Baltic ports in 1857:—

Flags.	Entered.		Left.	
	Vessels.	Tonnage.	Vessels.	Tonnage.
Prussian flag	3974	761,610	3880	737,950
Other flags	4559	823,012	4561	826,434
Total	8533	1,584,622	8441	1,564,384

In these numbers the coasting trade has not been included, which is carried on by smaller vessels, above 500 in number, and with an aggregate burden of about 16,000 tons. Stettin, Stralsund, Königsberg, and Dantzic are the most frequented ports.

The abolition of the British navigation laws would have given a far greater impulse to ship-building in the Prussian ports, did not the high protective duties afforded by the Zollverein to the native iron enhance the price of this indispensable metal. Only 271 sea-going vessels were built in the three years 1855 to 1857, leaving 77 on the stocks at the end of that year. An improvement is, however, traceable in the number of Prussian vessels participating in the traffic between Prussia and British ports, as will be seen from the following official list:—Number of Prussian vessels entering British ports in 1855, 1205; tonnage, 278,350: in 1856, 1238; tonnage, 296,362: in 1857, 1353; tonnage, 319,196. Number of Prussian vessels quitting British ports in 1855, 1302; tonnage, 286,404: in 1856, 1395; tonnage, 326,162: in 1857, 1561; tonnage, 354,412. The total number of Prussian sea-going vessels, not including the coasting trade, was 953 vessels, of 278,251 tons in 1854, 29 of them steamers; and 1033 vessels of 326,569 tons in 1857, 63 of them steamers; showing an increase of 80 vessels, and 48,318 tons. During this period 42 vessels had been sold into other countries, and 113 had been lost at sea. A new and most salutary stimulus to navigation in these parts was given by the treaty of 14th March 1857, in which the King of Denmark renounced the sound dues for the payment of sums apportioned to the amount of shipping of each country. If little advantage has been taken as yet (1858) of this dearly-bought liberty of the seas, the reason is to be found in the distress occasioned by the great commercial crisis of 1857.

Roads.

The miserable condition, and in some parts the absence of roads, in the beginning of this century, has given way to plentiful and excellent means of communication. Turnpike roads, of which Frederick II. had professed so great a horror, were never seriously taken in hand until the general peace of 1815; and since that time no trouble or money has been spared to render the net-work complete. In 1857 Prussia possessed 14,331 miles of first-rate macadamized and mostly turnpike roads, or about one mile of macadamized road to every 7·76 square miles of land; 5992 of which belong to trusts or corporations, and 8340 to the state. The gross yearly cost of keeping up the latter is L.330,000, of which sum L.195,000 are covered by tolls, &c.

Prussia possesses 26 railroads belonging to private companies, and 5 belonging to the state. The aggregate length of railways (finished in 1858) is 2725 miles, which makes 1 mile of railway to every 193 square miles of land.[1] The increase since the end of 1848 has been of 938 miles, or of 84 per cent. The railways of the state have cost the sum of L.10,726,665. For the rest, L.16,516,380 were raised by ordinary shares, and L.13,746,120 by preferential shares and debentures; making a total expenditure of L.30,262,500 for private railways, and L.40,987,500 for all railways together. Seventeen more railways are to be finished by the end of 1860, 938 miles in length, which will increase the length of railways in Prussia to 3663½ miles. All state railways lie in districts where the expense of construction has been in too unfavourable a proportion to the traffic of the line. Thus the principal state railway—that to Königsberg, 289 miles long—required works of gigantic dimensions in the crossing of the Vistula and the Nogat, and passes through districts but thinly peopled. Yet the necessary sums were cheerfully voted on grounds of general utility. The lines belonging to the state consequently are not paying ones.[2] The condition of the private lines, on the other hand, is highly favourable, producing an average dividend on the paid-in capital (on an average of all the private lines together) of no less than 7 per cent. The Magdeburg-Leipsic line ranks first, with 24 per cent.; then the Upper Silesian and Magdeburg-Halberstadt line, with 13 per cent.; the Berlin-Stettin line, with 9$\frac{7}{12}$ per cent.; the Berlin-Anhalt line, with 9 per cent.; the Cologne-Minden line, with 8$\frac{2}{3}$ per cent.; the Rhenish line, with 6 per cent. If the nett profits, therefore, more than double the average of the nett profits in Great Britain, the gross receipts were 71$\frac{1}{2}$ per cent. of British receipts (in 1857), those on Prussian lines being L.1887 per mile. The aggregate traffic was of 12,982,000 passengers, and 170,518,000 cwt. of goods.

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[1] In Great Britain, the ratio was given as 1 mile of railway to every 65; and in France, 1 to every 213 square miles.

[2] The above-mentioned Eastern Railway produced a nett profit of 2·17 per cent. in 1857.

Banking system.

The Bank of Prussia (*Preussische Bank*) was instituted by Frederick the Great in 1765, and the following years,—first, by a loan of L.1,200,000, and then by directing that all deposits of tribunals and other public offices should be paid to one of the bank's offices, and deposited there at an interest of 3 per cent., and at a week's notice. The operations of the bank soon became extensive, and so profitable that its directors were enabled to repay the loan in the reign of Frederick's successor. After a partial suspension of payment in 1806, the bank resuscitated in 1815, and has ever since been increasingly beneficial. In 1846 the capital of private shareholders was admitted to the amount of L.1,500,000, and leave given to issue bank-notes, one-third of the amount to be covered by bullion. By an act passed May 6, 1856, the bank has been permitted to double its capital, and to increase its circulation of notes very considerably. The maximum of circulation in 1857 was L.11,055,600, and nearly L.15,000,000 in 1858. The bullion collected reached the sum of L.6,000,000 in 1857, and L.10,849,836 in 1858. Deposits were nearly L.3,000,000 at the close of the latter year. Originally the bank had two offices, in Berlin and Breslau; gradually the number has increased to 103. There are eight joint-stock banks in the monarchy licensed to issue notes at the rate of L.150,000 each. The number of private banks and money-offices (some of them very insignificant) is 512.

Army

In Prussia the army is in a certain sense co-extensive with the people. All men capable of bearing arms are expected to co-operate, if need be, to the country's defence. We shall have to speak,—1*st*, Of the *standing army*, with its reserve; 2*d*, Of the *landwehr* or *militia*; and 3*d*, Of the *landsturm*. The standing army consists of two distinct classes, to the higher of which belong the commissioned officers, who are gentlemen by birth and education and the non-commissioned officers or sergeants; to these commissioned and non-commissioned officers the military service is a profession for life, as in any other army in the world. The privates of the standing army, on the contrary, are recruits of one, two, and three years' standing, and comprise all able-bodied youths in the country, excepting the only sons of poor widows, or others similarly situated. They enter the army at the age of twenty, are drilled during three years, and then during the two following years are subject to be called back to their regiments regularly for a few weeks' exercising, and, if necessary, for war. By means of this reserve, the standing army can be increased by two-thirds of its numbers at three days' notice. One class of Prussians is, however, privileged to serve in the ranks only one year, after which they are at once placed on the lists of the reserves; to it belong all young men of superior education without distinction of birth or parentage, who are able to pay for their own sustenance, uniform, &c. If they prove themselves capable, and if they are admitted by the officers, these young "Freiwillige," as they are called, afterwards enter the landwehr, with a commission as landwehr officers. All the rest, at the expiration of five years from their first entrance into the army, become privates or sergeants in the landwehr. This land armament or militia is composed of all the drilled men during a further term of thirteen years, after they have quitted the standing army and reserve. Six years out of these thirteen constitute the first *Aufgebot* or levy, and the rest the second *Aufgebot*. The first Aufgebot is called under arms every three or four years for several weeks' practice in manœuvring. All the landwehr lists, accoutrements, &c., are kept in such perfect order that a fortnight's notice will suffice to equip them ready for war. After attaining his thirty-ninth year a Prussian is free from military service, excepting in cases of extreme need, when the king is by law empowered to call upon every man, up to his fiftieth year, to rise and take arms for the defence of the district in which he lives. This last-named formidable levy would, if ever called out, constitute the landsturm.

The education of officers and sergeants for their military profession is attended to as carefully as in most other well-organized armies, by military and cadet schools for the infantry and cavalry, as well as for the artillery and engineers. No officer can, however well qualified, enter a regiment, even with a royal commission in his pocket, unless the officers of that regiment declare their willingness to receive him as a man of unimpeached honour. Sergeants are picked men from the rank and file, induced to remain in the service by the certainty of being provided for by the state when disabled by wounds or old age to serve any longer. The privates of the Prussian militia or landwehr make better soldiers on the whole, at any given time, than those of the standing army. This may seem a paradox, as the latter are actually under arms, whilst the former return to their banners, each from his civil employment. But in the landwehr you have men perfectly drilled, and in the prime of life, against recruits who have scarcely outgrown their boyish years. Of the officers of the landwehr the same cannot be said. One year's training, and after that a few weeks of field practice, with long intervals between, do not enable the majority of those even in the position of subalterns to act independently of officers of the standing army. A partial reform of the militia institution has therefore been considered necessary. The landwehr, instead of being combined into separate regiments, is to form additional (4th, 5th, and 6th) battalions of each regiment in the standing army. With this view, the staff of officers in the latter is being greatly augmented, in order that every regiment may be able to grant a sufficient number of them to their respective landwehr battalions, whenever the militia may be called out.

The standing army, with its reserve and the militia (we may omit the landsturm in our further remarks) is divided into 9 army corps, 1 of which is formed by the household troops, and each of the 8 others belonging to one of the princes of the monarchy. The first army corps-d'armée is stationed in Prussia proper, the eighth in Rhineland. An army corps is divided into 2 divisions, of 2 brigades each. Again, it consists of 4 regiments of infantry, 4 regiments of cavalry (the guards only have 6 cavalry regiments), 1 regiment of artillery, 1 rifle battalion, and 1 detachment of pioneers. The Prussian infantry consists of 144 battalions of the standing army, including 10 rifle battalions, and 116 of landwehr, of the first aufgebot. Nearly all regiments contain 3, but some of them have 2 battalions of 1000 men each. In the cavalry the numbers are,—152 squadrons of the standing army, and 144 of landwehr, 4 squadrons to a regiment, and each squadron of 120 horses in times of peace, 160 horses in its war strength. The artillery also is divided into regiments, 9 in number, and consisting of 16 batteries each, with 5 additional, making 149 batteries in all. There are in time of peace 216 guns, fully equipped, belonging to the horse artillery (a corps first instituted by

Frederick the Great), 648 to the foot artillery, and 10 to the fortress companies,—874 in all.

Without further enumerating pioneers, &c. &c., we shall now state the numbers of the Prussian army. Its real numbers in times of peace amount to 161,000 officers and men. In case of war, this can be instantly increased to an effective force of 357,000. Sealed orders for completing this number ("mobilizing," as it is termed) always lie ready in the office of every officer holding a separate command. In warlike contingency, a telegram would direct him to open the sealed packet, and then the work of producing his troops, complete in every respect, must be done in a fortnight's time. In addition to the above number, there would further be 246,000 men armed and equipped for doing the service in the interior, ready for any emergency.

Thus the Prussian army, in case of war, can at any time be raised to the formidable number of 603,000 men, all perfectly drilled,—a popular army, such as no other country possesses, unassailable for defence in a cause of undoubted necessity and justice. Many people were of opinion that this popular institution contains elements which might prove dangerous to the state, or at least not be available under all circumstances and for every purpose alike. The latter of these doubts seems to be well-founded; for it may be asserted that for any prolonged war merely for dynastic interests,—in fact, for any war not absolutely forced upon the country,—an army so composed would be no suitable instrument. But there is no fear of this militia being turned to purposes subversive of public order and tranquillity. When the king called out part of the landwehr in the midst of the revolutionary commotion of 1848, they assembled under their banners as willingly as they would at any other time. Exception is also frequently taken to the rawness of these troops, which must, it is believed, place them in disadvantages if opposed to elder men. It would seem that there must be advantages as well in the greater youthfulness of part at least of the Prussian troops (for the landwehr are grown-up men), for it is a historical fact, that the greatest general of modern days, on being asked which of the three armies, the Russian, Austrian, or Prussian, he would most like to command, declared unhesitatingly, "They are all three very good, but I should prefer commanding the Prussian army."[1]

The pay of a Prussian soldier in times of peace is very small, and his keep as economical as possible. The private receives twopence-worth in kind, and 3¼d. in money, or 5¼d. a day, which is even less than the Frenchman's pay of 6d. per day, and only ⅖ths of an English private's pay. For officers of the lower grades also the emoluments are so trifling that it would appear almost impossible for any of them to clothe and feed themselves without some private fortune. A great many of them, however, manage to exist upon that pittance, without any such extra help, proud of their profession and the social distinctions it confers upon them. Nevertheless, the cost of the military establishment swallows up nearly one-fourth of the entire annual expenditure of the state.

Prussia keeps federal garrisons (alone or jointly with Austria and other German states) in the fortresses of Luxemburg, Maintz, and Rastadt. Her own fortresses are numerous, and some among them of the first magnitude. Towards France, Saarlouis holds the first line of defence, then Jülich, Wesel, *Cologne*, and *Coblentz*, with *Ehrenbreitstein.* Towards Russia the line of fortifications has been more attended to of late, but is far from complete yet. Here the fortress of *Posen* forms the principal bulwark against aggression. Königsberg on the Baltic will soon equal it in strength. Further on, the line of the Vistula is defended by Thorn, Culm, Grandenz, and *Dantzic;* and the Oder line by Neisse, Cosel, Glatz, Glogau, Cüstrin, *Stettin;* the Elbe line by Torgau, Wittenberg, and *Magdeburg.* Besides these, Pillau, Colberg, and Stralsund must be mentioned as maritime defences, and Schweidnitz and Silberberg as defences against Austria. Among this large number, six are of first magnitude (in italics), nine other of second, and the rest of third rank.

Naval defences.

The total absence of a fleet had placed the coasts of Prussia and Germany at the mercy of their Danish neighbour in 1848. Hence the general desire in Prussia that the coasts should be adequately protected, and that there should be a small number of armed vessels of the best description, to prevent a third-rate power from again seriously damaging the trade of their large and mighty country. Accordingly, Dantzic and Stettin, Stralsund and the island of Rügen, received additional fortifications on the sea-side. These places were not, however, considered as sufficiently good harbours; and the Prussian government purchased the Bay of Jahde, a waste stripe of coast, from the Grand Duke of Oldenburg, which is eventually to become the naval port of Prussia. The Prussian flotilla at present consists of 2 frigates, 3 corvettes, 3 steamers of 12 guns each, 3 schooners, 42 gunboats, a transport vessel of 292 guns altogether, 90 officers, 1300 sailors, and a battalion of marines, with 622 officers and men.

Public education.

Prussia has strenuously laboured to earn the reputation of being inhabited by a better-educated people than any in the world. "Every child shall be taught to read and write and to make sums:" such is the principle of Prussian law—by its parents, or if not, by professional masters and mistresses, and at the expense of every parish. The state providing,—1*st*, Normal schools and examiners for the schoolmasters, no schoolmaster being licensed to teach publicly who has not passed the prescribed examination; 2*d*, Supplementary means, where the parish funds do not suffice, in which cases the government has the appointment, or a share in it; and 3*d*, The strong hand of the law, if parents disobey the country's injunction to send their children to school. In 1855, out of 2,943,251 children of school age in all stations of life then living in the monarchy, 2,758,472 went to elementary schools. The number of schools was 24,292; of schoolmasters, 31,467; of schoolmistresses, 1523. The pay of all elementary schoolmasters and schoolmistresses together throughout the monarchy, from private and government funds, amounted to L.900,000 in 1857, which is more by L.64,500 than the sum-total was in 1852. In this the contributions of government are only L.60,000. A Prussian schoolmaster or mistress receives, on an average, L.28, 13s. a year of fixed salary, besides lodging and some other emoluments and occasional helps. The cry for increased salaries is becoming very loud (the government board is now, 1858, granting relief at the rate of L.5,500 a year), and there seems to be a growing inclination to enforce an improvement by law.

Normal schools (*Seminare*) were first instituted in 1820; their number is at present 39 for the education of masters, and 4 for mistresses. Of these, 43 were Protestants, and 15 Roman Catholic. There are 2398 pupil teachers educated in them, at a cost to the state of L.29,731, or about L.12, 15s. each.

Another higher class of schools, also entirely supported by parishes (or nearly so), is comprised under a variety of names, beginning from middle-schools (*Progymnasien*), and rising up to *Höhere Bürgerschulen* or *Realschulen.* Their number was 512 for boys, with 2394 teachers and 72,653 scholars; and 382 higher schools for girls, with 2015 teachers and 54,753 scholars in the year 1852. The instruction in these schools is grounded principally on mathematics, and not on the classics, and is carried on with a constant and almost exclusive view to those practical occupations in after-life for which most of the pupils are brought up. The highest of this class, called *Realschulen* (mathematical schools, as we should call them), 56 in number, have the right of giving certificates to their pupils on leaving. The number of gymnasia or classical schools is 131, with about 1000 ordinary masters, 700 assistants, and 34,000 pupils. Only a few of these gymnasia have accommodation for the pupils; among them is the famous old school of Pforta, in the Saxon province, founded in 1543. These are mostly ancient foundations, and self-supporting; nearly all the rest require very large assistance at the hands of government, if they are not entirely supported by it.

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[1] These words fell from the lips of the late Duke of Wellington in an after-dinner conversation in the year 1849.

The Prussian universities, alike in every respect to those of the rest of Germany, are divided into four "faculties," according to the principal branches of learning; the first of theology (subdivided in Breslau and Bonn into an evangelic and Roman Catholic faculty), the second of jurisprudence, the third of medicine, and the fourth of philosophy, which comprises all studies, without exception, not taught under any of the above heads. The number of students is subject to considerable fluctuations. The following table for 1856–57 can be taken as tolerably near the average of the last years:—

VII. *Attendance at the different Prussian Universities*, 1856–57.

Universities.	Divinity.		Jurisprudence.	Medicine.	Philosophy.	Total Number of Students.	Number of Students in 1836.	Professors.	Yearly Expenditure.
	Evangelical.	Roman Catholic.							
Berlin	292	...	694	265	319	1570	1832	149	L.19,228
Bonn	61	211	213	96	247	828	835	71	16,365
Breslau	83	203	202	138	158	784	875	72	14,074
Halle	445	...	125	47	79	696	777	74	13,508
Königsberg	94	...	123	86	46	349	430	60	12,600
Münster	...	301	...	...	148	449	255	16	...
Greifswalde	35	...	46	101	55	137	204	41	10,284
Total...........	1010	715	1403	733	1052	4813	5208	483	...

On a comparison of these numbers with those of previous years,—for instance, 1836,—we find that in almost every university, and particularly in the faculties of divinity, a decided diminution has taken place, the only exception being the university of Münster, and these just in its theological faculty. The cause of this lies mainly in the circumstance, that all learned professions are at present overstocked in Prussia, and that the progress of industrial and commercial activity in the country carries many young men straight from school into practical life. As for the exception (viz., Münster), it is explained by the decided predilection evinced by Romanist bishops for a place where their students should be free from contact with any other but their own doctrine.

The highest literary body in the country is the Academy of Sciences at Berlin, instituted by Frederick I. in 1706, after an elaborate plan of the great Leibnitz, much encouraged (though in imitation of the Parisian model) by Frederick II. Its publications are of the highest order both in physical science, mathematics, &c., and in classical philology, geography, &c. Its membership is much coveted in Prussia, as well as in other countries: the present numbers are,—50 German members, 20 foreign members, 185 corresponding members. There is a Royal Academy of Arts in Berlin, and a Royal Academy for Painting at Dusseldorf. Veterinary schools, deaf-and-dumb schools, and blind asylums abound.

Law.

The criminal law of the country was entirely codified and proclaimed as one and the same for the whole monarchy, in 1851. Not so the common law; in this there exists a considerable diversity, according to provinces and districts. In parts of Pomerania, and near Ehrenbreitstein, for instance, the old laws of the Empire still exist; local customs prevail unimpaired in other districts; in the greater portion of Rhineland the French code has remained in force, and is much esteemed for its distinctness and simplicity; and in the rest of the monarchy the landrecht (essentially instituted by Frederick the Great, but promulgated only in 1794) holds its sway, except where more modern statutes have modified its tenets.

The law acknowledges no inequality amongst Prussians. All special jurisdictions are by law abolished, excepting the military code for persons in actual military service, and a special tribunal for students of universities, before which, however, only matters of discipline are brought.

The highest court of the monarchy is the Ober Tribunal in Berlin, to the decrees of which distinguished body the judges of other courts invariably refer in questions of precedents. The next class of tribunal is formed by twenty-two *Appellations-Gerichte*, to which parties may appeal from the judgments of the *Stadt-* or *Kreis-Gerichte*. The former of these exist in the five most populous towns; and of the latter there are 238, or nearly one to every administrative *Kreis* or district in the realm. Assizes, with trial by jury (instituted since 1848 throughout the monarchy, and imitating rather too closely the French instead of the English model), are held four times a year, in eighty of the towns.

Constitution.

The kingdom of Prussia is a limited monarchy. We have seen above that on February 6, 1850, King Frederick-William IV. solemnly took the oath required by the new law of the country, "to observe faithfully and unswervingly the constitution of his country and monarchy, and to govern in accordance with it and the laws." Thus the new order of things was inaugurated; and the constitution (called, after the day of its publication, that of the 31st of January 1850) has existed ever since; painfully, it is true, and subject to several modifications, but beneficently, if we consider what the country would have been without it, and hopefully, too, for the future. The usual form and character of continental constitutions is well known to our readers, and on the whole, it is adhered to in the Prussian fundamental law as now in force; we will therefore extract those points only which merit special attention. The king is inviolable and irresponsible. The signature of a responsible minister is necessary for the validity of every act of government. His majesty, the ministers, and all civil servants of the state, are required to swear an oath on the constitution; also the members of parliament, but not the army, whose oath is to the king only. Parliament consists of two houses,—the Herrenhaus (literally House of Lords), and the House of Representatives (Abgeordneten). In the composition of the Prussian House of Lords, which now numbers a little more than 200 members, four elements are mixed up,—birthright, dignity, nomination, and, finally, election. By right of birth, seats in this house belong to 51 persons in all—viz., the princes of Hohenzollern, the heads of 14 ancient mediatized families, whose possessions lie within Prussia, and some other princes, counts, and lords of extensive patrimony; to this number of hereditary peers the king can add new lords at his pleasure, as in England. There are four members in virtue of official dignity, each occupying one of the mediæval high dignities of Prussia proper, which have outlived the reforms of modern days. The princes of the blood take their seat in the house for life, of course. Of real life-peers there are at present 31 in the house, law-advisers of the crown, and others. *Lastly*, the right of election (subject to his majesty's approval of the elected candidate) is granted to the universities, to certain large towns, and in each province to three bodies of noblemen who are landed proprietors—viz., 1*st*, Counts; 2*d*, Noblemen of considerable property; 3*d*, Noblemen, and others, of ancient landed property; each of these classes electing a life-peer, and presenting him for the king's approval. The Lower House consists of 352 representatives of the people, returned by a peculiar kind of double election which we will elucidate in a few words. The franchise being extended to every man twenty-five years old (who has not lost the right of voting in the parish elections), the electors first of all meet in their respective parishes, divided into three classes, according to property. Each class of electors then choose, not the member, but a man of confidence, who is now called a *wahlmann*, within the parish. On a later day these men of confidence assemble at the town appointed for polling, and return a member for the electoral district, every Prussian thirty years old being eligible for this distinction.

The constitution accords to the houses of parliament the following fundamental rights, without which, indeed, it would be worthless:—1*st*, The right of originating laws, as well as deliberating upon such as have been proposed by the crown, no law being valid without the assent of both houses; 2*d*, The right of voting the yearly budgets; 3*d*, Of investigating by commissions any public matter; 4*th*, Of accepting or rejecting, before ratification, every commercial treaty, and all such conventions with foreign powers which may in any way affect the financial obligations of the country. No member of parliament can be arrested or put on his trial without leave given by the house to which he belongs. The Upper House is not permitted to propose amendments to the budget, but must accept or reject it as a whole. The Lower House is elected for three years. Both houses are annually convoked by royal summons; the usual period is about New-year.

Provincial and other assemblies.

Besides this general parliament (*Landtag*) Prussia still possesses some antique assemblies of Stände for each province and district, which have been mentioned in our historical introduction. Their deliberations extend to local matters only; and besides these, they have the management of certain local funds. It is probable that they will soon make room for local elective bodies differently constituted.

Government.

The king's cabinet consists seven of ministers, viz.:—1. Of Foreign Affairs; 2. Of the Interior; 3. Of Finance; 4. Of Justice; 5. Of War; 6. Of Commerce, Trade, and Public Works; 7. Of Church Affairs, and Public Education. Besides these, the cabinet contains a president, or even, as at present, two presidents, without special office. Not belonging to the cabinet are—the minister of the Royal Household, and the president of the Board of Agriculture. The government of the interior is entrusted under the minister to eight presidents of provinces (*Ober-Präsidenten*); under each of them to *Regierungs-Präsidenten*, or presidents of departments; and under these again to *Landräthe*, or commissioners of districts. These *Kreise* or districts correspond to our hundreds; their number is 335.

The management of the woods, forests, &c., forms part of the functions of the minister of finance. The minister of commerce, trade, and public works, is responsible also for the general post-office. In the bureaucratic country of Prussia, the most dreaded public office, the object of a profounder awe than either the king, or laws, or police can command, is the *Ober-Rechnung-Kammer*, or General Board of Accounts, to whose radamanthine scrutiny every official account of money, without exception, has to be submitted.

Prussia never was and never can be a rich country.[1] Economy, not to say parsimony, and strictest order alone, have preserved a firmness to Prussian credit, even in the times of great calamity, such as few other states possess, and enabled her to furnish means for the exigences of war and for national progress in times of peace. The country's debt, which Frederick-William III. had brought down to the trifling sum of L.3,750,000 in 1806, had risen to L.43,125,000 during the disasters and triumphs of war following that year. But ever since 1815 it continued steadily decreasing under the careful hands of that monarch, who paid off no less than L.18,825,000 during the twenty-five remaining years of his reign. In order to give every security to the native and foreign holders of Prussian stock, he declared, on the 17th January 1820, that no new loan should be raised for the state without the consent and under the guarantee of an assembly of representatives of the people. Accordingly, no new loan was made until 1848, since when, every succeeding parliament has listened but too indulgently to the increasing demands on the country's purse by the king's ministers, some of them very useful (as, for instance, for the Eastern Railway, mentioned above), others of a more doubtful nature. In 1851 the public debt had already increased to L.28,892,832; in 1855, to L.36,415,292; in 1856, to L.37,177,726; in 1857, to L.38,038,745. There seems now to prevail a decided inclination to stop in this headlong progression; indeed the year 1858 shows already a diminution of about 1¼ million pounds sterling. The public credit of these securities never suffered to any considerable extent during the late years of revolution and panic, either within the limits of the country or without. Besides this debt, for which interest is paid, another debt of L.2,488,852, paying no interest, should be mentioned in this place,—*i.e.*, the convertible paper-money of the state. The property of the state in woods and forests, &c., from which profit can be made, is officially calculated at L.12,832,704. Taxation is by no means light in Prussia, and almost in the same unfavourable proportion as the public debt, the taxes of the country have increased in an exorbitant degree. The *direct* taxation comprises,—1*st*, A land and house tax, worth about 1½ million pounds. 2*d*, Income-tax, paid by all whose income is above L.150 a year, classified under thirty heads, and so arranged as to be a little below 3 per cent. for each class. The highest amount of income-tax paid in Prussia is L.1080, corresponding to an income of L.30,000 a year. This tax produces to the state about L.450,000. 3*d*, The *Classensteuer*, a misnomer, by which is understood another and older kind of income-tax, averaging about 2 per cent., laid upon those persons or householders whose yearly income does not reach L.150. These are divided into three classes. From this tax are exempt the poor, children, and old people; soldiers, &c., on active service; all foreigners; and, lastly, the citizens of larger towns, in consideration of the *octroi* (see below). Its result to the state is about 1¼ million. 4*th*, A tax on trades (*Gewerbe-Steuer*), producing about L.450,000 a year. 5*th*, A railway-tax of very modern date, raised on the yearly dividend in a progressive ratio, which produces about L.100,000. In the chapter of *indirect* taxation, custom-house and transit dues rank first in productiveness, viz., L.1,800,000; then follows the malt-tax, with the excise on brandy and beet-root sugar, worth 1½ million pounds sterling; the stamp-duty contributes L.600,000; the *octroi*, or *Mahl und Schlachtsteuer*, raised at the gates of 83 Prussian towns on cereals and butcher's meat, about L.350,000; turnpike roads, nearly L.200,000; tolls and port dues, about L.140,000; shipping dues, L.65,000.

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[1] All calculations regarding the wealth of a given population must needs be of a precarious nature. This want of exactitude has not diminished since the introduction into European states of income-taxes, but rather increased. We prefer, therefore, to take the lists of 1850 (the year previous to the introduction of the income-tax) to all the more specious accounts to be found in recent statistical publications. In that year the number of rate-payers was 4,950,454. Of this number only 19,988, or 0·4 per cent., appear from official lists to have been rated as enjoying an income of more than L.180; 159,985, or 3·23 per cent., between L.60 and L.180 a year; 359,564, or 7·26 per cent., L.30 to L.60; 835,537, or 16·88 per cent., L.15 to L.30; 3,575,380, or 72·23 per cent., L.3, 15s. to L.15. Only 180,000 heads of households, therefore, or persons living singly throughout Prussia, or 4 per cent. of all rate-payers, had an income above L.60 in the year 1850. Another fact worth mentioning in this place, perhaps, is this: taking the larger estates (*Rittergüter*) of the Prussian monarchy all together, the mortgages officially registered against them amount to four-fifths of their *rated* value, or to two-thirds of the *selling* price which they would fetch in the market.

The yearly expenditure of the state for raising these sums of direct and indirect taxation, which amount in the aggregate to above eight and a half million pounds sterling, is only L.780,000. There are two state monopolies still in existence, both contrasting strangely with the general and financial progress of the country, the one raising the price of one of the first necessaries of life, the other pandering to an unruly love of gain. We mean the monopoly on salt, which produces L.1,350,000, at a cost of no less than L.480,000, and which is relaxed in its severity only in favour of cattle-salt; and the state-lottery, whose evil effects on the lower classes the government have in vain fancied to conjure by the high price of lots, and the slowness of its operations (only four times a year),—a monopoly in the strictest sense of the word, as all other public gambling, *roulette*, &c., is prohibited in the Prussian dominions. The wages of this sin to the state are L.200,000, gained at a trifling cost of L.15,000. The share of state profit in the operations of the Bank of Prussia was about L.150,000 latterly.

The *Domänen* (woods, forests, &c., according to our nomenclature) are royal estates which Frederick-William III. gave over to the country in that same memorable decree of 17th January 1820, which we had occasion to mention above. They are administered by the minister of finances. A sum of L.385,965 is deducted first of all from their rental, for the maintenance of his majesty and the royal family, and all the expense of their different households. It should be remarked that this sum of L.385,965, although partaking of the nature of a civil list, is not subject to an annual vote by the legislature, but is deducted at once from the receipts under the form of a standing and inalienable charge. The Prussian Chamber of Representatives, without ever calling into doubt this prerogative of the crown, which is, moreover, sanctioned by the constitution; and without claiming the power of reducing that sum, have, however, willingly taken it upon themselves to *raise* it (March 1859) by L.75,000, in consideration of the altered value of money.

Having premised these few preliminary explanations of Prussian finance, we now give the budget of 1858, contracting a number of its minuter details:—

RECEIPTS.

1. Minister of finance		L.11,890,954
Woods and forests, &c. (*minus* L.385,965 for crown, as above)	L.1,409,061	
Direct taxation	3,813,549	
Indirect taxation	4,847,139	
Salt monopoly	1,355,625	
State lottery	197,115	
Share of profit in the Bank of Prussia, &c. &c.	162,900	
Carry forward		L.11,890,954
Brought forward		L.11,890,954
2. Minister of commerce, trade, and public works		5,192,590
General post-office	L.1,706,070	
Electric telegraph	105,751	
Mines, &c	2,077,019	
State railways, &c	1,262,789	
3. Minister of justice		1,445,084
4. Minister of the interior		117,772
Prisons	L.78,459	
5. General Board of Agriculture		222,972
Studs of Trakehnen, &c	L.65,443	
6. Minister of church affairs and public education		13,738
7. Minister of war		45,725
8. Minister of foreign affairs (consular and passport dues)		1,345
9. Receipts from Hohenzollern		31,286
Total of receipts		L.18,961,466

EXPENDITURE.

1. Public debt			L.1,979,977
Interest		L.1,341,895	
Sinking fund		570,598	
2. Parliament			36,250
3. Council of ministers (*Staats ministerium*)			37,153
4. Minister of foreign affairs			127,092
Diplomatic service		L.66,817	
Consular service		16,189	
5. Minister of finances			2,828,961
a. General expenses		L.957,176	
b. Special expenses		1,871,785	
Woods, forests, &c.	L.574,799		
Direct taxation	152,811		
Indirect taxation	628,389		
Salt monopoly	487,577		
State lottery	16,515		
6. Minister of commerce, trade, and public works			4,974,810
a. General expenses		L.798,318	
b. Special expenses		4,176,491	
Post-office	L.1,409,456		
Mines	1,585,636		
Electric telegraphs	69,571		
State railways, &c. &c.	1,081,902		
7. Minister of justice			1,698,738
8. Minister of the interior			813,724
Gaols	L.326,729		
Police	296,430		
Statistical and meteorological office only	2,716		
9. General Board of Agriculture			337,130
Studs of Trakehnen, &c.		L.95,721	
10. Minister of church affairs and public education			539,647
Affairs of the Evangelic Church		L.61,071	
Affairs of the Roman Catholic Church		11,312	
Universities		73,068	
Grammar and mathematical schools (*Gymnasien* and *Realschulen*)		47,144	
Elementary schools		66,817	
Science and art		30,936	
11. Minister of war			4,549,120
12. Board of Admiralty			92,159
13. Expenditure on Hohenzollern			28,885
14. Special credits for 1858			917,820
Total of expenditure			L.18,961,466

The budgets of Prussia have, like her public debt, been rapidly increasing of late years. The first budget published by authority was that of 1821. It amounted, in receipt and expenditure, to L.7,500,000, and was followed by as moderate ones during the reign of Frederick-William III. In 1844 it had risen by rather more than L.1,000,000, and in 1850 it was L.13,695,353. From 1851 to 1854 there were successive deficits to cover. The balance was re-established in 1855, when it was L.16,774,168; it was L.17,829,610 in 1856; L.18,036,346 in 1857; and L.18,961,466 in 1858. If we distribute the expenditure equally over its entire population at given epochs, we shall find that the contribution of each inhabitant would have been, in the years from 1821 to 1844, 11s. 6·1d.; in 1849, 16s. 2·4d.; in 1852, 17s. 7·2d.; in 1855, 19s. 6d.; in 1856, 20s. 7·2d.; in 1857, 20s. 9·4d.; in 1858, 21s. 8·4d. (G. v. B.)

Prussia.

PRUSSIA, a province of the kingdom of that name, forming its most easterly portion, bounded on the N. by the Baltic, E. by Russia, S. by Poland and the province of Posen, and W. by those of Brandenburg and Pomerania. The division into E. and W. Prussia, historically of considerable importance, is now only used as a convenient way of designating the two chief parts of the province, as they have long ceased to be two distinct provinces. Extreme length from E.N.E. to W.S.W. about 300 miles; greatest breadth, 150; area, 24,967 square miles. The surface is in general low, but not by any means flat; for a chain of hills, on an average 300 or 400 feet high, extends in a curved line from the vicinity of Goldap, near the Russian frontier, to that of Marienburg on the Vistula. Of these hills, and of the whole province, the highest point is the Hasenberg, near Landsberg, to the S. of Königsberg, which attains the height of 725 feet. Along the coast of the Baltic there are on the west of the Vistula many well-wooded hills, from 150 to 500 feet high; but to the east of that river the shores are perfectly flat, except where shifting sand-hills break the level. The Gulf of Dantzic and the arms of the sea called the Frische and the Kurische Haff, indent the coast of this province. The largest rivers are the Vistula, flowing northwards from Poland into the Gulf of Dantzic by several arms; the Passarge from the south and the Pregel from the east, flowing into the Frische Haff; the Memel, the Mange, and the Dange, flowing westwards from Russia into the Kurische Haff. Of lakes the province contains a great number, distributed in three principal groups. The largest of these groups lies near the eastern extremity of Prussia, between the basins of the Pregel and Vistula, in a valley more than 300 feet above the sea, and it includes Lake Spirding, 45 square miles in extent. Another group of lakes, smaller in size and lower in elevation, lies between the Passarge and the Vistula; while the third group lies to the west of the latter river. There are several extensive swamps and moors, especially towards the north-eastern extremity of the province. The soil is in general very fertile; and no other province in the kingdom has such an extent of good land. About two-thirds of the surface is good land; the rest being mostly sandy ground. Of the whole area of the country, 6,930,985 acres consisted in 1852 of arable land; 204,240 of gardens, vineyards, &c.; 2,955,726 of meadows and pastures; 2,513,460 of forests; and 3,368,667 of waste land. Wheat is one of the principal crops raised, especially in the low country along the Vistula, Pregel, and Memel; rye is also raised of such excellence as to be much exported. Besides these, most of the common crops are grown in the province. Prussia contained in 1855, 461,504 horses, 987,023 horned cattle, 2,642,268 sheep, 17,143 goats, and 520,512 swine. Manufactures are not very extensively carried on in the province, the whole number of hands employed being 128,568; less in proportion to the population than there are in any other province of the kingdom. The only important mineral found here is iron, which is plentiful in various places; but on the shores of the Baltic amber is obtained in greater abundance than anywhere else in the world. The trade is considerable; three of the chief seaports in the kingdom, Dantzic, Königsberg, and Memel, being in this province. Corn, timber, hides, tallow, and other articles are exported. Though there are numerous excellent educational institutions in the province, the percentage of those receiving instruction is considerably under the average of the kingdom. There is one university, that of Königsberg; 8 normal seminaries; 14 gymnasia, with 188 teachers and 4207 scholars; 6 progymnasia; 42 middle schools; and 4417 elementary schools, with 5059 teachers and 338,516 scholars. In regard to religion, the most of the inhabitants belong to the Evangelical Church. Besides these, who are 1,885,256 in number, there are 703,252 Roman Catholics, 1204 of the Greek Church, 12,693 Mennonites, and 34,351 Jews. For administrative purposes the province is divided into the governments of Königsberg, Gumbinnen, Dantzic, and Marienwerder. The Æstui, who are described by Tacitus as a nation largely employed in collecting and trading in amber, seem from this fact to have been the original occupants of this province. After this, however, the history of the country is for a long period involved in almost total obscurity. Bands of Goths and Scandinavians in the third century, and of Letts and other nations in the sixth, settled here, and mingled with the original inhabitants. The Prussians, as they were called from a very early period, resisted for a long time all the efforts made to convert them to Christianity. St Adalbert, who was the first to attempt it, suffered martyrdom in 997. Bruno, a monk, who renewed the attempt, met with a similar fate; and neither the persuasions of these and similar missionaries, nor the sword of the kings of Denmark and Poland, professedly drawn in the service of the church, could induce the Prussians to abandon a religion believed to be inseparable from their freedom, till the Teutonic Knights in 1230 entered the country. Little by little this crusade proved successful, and the knights possessed themselves of the whole country; the grand-master establishing his seat at Marienburg in 1309. On the introduction of Christianity, many Germans settled in the country; thriving towns rose; and commerce began to extend itself. But the prosperity of the country excited the envy of the Polish sovereigns, who proceeded to open hostilities, which resulted in the battle of Tannenberg in 1410, so decisively against the Teutonic order that Prussia became then actually, and afterwards also formally, a fief of the Polish crown. The contest, however, did not cease here; and the fortune of war still proving adverse to the knights, they were obliged by the peace of Thorn in 1466 to give up West Prussia entirely to Poland, retaining the eastern portion as a fief from the crown. The office of grand-master afterwards became hereditary in the Brandenburg family; and in 1525 the Margrave Albert, having adopted the Protestant faith, had the office changed into a dukedom. The victory of Warsaw, gained in 1656 by the Elector Frederic William over the Poles, enabled him to get rid of the Polish supremacy over East Prussia; and the western part of the province was restored to the kingdom of Prussia by degrees in the successive partitions of Poland. It was from this province that Frederic III., the elector of Brandenburg, took, in 1701, the title of King of Prussia. Pop. (1855) 2,636,766.

Prynne.

PRYNNE, William, an English lawyer, noted alike for his pamphlets and his punishments, was born at Swainswick, near Bath in Somersetshire in 1600. After graduating at Oxford in 1620, he became an outer barrister of Lincoln's Inn, was well read in English law, and was filled with zeal for gospel doctrine and morality. On his arrival at the Inn he became a follower and admirer of the Puritan lecturer Dr John Preston, who, finding Prynne hot-spirited and zealous to a degree, put him forward on occasions where a considerate man would not have dared to appear. Struck by certain scandals of the time, real or imaginary, especially by that of play-acting and masking, Prynne saw good, in 1632, to assail them in his *Histriomastix*, or "Player's Scourge." Dr Peter Heylin, "lying Peter," as men sometimes call him, who had an old grudge at this zealous lawyer for "confuting some of his doctrines," was busy reading this book with the most intense interest, and by Laud's direction, making excerpts from it. This being done, Laud charged Attorney-General Noy to prosecute Prynne before the Star Chamber. This Noy did with rigour, and the young barrister was sentenced to pay a fine of L.5000, to stand in the pillory, to lose his ears, to suffer perpetual imprisonment, and to witness the burning of his

Histriomastix by the common hangman. During his residence in prison he continued writing and publishing fulminations against the bishops, "calling them Luciferian lord bishops, execrable traytors, devouring woolves, with many other odious names not fit to be used by a Christian," thinks old Wood. (*Athen. Oxon.*, vol. iii. Bliss.) He published his pamphlet, *News from Ipswich*, in 1637, in which he fell foul of bishops and archbishops, and roused afresh the indignation of Laud; on which he was again before the Star Chamber; was fined again in L.5000; to lose his ears the *second* time, having had them "sewed on again" before; to be branded on both cheeks S. L. (seditious libeller); and to be perpetually imprisoned in Caernarvon Castle. A great crowd, we are told, witnessed the spectacle in the Old Palace Yard on the 30th June 1637, "silent mainly and looking pale" (Carlyle's *Cromwell*, vol. i.), with Prynne addressing them from his exalted position, defying Lambeth, with Rome at the back of it, to prove to him that these practices were according to the law of England. It was against Laud and his "surplices at Allhallowtide" that Prynne had offended, and not against the law of England. He was borne to Caernarvon; thence to Mount Orgeuil Castle; when, on November 7, 1640, there came an order from "the blessed House of Commons" (so termed by his party) for his releasement. "On the 28th of the same month," writes Anthony à Wood, "they triumphantly entered, being then accompanied with thousands on foot and horseback, and in coaches, with rosemary and bays in their hats, crying 'Welcome home, welcome home! God bless you! God be thanked for your return!' &c., to the great contempt of authority and justice." Prynne was elected member of Parliament for Newport in Cornwall, shortly after. Here he kept up his original assault against the bishops, and played an important part in the trial of Archbishop Laud. In the Long Parliament he was zealous in the Presbyterian cause; and when the Independents gained the ascendancy, he opposed them strongly. On his being excluded from the House by the "purging" which it received, he attacked Cromwell and his party with so great bitterness that he was again thrown into prison. He was shortly afterwards released, and took to his favourite exercise of the pen. Being raised to his seat after Cromwell's death, he was active in furthering the Restoration, and was chosen keeper of the records of the Tower, with a salary of L.500. He died in 1669.

He was a most voluminous writer, but we fear more than the *Histriomastix* is now altogether unreadable. He wrote *Records of the Tower*, in 3 vols., and *Parliamentary Writs*, in 4 vols.; and presented his works, nearly 200 of them in all (a list of which is to be found in Wood's *Athenæ Oxonienses*, vol. iii.), in 40 vols., to the Lincoln's Inn library.

PRYTANES (πρυτάνεις), in Grecian antiquity, were the presidents of the Senate, whose authority consisted chiefly in assembling the Senate, which for the most part was done once every day. The Senate consisted of 500, fifty senators being elected out of each tribe; after which lots were cast to determine in what order the senators of each tribe should preside, which they did by turns, and during their presidentship were called *prytanes*. Their period of office was termed a *prytany* (πρυτανεία), and the building in which they held their meetings was called the *prytanium* (πρυτανεῖον). However, all the fifty prytanes of the tribes did not govern at once, but one at a time, namely for seven days; and after thirty-five days another tribe came and presided for other five weeks; and so of the rest

PRZEMYSL, a town of the Austrian empire, in Galicia, on the San, 51 miles W. of Lemberg. It is walled, and is one of the most ancient towns in the country. On a hill in the vicinity stand the remains of an old castle, once the residence of the princes of Przemysl, which was in the tenth century an extensive Rusmak principality The town is the seat of a Roman Catholic and of a Greek bishop; and it contains several fine Gothic churches, the chief being the Roman Catholic cathedral, with some interesting paintings and old military trophies. There are also here several schools and an hospital. Leather, linen, and woollen articles are manufactured. Pop. 8650; more than the half being Jews.

PRZIBRAM, a town of the Austrian empire, in Bohemia, on the Litawka, 35 miles S.S.W. of Prague. It is a small place, and chiefly remarkable for its mines of silver and lead, the former producing upwards of 1500 lb. annually. There are here smelting-houses and paper-works. Pop. 5638.

PSALMANAZAR, George, the fictitious name of a pretended Formosan, a person of learning and ingenuity. Born in France about 1679, he was educated in a free school, and afterwards in a college of Jesuits, in an archiepiscopal city, the name of which, as likewise those of his birth-place and his parents, are unknown. Upon leaving the college, he was recommended as a tutor to a young gentleman, but soon fell into a mean and rambling life, which involved him in disappointments and misfortunes. His first pretence was that of being a sufferer for religion. He procured a certificate that he was of Irish extraction, that he had left that country for the sake of the Catholic faith, and was going on a pilgrimage to Rome. But being unable to purchase a pilgrim's garb, and observing one in a chapel dedicated to a miraculous saint, which had been set up as a monument of gratitude by some wandering pilgrims, he contrived to take away both the staff and the cloak; and, thus accoutred, he begged his way in fluent Latin, accosting only clergymen or persons of figure, whom he found so generous and credulous that, before he had gone 20 miles, he might easily have saved money, and put himself in a much better dress. As soon as he had got what he thought sufficient, however, he begged no more, but viewed everything worth seeing, and then returned to some inn, where he spent his money as freely as he had obtained it. Having heard the Jesuits speak much of China and Japan, he started the wild scheme, when he was in Germany, of passing for a native of the island of Formosa; and what he wanted in knowledge he supplied by a pregnant invention. He formed a new character and language on grammatical principles, which, like other oriental languages, he wrote from right to left with great readiness; and he planned a new religion, and a division of the year into twenty months, with other novelties, in order to give credit to his pretensions. He now assumed the character of a Japanese convert to Christianity, travelling for instruction, with an appearance of greater wretchedness than even that of common beggars. He then entered as a soldier in the Dutch service; but, being still desirous of passing for a Japanese, he altered his plan to that of being an unconverted heathen; and at Sluys, Brigadier Lauder, a Scotch colonel, introduced him to one James, chaplain to the forces, who, with the view of recommending himself to the Bishop of London, resolved to carry him over to England. At Rotterdam, some persons having put shrewd questions to him that carried an air of scepticism, he took one more whimsical step, which was to live upon raw flesh, roots, and herbs, thinking that such strange food would remove all scruples. The Bishop of London patronized him with credulous humanity; and Psalmanazar found a large circle of friends, who extolled him as a prodigy. Yet there were some who entertained a just opinion of him, particularly Dr Halley, Dr Mead, and Dr Woodward; but their endeavours to expose him as a cheat, only made others think the better of him, especially as these gentlemen were supposed to be unfriendly to revelation. In this instance, at least, easiness of belief was no great evidence of penetration. He was employed to translate the Church Catechism into the Formosan language, which was examined, approved, and laid up as a valuable manuscript; and the author, after writing his well-known *History of Formosa*, was rewarded and sent to Oxford to study what he liked, whilst his patrons and opponents were learnedly disputing at London on the merit of his work. The learned members of the university were no better agreed in their opinions than the savans of London; but at length the sceptics triumphed. Some absurdities were discovered in his *History* of such a nature as to discredit the whole narration, and saved him the trouble of an open declaration of his imposture, which, however, he owned at length to his private friends. For the remainder of his life, his learning and ingenuity enabled him to procure a comfortable support by his pen; and he was concerned in several works of credit, particularly *The Universal History*, and *The Complete System of Geography*, 1747. He published anonymously an *Essay on Miracles*, by a Layman, which enjoyed considerable reputation. He lived irreproachably for many years, and died some time in 1763. There was printed after his death, *Memoirs of ——— ———, commonly known by the name of George Psalmanazar, a reputed native of Formosa, written by himself*, London, 1765.

PSALMODY, from the Greek ψαλμος, *the art* or *act of singing psalms*. The earliest music of the Psalms is not now known. The modern Jewish psalmody is by no means the same in all their synagogues in different countries. Psalms were sung by the primitive Christians, but there are no data to show the precise nature of the melodies. St Augustin (lib. x. Confess. cap. 33) says, "De Alexandrino Episcopo Athanasio sæpe mihi dictum commemini, qui tum modico flexu vocis faciebat sonare lectorem psalmi, ut pronuncianti vicinior esset quam canenti." St Athanasius was made bishop of Alexandria in 326. Of the Ambrosian and Gregorian chants of the fourth and sixth centuries time and change seem to have spared little more than the tonalities. In Roman Catholic church services the psalmody varies according to the particular occasion; and so also in some Protestant churches. Many of the psalm-tunes now in general use in Protestant churches were composed in the time of Luther, or not long afterwards, for the Protestant congregations which then began to spread over the European continent. Others of these tunes are the productions of various Protestant musicians in later times. Amongst the authors of these more recent tunes we find the names of some of the Bachs, of Handel, and several other eminent German composers. Psalm-tunes are for voices only, or for voices accompanied by the organ, or for voices accompanied by different instruments; others for a single voice alone, or accompanied, and so on. (G. F. G.)

PSALMS, THE BOOK OF, received its name, Ψαλμοί, in consequence of the *lyrical* character (ψάλλω, *to touch* or *strike a chord*) of the pieces of which it consists, as intended to be sung to stringed and other instruments of music. Another name, *Psalter*, was given to this book, from the Greek ψαλτήριον, the *stringed instrument* to which its contents were originally sung. The Hebrew title (*tehilim*) signifies *hymns* or *praises*, and was probably adopted on account of the use made of the collection in divine service, though only a part can be strictly called songs of praise, not a few being lamentations and prayers. In Ps. lxxii. 20, we find all the preceding compositions (Ps. i.–lxxii.) styled *prayers of David*, because many of them are strictly prayers, and all are pervaded by the spirit and tone of supplication. All the best judges, as Lowth, Herder, De Wette, Ewald, Tholuck, and others, pronounce the poetry of the Psalms to be of the *lyric* order. "They are," says De Wette (*Einleitung in die Psalmen*, p. 2), "lyric in the proper sense; for among the Hebrews, as among the ancients generally, poetry, singing, and music were united, and the inscriptions to most of the Psalms determine their connection with music, though in a way not always intelligible to us. Also as works of taste these compositions deserve to be called lyric. The essence of lyric poetry is the immediate expression of feeling; and feeling is the sphere in which most of the Psalms move. Pain, grief, fear, hope, joy, trust, gratitude, submission to God, everything that moves and elevates the heart, is expressed in these songs. Most of them are the lively effusions of the excited susceptible heart, the fresh offspring of inspiration and elevation of thought; while only a few are spiritless imitations and compilations, or unpoetic forms of prayer, temple hymns, and collections of proverbs." We shall consider in their order the *Titles* of the Psalms, their *Authors*, their *Collection and Arrangement*, and their *Canonicity and Use*.

Titles.—All the Psalms, except thirty-four, bear superscriptions. According to some, there are only twenty-five exceptions, as they reckon a title in all the Psalms which commence with it. The authority of the titles is a matter of doubt. By most of the ancient critics they were considered genuine, and of equal authority with the Psalms themselves, while most of the moderns reject them either in whole or in part. They were wholly rejected at the close of the fourth century by Theodore of Mopsuestia, one of the ablest and most judicious of ancient interpreters. They are received, on the other hand, by Tholuck and Hengstenberg in their works on the Psalms. Of the *antiquity* of the inscriptions there can be no question, for they are found in the Septuagint. They are supposed to be even much older than this version, since they were no longer intelligible to the translator, who often makes no sense of them. Their obscurity might, however, have been owing not so much to their antiquity as to the translator's residence in Egypt, and consequent ignorance of the Psalmody of the Temple service in Jerusalem. At any rate the appearance of the titles in the Sept. can only prove them to be about as ancient as the days of Ezra. Then it is argued by many that they must be as old as the Psalms themselves; for very important traces of the custom of prefixing titles to their songs by Orientals appear in Isa. xxxviii. 9, in Hab. iii. 1, and in 2 Sam. i. 17, 18 (Tholuck's *Psalmen*, p. xxiv.). In 2 Sam. xxiii. 1, and Num. xxiv. 3, there is strong proof of the usage, if, with Tholuck, we take the verses as inscriptions, and not as integral parts of the songs, which most hold them justly to be from their poetical form.

The following considerations militate against the authority of the titles:—1. The analogy between them and the subscriptions to the apostolical Epistles. The latter are now universally rejected: why not the former? 2. The Greek and Syriac versions exhibit them with great and numerous variations, often altering the Hebrew. Could such variations have arisen if the titles had been considered sacred like the Psalms themselves? 3. The inscriptions are occasionally at variance with the contents of the Psalms.

The design of these inscriptions is to specify either the author or the chief singer (never the latter by name, except in Ps. xxxix.), or the historical subject or occasion, or the use, or the style of poetry, or the instrument and style of music. Some titles simply designate the author, as in Ps. xxv., while others specify several of the above particulars, as in Ps. li. The longest and fullest title of all is prefixed to Ps. lx., where we have the author, the chief musician (not by name), the historical occasion (comp. 2 Sam. viii.), the use or design, the style of poetry, and the instrument or style of music. It is confessedly very difficult, if not impossible, to explain all the terms employed in the inscriptions; and hence critics have differed exceedingly in their conjectures.

Authors.—Many of the ancients, both Jews and Christians, maintained that all the Psalms were written by David:

which is one of the most striking proofs of their uncritical judgment. So the Talmudists (*Cod. Pesachim*, c. x., p. 117); Augustine (*De Civ. Dei*, xvii. 14); and Chrysostom (*Prol. ad Psalmos*). But Jerome held the opinion which now universally prevails (*Epist. ad Sophronium*). The titles and the contents of the Psalms most clearly show that they were composed at different and remote periods by several poets, of whom David was only the largest and most eminent contributor. According to the inscriptions, we have the following list of authors:—

1. David, "the sweet Psalmist of Israel" (2 Sam. xxiii. 1). To him are ascribed seventy-three Psalms in the Hebrew text, and at least eleven others in the Septuagint, namely, xxxiii. xliii. xci. xciv. xcix. civ. cxxxvii.; to which may be added Ps. x., as it forms part of Ps. ix. in that version. From what has been advanced above respecting the authority of the titles, it is obviously injudicious to maintain that David composed all that have his name prefixed in the Hebrew, or to suppose that he did not compose some of the eleven ascribed to him in the Septuagint, and of the others which stand without any author's name at all. Of those which the Septuagint ascribes to David, it is not improbable that Ps. xcix. and civ. are really his; and of those which bear no name in either text, at least Ps. ii. appears to be David's. David's compositions are generally distinguished by sweetness, softness, and grace; but sometimes, as in Ps. xviii., they exhibit the sublime. His prevailing strain is plaintive, owing to his multiplied and sore trials, both before and after his occupation of the throne. See Herder's *Geist der Ebr. Poesie*, ii. 297–301; and especially Tholuck (*Psalmen, Einleitung*, § 3), who gives a most admirable exhibition of the Psalmist's history and services. The example and countenance of the king naturally led others to cultivate poetry and music. Of these Psalmists the names of several are preserved in the titles.

2. Asaph is named as the author of twelve Psalms, viz., l., lxxiii.–lxxxiii. He was one of David's chief musicians. All the poems bearing his name cannot be his; for in Ps. lxxiv. lxxix. and lxxx. there are manifest allusions to very late events in the history of Israel. Either, then, the titles of these three Psalms must be wholly rejected, or the name must be here taken for the "sons of Asaph;" which is not improbable, as the family continued for many generations in the choral service of the Temple. Asaph appears from Ps. l. lxxiii. and lxxviii., to have been the greatest master of didactic poetry, excellent alike in sentiment and in diction.

3. The sons of Korah was another family of choristers, to whom eleven of the most beautiful Psalms are ascribed. However, in Ps. lxxxviii. we find, besides the family designation, the name of the individual who wrote it.

4. Heman was another of David's chief singers (1 Chron. xv. 19). He is called the Ezrahite, as being descended from some Ezrah, who appears to have been a descendant of Korah; at least Heman is reckoned a Kohathite (1 Chron. vi. 33–38), and was therefore probably a Korahite; for the Kohathites were continued and counted in the line of Korah.

5. Ethan is reputed the author of Ps. lxxxix. The Ethan intended in the title is doubtless the Levite of Merari's family whom David made chief musician along with Asaph and Heman (1 Chron. vi. 44; xxv. 1, 6). The Psalm could not, however, be composed by him, for it plainly alludes (ver. 38–44) to the downfall of the kingdom.

6. Solomon is given as the author of Ps. lxxii. and cxxvii., and there is no decided internal evidence to the contrary, though most consider him to be the subject, and not the author, of Ps. lxxii.

7. Moses is reputed the writer of Ps. xc., and there is no strong reason to doubt the tradition. But the Talmudists, whom Origen, and even Jerome, follow, ascribe to him also the ten succeeding Psalms (xci.–c.), on the principle that the anonymous productions belonged to the last-named author. This principle is manifestly false, since in several of these Psalms we find evidence that Moses was not the author. In Ps. xcv. the forty years' wandering in the wilderness is referred to as past; in Ps. xcvii. 8, mention is made of Zion and Judah, which proves that it cannot be dated earlier than the time of David; and in Ps. xcix. 6, the prophet Samuel is named, which also proves that Moses could not be the writer.

The dates of the Psalms, as must be obvious from what has been stated respecting the authors, are very various, ranging from the time of Moses to that of the Captivity—a period of nearly 1000 years. In the time of King Jehoshaphat (about B.C. 896), Ps. lxxxiii., setting forth the dangers of the nation, as we read in 2 Chron. xx. 1–25, was composed either by himself, as some suppose, or most likely, according to the title, by Jahaziel, "a Levite of the sons of Asaph," who was then an inspired teacher (see 2 Chron. xx. 14). In the days of Hezekiah, who was himself a poet (Isa. xxxviii. 9–20), we may date with great probability the Korahitic Psalms xlvi. and xlviii., which seem to celebrate the deliverance from Sennacherib (2 Kings xix. 35). In the period of the Captivity were evidently written such laments as Ps. xliv. lxxix. cii. and cxxxvii.; and after its close, when the captives returned, we must manifestly date Ps. lxxxv. and cxxvi.

Collection and Arrangement.—As the Psalms are productions of different authors in different ages, we are led to inquire how and when they were collected. The truth seems to be, as Ewald and Tholuck maintain, that the collection was made not so much with reference to the beauty of the pieces as to their adaptation for devotional use in public worship. When the Psalms were collected, and by whom, are questions that cannot be confidently answered. It is certain that the book, as it now stands, could not have been formed before the building of the second temple, for Ps. cxxvi. was evidently composed at that period. In all probability it was formed by Ezra and his contemporaries, about B.C. 450 (Ewald's *Poet. Bücher*, ii. 205). But in the arrangement of the book there is manifest proof of its gradual formation out of several smaller collections, each ending with a kind of doxology. The Psalter is divided in the Hebrew into five books, and also in the Septuagint version, which proves the division to be older than B.C. 200. The *first* book includes i.–xli.; the *second*, xlii.–lxxii.; the *third*, lxxiii.–lxxxix.; the *fourth*, xc.–cvi.; and the *fifth*, cvii.–cl. These five books may, with some propriety, be thus distinguished:—The first *Davidic*, the second *Korahitic*, the third *Asaphitic*, and the two remaining *Liturgic*.

Various classifications of the Psalms have been proposed (Carpzov, *Introductio*, &c., ii. 132–134). Tholuck would divide them, according to the matter, into songs of praise, of thanksgiving, of complaint, and of instruction. De Wette suggests another method (*Einleitung*, p. 3), into—1. Hymns, as viii. xviii.; 2. National Psalms, as lxxviii. cv.; 3. Psalms of Zion and the Temple, as xv. xxiv.; 4. Psalms respecting the king, as ii. cx.; 5. Psalms of complaint, as vii. xxii.; and 6. Religious Psalms, as xxiii. xci. It is obvious, however, that no very accurate classification can be made, since many are of diversified contents and uncertain tenor.

Canonicity and Use.—The inspiration and canonical authority of the Psalms are established by the most abundant and convincing evidence; and no other writing is so frequently cited in the Scriptures. In every age of the church the Psalms have been extolled for their excellence and their use for pious purposes (Carpzov, *l. c.*, pp. 109–116). Among the early Christians it was customary to learn the book by heart, that psalmody might enliven their social hours, and soften the fatigues and soothe the sorrows of life. They employed the Psalms not only in their religious assemblies, but also at their meals and before retiring to rest.

It may be well here to notice what are called the vindictive Psalms, namely, those which contain expressions of wrath and imprecations against the enemies of God and his people, such as Ps. lix. lxix. lxxix., and which in consequence are apt to shock the feelings of some Christian readers. In order to obviate this offence, most of our pious commentators insist that the expressions are not maledictions or imprecations, but simple declarations of what will or may take place. But this is utterly inadmissible; for in several of the most startling passages the language in the original is plainly imperative, and not indicative. (See Ps. lix. 14; lxix. 25, 28; lxxix. 6.) The truth is, that in reality they are not opposed to the spirit of the gospel, or to that love of enemies which Christ enjoined. Resentment against evil-doers is so far from being sinful, that we find it exemplified in Christ himself. (See Mark iii. 5.) If the emotion and its utterance were essentially sinful, how could Paul (1 Cor. xvi. 22) wish the enemy of Christ to be accursed, or say of his own enemy, Alexander the coppersmith, "the Lord reward him according to his works" (2 Tim. iv. 14); and, especially, how could the spirits of the just in heaven call on God for vengeance (Rev. vi. 10)? See a good article on this subject ("The Imprecations in the Scriptures") in the American *Bibliotheca Sacra* for February 1844.

The following are among the chief exegetical aids for explaining this book:—Poli *Synopsis;* Venema, *Comment. in Psalmos;* De Wette's *Commentar über die Psalmen*, 1836; Rosenmülleri *Scholia in Epit. Redacta*, vol. iii.; Maureri *Comment. Crit. Grammaticus*, vol. iii.; Hitzig's *Comment. und Uebersetzung;* Ewald's *Poet. Bücher*, vol. ii.; Tholuck's *Uebersetzung und Auslegung der Psalmen;* and Hengstenberg's *Commentar ueber die Psalmen.* The last two are excellent.

The principal English works on the Book of Psalms are the translations (mostly with notes) of Mudge, 1744; Edwards, 1755; Fenwick, 1759; Green, 1762; Street, 1790; Wake, 1793; Geddes, 1807; Horsley, 1815; Fry, 1819; French and Skinner, 1830; Noyes, 1831 (Boston, U.S.); Walford, 1837; Bush, 1838 (New York); and numerous commentaries. An excellent work is, Rev. John Jebb, *A Literal Translation of the Book of Psalms, with Dissertations*, Lond. 1846. There is also a tolerably well executed translation into English verse, by E. A. Bowring, Lond. 1858.

PSAMMITICHUS, a renowned sovereign of Egypt, who flourished B.C. 664. (See EGYPT.)

PSELLUS, MICHAEL CONSTANTINUS, a learned Christian of the eleventh century, was by birth a Constantinopolitan of consular rank, and flourished under the Emperor Constantine Monomachus, 1020 A.D. His genius and industry raised him far above the level of his contemporaries; and the celebrated historian Anna Comnena speaks of him as one who had been more indebted for his attainments to his own excellent talents than to the instructions of his preceptors; adding, that having made himself master of all the wisdom of the Greeks and the Chaldæans, he was justly esteemed the most learned man of the age. Thus furnished, he became the chief instructor of the Constantinopolitan youth. He was at the same time the companion and preceptor of the emperor, who became so captivated by the studies and amusements in which Psellus engaged him, that, according to Zonaras, he neglected the concerns of the empire. The Byzantine historians complain, that the emperor, deluded by "the Prince of the Philosophers," the title with which Psellus was honoured, lost the world. Towards the close of his life, Psellus, meeting with some disappointment, retired into a monastery, and soon afterwards died; but the time of his death is uncertain. He was not only the most accomplished scholar, he was likewise the most voluminous writer of his age. He published a great variety of works, both prose and poetical, written with a high degree of eloquence and taste. Besides his *Synopsis Organi Aristotelici*, 8vo, 1597, and his mathematical works; there are sixteen other works which have been printed separately. There are likewise numerous writings of this author still inedited. (For an account of those writings, see Fabricius, and Cave.)

PSEUDO (ψεῦδος, *a falsehood*), is used in the composition of many words to denote *false* or *spurious.*

PSEUDONYMOUS, amongst critics, is an author who publishes a book under a false or feigned name; as *cryptonymous* is given to him who publishes one under a disguised name, and *anonymous* to him who publishes without any name at all.

PSKOV (Germ. *Pleskau*), a government of European Russia, bounded on the N. by that of St Petersburg, N.E. by that of Novgorod, E. by that of Iver, S.E. by that of Smolensk, S. and S.W. by that of Vitebsk, and W. by that of Livonia: length, from N.W. to S.E., 202 miles; greatest breadth, 140; area, 17,705 square miles. The surface is low and very nearly level, having only a gradual slope from the Valdai Hills, in the S.E. of the government, towards the N. and W. Most of the rivers flow in a northeasterly direction, the principal exception being the Düna, which flowing S.W., forms the boundary between this government and that of Smolensk. Though numerous, the rivers are all of small size; the principal being the Velikaia Pskova, Lovat, and Schelon, which are navigable for flat-bottomed boats. The latter two rivers flow into Lake Ilmen in Novgorod, the former two into Lake Pskov, at the N.E. extremity of the government; all discharging their waters finally into the Gulf of Finland. The principal lake is that already mentioned, communicating by a strait with that of Peipus. A great part of the country is occupied with marshes, and the soil is generally of inferior quality; but by dint of careful cultivation and manuring, it is made to produce more corn than the wants of the inhabitants require. The quantity of arable land in the government in 1849 was 3,462,151 acres; of meadow land, 522,425 acres; of wood, 5,760,156 acres; and of waste land, 1,183,105 acres. Wheat is little grown; the chief crops being rye, oats, barley, pulse, &c. Hemp and flax are also raised. In 1849, 15,584,447 bushels of corn and 1,594,839 bushels of potatoes were produced in Pskov. In the same year the government contained 144,720 horses; 226,960 horned cattle; 112,945 sheep; 122,890 swine; and 5460 goats. Game and various other wild animals are found in the forests, and the rivers abound in fish. No minerals of any importance are found in the country; but timber, especially pine, is obtained from the forests. The people are chiefly engaged in agriculture, and manufactures are not extensively carried on. Of these there were in 1849, 112, employing 4057 hands; the most important being the tanneries, 41 in number. Corn, timber, hemp, flax, hides, &c., are exported; while colonial and other produce is imported. The majority of the people are of Russian origin, and belong to the Greek Church; but there are also a few Roman Catholics, Protestants, and Mohammedans. The government contained in 1854 thirty village schools, with 806 pupils. Pop. (1851) 657,283.

PSKOV, the capital of the above government, on the left bank of the Velikaia, about 5 miles above its mouth in Lake Pskov, and 165 S.W. of St Petersburg. In the centre stands the Kremlin or citadel, inclosed by a wall; the middle town, also walled, surrounds this in a semicircular form, beyond which is the great town; the whole being inclosed by a wall 5 miles in circuit. The houses and many of the public edifices are built of wood. Some of the latter are splendid buildings, such as the cathedral and the palace of the archbishop, formerly that of the princes of Pskov. The churches are numerous; and there are also a gymnasium, several other schools, an orphan hospital, and three convents. The manufacture of leather is actively carried on; glass, linen, and sail-cloth are also made. Large markets are held here annually, and there is much trade in the produce of the country. Pskov was in the middle ages an independent town, and carried on a very extensive trade with the Hanse towns. Though much inferior now to its ancient greatness, it is still a large and important place. Pop. 10,842.

PSYCHE (Ψυχή, *breath, the soul*) is represented in later antiquity as the personification of the human soul, and about whom Apuleius (*Met.* iv. 28, &c.) has the following beautiful allegory:—Psyche, the youngest of the three daughters of a king, having aroused by her beauty the jealousy and envy of Venus, that goddess ordered Amor or Cupid to inspire her with a love for the most contemptible of mortals. Amor had no sooner beheld this matchless beauty than he became suddenly enamoured of her. He bore her to some charming spot, where he unseen and unknown visited her every night, and left her when the day began to dawn. Her sisters persuaded her that she embraced some hideous monster under the darkness of the night. To satisfy her curiosity, she arose with a lighted lamp, and beheld to her inexpressible delight the most handsome and lovely of the gods. In her bewilderment of joy and fear, she gazed on him as he slept, when a drop of hot oil fell from her lamp upon his breast. Amor awoke, censured Psyche for her mistrust, and immediately vanished. Her peace was now gone; she attempted in vain to throw herself into a river; she wandered about inquiring for her beloved; when she arrived at the palace of Venus. The goddess retained her as a slave, and imposed upon her the hardest tasks. Amor, who still secretly loved her, brought her invisible comfort and assistance, till Venus, overcome by the gentle obedience and silent attention of the fair slave, granted her immortality, and she became united with Amor for ever.

In this lovely story one can recognise in the misfortunes of Psyche the purification of the soul by suffering and trial before entering upon true and lasting happiness. Psyche is represented by artists as a maiden with the wings of a butterfly. Lafontaine has wrought her story into a pastoral, and Mrs Tighe into a poem. (See vol. li. of Bohn's "Classical Library.")

PSYCHOLOGY. See Metaphysics.

PTOLEMÆUS, Claudius, a great astronomer and geographer. (See Astronomy, and Geography.)

PTOLEMIES, The. See Egypt.

PUBLICOLA was the surname given to Publius Valerius, an old Roman consul. The character of this famous man, as portrayed by Livy and Plutarch, is that of a magnanimous patriot. He was one of those who witnessed the suicide of the ill-fated Lucretia, and who swore over the reeking dagger to avenge the outraged matron. Nor was his oath carelessly performed. He bore a chief part in expelling the Tarquins, and both in his private capacity and after he was elected one of the consuls, he foiled the attempts of the detested family to regain the Roman crown. His zeal became still more disinterested when the death of his colleague, Junius Brutus, left him for some time alone in the consulship. Hearing that the citizens began to be suspicious lest he should suddenly change into a despot, he at once adopted the most decisive measures to disabuse them of this notion. A palatial edifice which he had reared on the Velian Hill was forthwith demolished in a night. The fasces, the insignia of power which were carried before him, were ordered to be henceforth lowered whenever he came into the presence of the people. The most decided and stringent laws were instituted to protect the liberties of the citizens. Among other decrees, it was enacted that every convict should have the right of appeal from the consuls to the people, and that whoever should attempt to set himself up for a king might be slain by any man at any time. For these services Publius Valerius was raised to the very highest place of honour in the state. The surname of *Publicola* ("friend of the people") was conferred upon him and his descendants for ever. He was thrice re-elected to the consulship. On the last of these occasions he had the honour of leading a successful attack against the Sabines, and of entering the city in triumph. The popular favour continued with him to the last; and on his death in 503 B.C., he was buried at the public expense, and lamented by the Roman matrons for ten months.

PUBLIUS Syrus, a celebrated writer of mimes, flourished at Rome about B.C. 42. He was of Syrian extraction, as his name implies, and was brought to Rome as a slave; but his talents having excited the admiration of his master, he received his freedom, and assumed the name of Publius. His farces were much admired, and Julius Cæsar is said to have considered them as superior even to those of Laberius. He interspersed them with moral sentences, many of which have been preserved by later writers. St Jerome states that a collection of these moral sentences was made, and that the Romans employed them as a school-book. They have been collected from various sources, and published several times, along with Seneca or Phædrus; and they have also occasionally appeared separately. The best editions are those of J. C. Orellius, Leipsic, 1822; and of Bothe, in his *Poetarum Latin. Scenic. Fragmenta*, vol. ii., p. 219, 8vo, Leip. 1834.

PUCHBUDRA, a town of British India, in the Rajpoot state of Jodhpoor, in a rich but little cultivated region, 60 miles S.W. of Jodhpore. In the vicinity there are extensive and rich salt marshes, which yield a considerable revenue to the maharaja of Jodhpoor. Coarse cloth is also made here. Pop. 5000.

PUEBLA. See Mexico.

Puebla de Don Fadrique, a town of Spain, in the province of Granada, at the foot of Mount Calar, 77 miles N.E. of Granada. It has a town-hall, several churches and schools, and an hospital. Linen and woollen fabrics are woven here, and there is a considerable trade in timber. Pop. 6555.

Puebla de Montalvan, a town of Spain, in the province of Toledo, in a rich and beautiful country on the Tagus, 17 miles W. of Toledo. It is remarkable for its noble and splendidly-ornamented churches, hospital, and convent. Here is also a palace of the dukes of Uceda. The town has oil and flour mills; and an annual fair is held. Six miles off is the old castle of Montalvan, picturesquely situated in a ravine. Pop. 4332.

PUENTE GENIL, a town of Spain, in the province of Cordova, on the Genil, 27 miles S. of Cordova. Woollen cloth, oil, and earthenware are manufactured here. Pop. 6400.

PUERTO-DE-SANTA-MARIA, commonly called *El Puerto* ("The Port"), a town of Spain, Andalucia, in the province and 7 miles N.E. of Cadiz, near the mouth and on the right bank of the Guadalete, which is crossed by a suspension-bridge. It is a pleasant and well-built though somewhat dull town, in a fertile country; and its houses resemble these of Cadiz, though they are often larger, and profusedly decorated with painting. The principal street, called the Calle Larga, about a mile long, is handsome and well paved, which cannot be said of the other thoroughfares. There are several beautiful public walks shaded with trees; that called La Victoria being the finest. The places of public amusement include a theatre and a ring for bull-fights; the scene of one given in honour of Wellington, and described by Byron. Puerto is chiefly important as a place of exportation of wine. The *bodegas*, or wine stores, are large and lofty buildings, with thick walls and narrow windows; but they are not on such a large scale as those of Xeres. The people are employed to a large extent in farming. So excellent is the water of this place, that most of the drinking-water of Cadiz is conveyed from hence. The harbour of Puerto is formed by the river, but its mouth is obstructed by a dangerous bar. Steamers ply between this port and Cadiz. Timber and iron are the chief imports of the town. Pop. 17,930.

Puerto Cabello, a town of Venezuela, in the province of Carabobo, on a small island connected with the mainland by a bridge, 20 miles N.W. of Valencia. It is well built but unhealthy, has an excellent harbour, and a flourishing commerce. Pop. 7500.

Puerto Llano, a town of Spain, in the province and 20 miles S.S.W. of Ciudad Real. It has manufactures of lace, pottery, flour, &c. Near it there are mineral baths. Pop. 5000.

Puerto Principe, a town of Cuba, capital of a jurisdiction of the same name, stands in the interior of the island, 36 miles W.S.W. of its port, Las Nuevitas, with which it is connected by a railway. It was formerly the seat of the supreme court of justice for the island, but this is now at Havana. A considerable trade is carried on through the port, sugar and tobacco being the chief exports. Pop. of the jurisdiction (1854) 46,532; of the town, 26,648.

PUFFENDORF, Samuel, a distinguished juridical writer and historian, was born in 1632 at Chemnitz, a small town in Saxony, where his father, Elias Puffendorf, was a Lutheran clergyman. He received his elementary education from his father, and studied the humanities at the school of Grimma, theology at Leipsic, and philosophy under Erhard Weigel at Jena. The teaching of Weigel was then exciting considerable attention in Germany, and Puffendorf seems to have eagerly availed himself of his instructions. It was here he seems to have first applied himself to the study of the law of nature on which he was destined to become an eminent writer. Full of the philosophy of Descartes, of the jurisprudence of Grotius, and of the rigorous method of Weigel, he offered his services to his country. His brother Isaac, who was employed by Oxenstierna in lucrative and confidential offices under the government of Sweden, prevailed upon him to seek his fortune in foreign diplomacy; and with that intent he became tutor to the son of the Swedish ambassador at Copenhagen. He had hardly joined the legation when a rupture occurring between the governments of Denmark and Sweden, the embassy was detained as prisoners for eight months in the Danish capital. Puffendorf employed his leisure in reducing to writing, with occasional reflections of his own, the principles of general law contained in the works of Grotius, Hobbes, and other writers of that class. He published this work shortly afterwards, on visiting Holland, with the title of *Elementa Jurisprudentiæ Universalis*, 1660. This crabbed yet original work was dedicated to the elector-palatine Charles Louis, which laid the foundation, perhaps more than the substantial merits of his book would warrant, of the subsequent fortunes of the author. In the university of Heidelberg, which had been gradually falling into decay, Charles Louis founded a professorship of the law of nature and of nations, and chose Puffendorf to fill the chair. He had no sooner opened his course in 1661 than the class-room was crowded with eager listeners to the new professor of law. Flattered by this encouragement, he pursued his juridical studies with unabated zeal; and shortly afterwards published anonymously, at Geneva, *Severini de Mozambano, De Statu Imperii Germanici*. This book exhibited in somewhat strong colours the absurdities and incongruities of that strange compound called the Germanic empire, urging at the same time certain practical remedies for the grievous abuses which had grown up under it. The work created great excitement throughout Europe, and particularly in Austria, where it was put upon the *Index Expurgatorius*, and the executioner was ordered to burn it. Puffendorf defended the work without daring to declare himself the author. The work was printed again and again, and translated into almost all the languages of modern Europe. Meanwhile Puffendorf found his position so uncomfortable that, to avert the possible consequences of the stir, he was glad to accept in 1670, from Charles XI. of Sweden, the chair of the law of nations at the university of Lund, then recently founded. He had hardly occupied his new position two years, when the great work on which his reputation now chiefly rests made its appearance. It bore the title *De Jure Naturæ et Gentium*. It was much more scientifically constructed than the *De Jure Belli et Pacis* of Grotius. Puffendorf, though without the genius or learning of his master, commences with the law of nature, discusses the subject as applied to individuals, and finally investigates the numerous complicated questions which emerge in the intercourse of nations. The new views contained in the work were virulently assailed by some of his contemporaries, and as enthusiastically admired by others, while the tide of his reputation steadily arose until it flooded over Europe. A few years afterwards he removed to Stockholm at the request of the King of Sweden, who appointed him his historiographer, and bestowed upon him the title of Counsellor of State. In this official capacity he published *Commentarii de rebus Suecicis ab expeditione Gustavi Adolphi usque ad abdicationem Christianæ*, Utrecht, 1686. The theme was promising, but Puffendorf was more familiar with the law of nations than he was with the rich details of their history. The work had gained the favour, however, of Frederic William, Elector of Brandenburg; for in 1688 he invited him to Berlin, and, with the consent of the King of Sweden, employed him to write the history of his life and reign. He was again made counsellor of state, and what was more to the purpose, he received an annual pension of 2000 crowns. Accordingly, there appeared in due time *Commentarii de Rebus Gestis Frederici Wilelmi Magni, Electoris Brandenburgici*; and we hope the Elector of Brandenburg received the performance with great enthusiasm, for it has to be recorded that nobody else did. His engagement at Berlin being merely temporary, he purposed returning to Stockholm; but as the King of Sweden had raised him to the dignity of a baron while resident at Berlin, and the climate being less severe in the southern metropolis, Puffendorf preferred postponing his journey northward. He died at Berlin on the 26th October 1694.

Puffendorf's works, which were somewhat voluminous, will be found in a detailed list appended to his Life in the *Biographie Universelle*.

PUGET, Pierre, a celebrated sculptor, architect, painter, and ship-builder, was born at Marseilles on the 31st October 1622. His genius developed itself under very unfavourable circumstances. He had little artistic education and few facilities for artistic study; yet his own innate bias forced him on towards excellence. Every opportunity, however unfavourable, was seized for giving embodiment to those great ideas that began to rise vaguely before his boyish mind. Design in any of its branches, and on any occasion, was ardently practised by the precocious youth. When a mere lad of sixteen, he was superintending the building of a galley in the dockyards of his native city. At the age of eighteen he was gaining a livelihood in Florence by carving in wood. A year had not elapsed before he was found in Rome the favourite pupil of the famous painter Pietro de Cortona. He then returned home at the age of twenty-one, ready to practise in any department of art that might suit his purpose. The established reputation of Puget now secured for him a series of commissions. The building of a most magnificent vessel, named La Reine in honour of Anne of Austria, was entrusted to his superintendence. No sooner had that been completed in 1646 than he was despatched to Rome to make drawings of the most celebrated monuments of antiquity. Six years were spent in this employment, and he then came back to France to undertake the painting of several pictures. His pencil was plied vigorously, until the towns of Marseilles, Aix, Toulon, Cuers, and Ciotat, were embellished with his productions, and his health gave way under the continued toil. Puget, thus compelled to change his vocation, turned his attention to sculpture and architecture. In no long time he began to take a prominent place in the profession. His own native genius, in spite of an imperfect education, led him to discover the secrets of his art. The edifices which he erected at Marseilles and Toulon were remarkable for the boldness, the originality, and the grandeur of their architecture. The statues which he set up at Genoa and other places were unrivalled for their rough vigour and intense expression. Especially did the colossal group of Milo excite the admiration of his contemporaries. While it was still unfinished, intelligence reached the French court about the figure, instinct with the throes of pain and baffled strength, which was gradually coming out from the dull, formless marble in a quiet studio at Toulon. King Louis XIV. issued orders that it should be conveyed to Versailles as soon as it was completed. A chest containing it arrived at the palace in the spring of 1683, and the court gathered round to see it produced. "Ah, poor man!" exclaimed the queen Maria Theresa, as she saw the agonized face of the statue appear. This cry of pity brought the reputation of Puget to a climax. From that time till the time when he died at Marseilles in 1694, he was recognised by his sovereign and countrymen as the greatest sculptor in Europe.

PUGHE, William Owen, an eminent Welsh scholar, was born in the parish of Llanfihangel-y-Pennant in Merionethshire in 1759. All his energies from an early period were devoted to the advancement of his native language. On removing to London at the age of seventeen, he began a series of exertions for preserving and illustrating the ancient Welsh literature. He assisted Owen Jones in editing the poems of Dafydd-ap-Gwilym and of Llywarch Hen, and in compiling the *Myvyrian Archæology of Wales*. At the same time he was producing several works on his own account. His great work, *The Welsh and English Dictionary*, appeared in 1793–1803; and his *Cambrian Biography*, in 1803. Scarcely less indefatigable were his labours in behalf of his mother-tongue, after he had succeeded in 1806 to a considerable estate near Denbigh. He wrote Welsh translations of Milton's *Paradise Lost*, Heber's *Palestine*, and other English poems. He was preparing for the press a treatise on *The Ancient Romances of Britain*, when he died in 1835 at Dolyddy-Cay, a house at the foot of Cader Idris.

PUGIN, Augustus, was an eminent architectural draughtsman who was born in France in 1769, and came over to London to practise his profession. The principal part of his attention was directed to the illustration of the architecture of the middle ages. He published *Specimens of Gothic Architecture selected from various Ancient Edifices in England* in 1821–23; and *Specimens of the Architectural Antiquities of Normandy* in 1825–28. He was also in 1831, the year before his death, assisting his son in producing a work entitled *Gothic Ornaments selected from various Buildings in England and France.*

Pugin, *Augustin Welby Northmore*, the son of the preceding, was born in 1811, and learned the profession of architectural draughtsman under his father. It was not long before he resolved to devote his time to the archæological study of style and symbolism in ornaments. Settling down at Ramsgate in 1833, he carried his resolution into practice both with pen and pencil. *Designs for Gothic Furniture in the style of the Fifteenth Century*, and *Designs for Iron and Brass Work in the Style of the Sixteenth and Seventeenth Centuries*, were published in 1835. *Designs for Gold and Silver Ornaments*, and *Ancient Timber Houses*, were produced in 1836. There followed soon afterwards an arrogant tract entitled *Contrasts, or a Parallel between Ancient and Modern Architecture*. His zeal increased when he had become a member of the Roman Catholic Church. All his energies from that time were devoted to the promotion of that magnificent style of architecture which has been identified with the Popish worship. Numerous churches, chapels, convents, and schools were erected under his superintendence throughout the country to shame the degenerate taste of the age. Especially did he concentrate all his powers upon rearing a model fabric at his own expense at Ramsgate. Nor did he neglect to advocate his views by plain statements. He published *The Principles of Christian or Pointed Architecture*, 1841; *An Apology for the Revival of Christian Architecture*, 1843; *A Glossary of Ecclesiastical Ornament*, 1844; and *A Treatise on Chancel Screens and Rood Lofts*, 1851. In fact, so much and so constantly did the one prevalent idea engage and harass his mind, that his brain became distracted, and he had only been brought back from a lunatic asylum when he died, on the 14th September 1852

PUGNANI, Gaetano, the founder of a celebrated violin-school, was born at Turin in 1727, and became a pupil of Somis, who had studied under Vivaldi and Corelli. Pugnani afterwards took lessons from Tartini, and when twenty-five years old, was appointed first violin of the King of Sardinia's chapel, and director of his concerts. In 1754 he visited Paris, and performed there in public with brilliant success. He was received with great applause in several other European capitals, and remained a considerable time in London, returning to Turin and settling there in 1770. Being made director of the orchestra of the king's theatre, he opened a violin school which sent forth several great artists, the most distinguished of these being the famous Viotti. Besides being a great violinist, possessing a fine tone, a grand and impassioned style, and perfect skill in all the artifices of bowing, Pugnani was remarkable for his talent of conducting an orchestra, a rare talent which he imparted to several of his pupils. He was an excellent composer for stringed instruments, in a bold and original style. Many of his compositions remain in manuscript. One of his nine Violin-Concertos was published at Paris; and there also he published four books of Violin Sonatas, two books of Violin Duets, and three books of Trios for two violins and bass, Paris and London. Six Quartets for two violins, viola, and bass, London. Twelve Symphonies for two violins, viola, bass, two oboes, and two horns, London. Two books of Quintets for two violins, two flutes, and bass, London. He composed the music of nine operas for the theatre. The French invasion of Italy caused him the loss of his offices and income. He died at Turin in 1803. In 1818 the writer of this article saw a portrait of Pugnani in the Gallery of the Liceo at Bologna. The countenance was full of energy and intelligence; but his nose (resembling the exaggerated beak of an eagle), was much too large to be handsome, and gave a ludicrous air of caricature to the portrait. However, Signor Felice

Radicati, violin-master in the Liceo, said that the picture was really a faithful likeness. (G. F. G.)

PULCI, Luigi, a celebrated Italian poet, was born in Florence in 1431. His talents were fostered and developed under very favourable circumstances. A comfortable office in the Florentine republic was held by him. Lucrezia, the mother of Lorenzo de Medici, encouraged him in the cultivation of poetry. Lorenzo himself kept a place for him in that brilliant company who were wont to display the bright coruscations of their wit and genius at his hospitable table. It was under this propitious patronage that Pulci thought of composing an epic poem. Choosing for his subject one of the legends regarding Charlemagne and his paladins, he commenced to treat it on a novel plan. The prevalent custom of narrating the most ridiculous fables with imperturbable gravity, and in pompous mediæval Latin, was repudiated. The ways and manners of ordinary life were introduced into the mysterious regions of romance. He looked upon the marvels there with familiar eye. He described them with the plain colloquial language of Tuscany, and in easy gossiping verse. Nor was his artistic treatment less guided by common sense. Whenever he alighted upon incidents that were natural and impressive, he warmed into earnestness and emotion. Whenever he fell back again upon the absurd exaggerations of the fable, he relapsed into his usual strain of banter and burlesque. The hero Orlando passed across the stage, and was pointed out as the model of a true and chivalrous knight. The villain Gano appeared, and was held up as an object of reprehension and righteous indignation. In this manner the *Morgante Maggiore* (deriving its name from one of its characters, the giant Morgante) was composed, and appeared before the public in 1481. After the author's death, in 1487, it continued to pass through several editions; and its character and merits were for a long time a subject of dispute. It still holds a place among the Italian classics. Luigi Pulci was also the author of a collection of satirical sonnets, and of several other poems.

PULGAR, Fernando del, an eminent Spanish historian, was born at Madrid in the first half of the fifteenth century. Making a fair start, he advanced through life a successful courtier, and a favourite of several successive sovereigns. John II. made him one of his pages. Henry IV. gave him several honourable posts. Isabella brought his preferment to a climax by keeping him near her person as her counsellor, secretary, chronicler, and confidential correspondent. It was in this favourable position that Pulgar set himself to describe the events and men of his time. His annals of the reign of Isabella rose to no great degree of excellence. The former part of this work, ending with the events of 1482, is not trustworthy. The latter part, bringing the narratives down to 1490, abandons the easy, picturesque style of a chronicle, to imitate the ancient histories in their lofty speeches and profound philosophical reflections. Much more able was his other work, *Claros Varones de Castilla*, or lives of forty-six of the most celebrated men of his own age. Catching the spirit of the great classical biographers, he described the knights and gentlemen of Castile with great force and effect. His conception of their characters was earnestly appreciative, his moral reflections were elevated in tone, and his style was dignified and elegant. Pulgar had died about the close of the fifteenth century, before these two productions were published. The *Claros Varones* appeared along with thirty-two of his letters, in 4to, 1500; and the History was first printed in 1565, under the name of Antonio de Lebrija. The best edition of the latter work is that published at Valencia, fol., 1780. One of the best editions of the former is that of Madrid, 4to, 1775. (See Ticknor's *Sp. Lit.*)

PULPIT (Lat. *pulpitum*), is a word which has undergone a great change of meaning. It is now an elevated place in a church in which the preacher stands. Originally it signified that part of the Roman stage on which the actors performed their parts. The French *Pupitre* signifies a reading-desk; while *Chaire* (Καθέδρα) corresponds with the English pulpit.

PULSE, is the alternate contraction and dilatation of the heart and arteries. As the beats of the arteries correspond with the motions of the heart, we can determine from the pulsation of the arteries the state of the circulation, which is highly valuable in many forms of disease. When in a healthy state the pulse beats about 72 times in a minute, or it ranges from 60 to 80 times. It is quicker in women than in men; and it is quicker in the sanguine than in the melancholic temperament, in youth than in age. The pulse of an infant is from 130 to 140; and during the first year it averages from 108 to 120. In feverish complaints it ranges from 100 upwards to 120, 168, and even becomes innumerable. The radial artery is usually chosen for ascertaining the state of the circulation, where it is conveniently seated in the wrist. When this cannot be reached, the temporal artery, at the corner of the lower jaw, may be tried.

PULTENEY, William, Earl of Bath, an eminent politician, was descended from a good family, and was born in 1682. After spending his years of education at Westminster School, and at Christ Church, Oxford, he travelled for some time on the Continent, and on his return was sent to Parliament by Henry Guy, Esq., formerly secretary to the Treasury, as representative of the borough of Hedon in Yorkshire. Guy subsequently left him a legacy of L.40,000, and landed property to the value of L.500 a year. Pulteney had a good estate of his own, and this legacy, together with a large portion brought him by his wife, Anna Maria, daughter of John Gumley, Esq. of Isleworth, enabled him in after life to perform numerous acts of charity and benevolence. On his entry into the House of Commons, he attached himself to the Whig party, and continued to represent Hedon throughout the entire reign of Queen Anne. He made his maiden speech on the "Place Bill;" he distinguished himself on the prosecution of Dr Sacheverell; and, in a word, rendered himself so obnoxious to the Tories, that when they came into power in 1710, they are said to have been avenged on the youthful orator by removing his uncle, John Pulteney, Esq., from the Board of Trade. During the latter years of the Queen's reign he had a principal share in the debates, and in 1712, on the prosecution of Walpole, he defended him in an elegant oration.

When George I. came to the throne, Pulteney was made secretary-at-war, an office which he held till 1717, when Walpole resigned. He was subsequently, in 1720, promoted to the valuable sinecure of cofferer of the household; but in 1725, after a disagreeable quarrel with his friend Sir Robert Walpole, he threw himself into the ranks of the opposition, was dismissed from his office of cofferer, and became so obnoxious to the King, that in 1731 his Majesty called for the council-book, and with his own hand struck out his name from the list of privy-councillors. This proceeding served to inflame his resentment and to increase his popularity; and he continued his attacks upon Walpole with a severity of eloquence and sarcasm which nothing could withstand. Nor did he confine his opposition to his speeches in Parliament: out of doors he assisted Bolingbroke in his paper called the *Craftsman*, and in numerous pamphlets he held up the minister and his friends to the scorn and reprobation of the nation. His shining qualities as a debater, the hot patriotism with which he spiced his harangues as leader of the opposition, lifted him to the height of public esteem, and rendered him the most popular man in the country. Meanwhile Walpole was at last overthrown, February 1742, and the entire authority seemed for a moment to lie at the feet of Pulteney. But Walpole secretly influenced his Majesty in his negotiations with his rival; the composition of the new cabinet disappointed the expectations both of his immediate partisans and of the public; suspicion and a sense of injury done to the cause burst into a perfect storm of popular indignation; when Pulteney, under cover of the smoke thus raised, walked into the House of Lords as Earl of Bath—shrunk, in short, as Chesterfield phrased it, "into insignificance and an earldom." In February 1746, on the resignation of the Pelham ministry, he held the premiership for two days, but was constrained to retire, as no persons of weight would join him. In 1760 he published *A Letter to Two Great Men* (Pitt and the Duke of Newcastle), recommending proper articles to be insisted on in a treaty of peace. It was published anonymously, was greatly applauded, and went through several impressions. He died in 1764; and as his only son had died before him, the title became extinct.

PULTUSK, a town of European Russia, in the kingdom of Poland and government of Plock, on the Narew, 32 miles N.N.E. of Warsaw. It has an episcopal palace, cathedral, and other churches; a nunnery, school, and hospital. Brandy is made, and an active trade carried on here. At Pultusk, in 1703, Charles XII. gained a victory over the Saxons and Poles; and in 1806 a battle was fought between Napoleon and the Russians, in which the former had the advantage, though both sides claimed the victory. Pop. (1854) 4772.

PUMP. See HYDRODYNAMICS, part iii., c. iii.

PUMPKIN. See BOTANY, c. iii., Nat. Ord. *Cucurbitaceæ.*

PUN is defined by Addison, in a paper in which he traces the history of punning from its original to its downfall (*Spectator*, No. 61), as "a conceit arising from the use of two words that agree in the sound but differ in the sense." To render this definition less objectionable, it may be varied into,—a conceit produced by the novelty and unexpectedness arising from the use of two words that agree in the sound, but differ in the sense, or of one word used with a double application. Addison observes, in the paper just mentioned, that "Aristotle, in the eleventh chapter of his *Rhetoric*, describes two or three kinds of puns, which he calls paragrams, among the beauties of good writing, and produces instances of them out of some of the greatest authors in the Greek tongue." "Cicero," he goes on to observe, 'has sprinkled several of his works with puns; and in his book, where he lays down the rules of oratory, quotes abundance of sayings, as pieces of wit, which also, upon examination, prove arrant puns." The age in which this species of wit chiefly flourished was in the reign of King James I. His majesty was a tolerable punster, and the taste of the sovereign was studied by the courtiers and by the clergy. The greatest authors, in their most serious works, made frequent use of puns. The sinner was punned into repentance, and in the theatres tears were solicited and got at no higher price. Quintilian and Longinus seem to have been the first among the ancients to distinguish between puns and true wit.

The writer of a clever paper in the *Guardian*, No. 36, named Birch, in "A Modest Apology for Punning," draws the distinction between the extemporaneous puns of conversation, and the deliberate and grave use of this species of false wit in general composition. While defending the pun as a means of enlivening the dull wits of those engaged in common conversation, he nevertheless affirms, "I look upon premeditated quibbles and puns committed to the press as unpardonable crimes. There is as much difference betwixt these and the starts in common discourse, as betwixt casual rencounters and murder with malice prepense."

PUNCH, a principal character in a well-known puppet-show, seems to be a corruption of the Italian *Policinella*, who is usually the leading character in Neapolitan puppet-shows. According to Galiani, in his *Vocabolario del Dialetto Napoletano*, Policinella, or Polecenella, was the name assumed by the successors of a facetious vintager with a very large nose and grotesque appearance, named Puccio d'Aniello, who, taking to the stage, crowded the theatres with his antic tricks and farcical drollery. By degrees, personifications of the original Polecenella were multiplied all over the country. On being transported into Britain, the name became Pochinella, and Punchinella, and, for shortness, *Punch*. Hence the name also of that popular publication the *London Charivari*.

PUNCTUATION, in grammar, the art of pointing, or of dividing a discourse into periods, by points expressing the pauses to be made therein.

The points used in English composition are as follows:—The *comma*, marked thus (,); the *semicolon*, marked thus (;); the *colon*, marked thus (:); the *period*, marked thus (.); the *interrogation*, marked thus (?); the *admiration*, marked thus (!); to which may be added the *dash* (—), the *apostrophe* ('), and the *parenthesis* ( ). We shall only observe, in general, that the comma is used to distinguish nouns from nouns, verbs from verbs, and such other parts of a period as are not necessarily joined together. The semicolon serves to suspend and sustain the period when too long; the colon to add some new or supernumerary reason or consequence to what is already said; and the period to close up the sense and construction, and release the voice.

It has been asserted that punctuation is a modern art, and that the ancients were entirely unacquainted with the use of our commas and other points, and wrote not only without any distinction of numbers and periods, but also without distinction of words; a custom which, Lipsius observes, continued until the hundred and fourth Olympiad, during which time the sense alone divided the discourse. What places this beyond dispute is the Alexandrian manuscript, in the British Museum. Whoever examines this codex, will find that the whole is written *continuo ductu*, without distinction of words or sentences. How the ancients read their works written in this manner it is not easy to conceive. After the practice ceased of joining words together, notes of distinction were placed at the end of every word. In all the editions of the *Fasti Capitolini* these points occur. The same are to be seen on the *Columna Rostrata*. For want of them, we find much confusion in the *Chronicon Marmoreum*, and the covenant between the Smyrnæans and Magnesians, which are both at Oxford. In Salmasius's edition of *Dedicatio Statuæ Rigillæ Herodis* the same confusion occurs, where we find ΔEYPITE and Δευρ ιτε.

Of these marks of distinction, the Walcote inscription found near Bath may serve as a specimen:—

IVLIUSv VITALISv FABRI
CESISv LEGv XXVv Vv V
STIPENDIORUMv

After every word here, except at the end of a line, we see the mark v. There is an inscription in Montfaucon, which has a capital letter laid in an horizontal position, by way of interstitial mark, which makes one apt to think that this way of pointing was sometimes according to the fancy of the graver:—

P. FERRARIVS HERMES
CAECINIAE ⊢ DIGNAE
CONIVGI ⊢ KARISSIMAE
NVMERIAE ⊢

Here we observe after the words a T laid horizontally, but not after each word, which proves this to be of a much later age than the former. As the improvement of stops appears not to have taken place whilst manuscripts and monumental inscriptions were the only known methods of conveying knowledge, it is conjectured that it was introduced with the art of printing. The fourteenth century, to which we are supposed to be indebted for this invention, did not, however, bestow those appendages which we call *stops.* Whoever will be at the pains of examining the first printed books will discover no stops of any kind, but arbitrary marks here and there, according to the humour of the printer. In the sixteenth century we observe their first appearance. From the books of this age, we find that they were not at all produced at the same time; those we meet with in use being only the comma, the parenthesis, the interrogation, and the full point. To prove this, we need but look into Bale's *Acts of English Worthies,* in black letter, printed in 1550. In the dedication of this book to Edward VI. we discover a colon, it is true; but as this is the only one of the kind throughout the work, it is plain that the colon was not established at that time, or, if it was, that it had not yet come into common use. Thirty years afterwards, in the sensible and judicial performance of Sir Thomas Elyot, entitled *The Governour,* imprinted in the year 1580, we see the colon as frequently introduced as any other stop; but the semicolon and the mark of admiration were still wanting, neither of these being visible in Sir Thomas's book. In Hackluyt's *Voyages,* printed in 1599, we meet with the semicolon; but, as if the editors did not fully apprehend the propriety of its general admission, it is sparingly introduced. It has been said, indeed, that the semicolon was brought into use at a much earlier period; but it appears that it was only for the purpose of an abbreviation, as in (*namq;*) (*neq;*) for *namque, neque,* and not in the sense in which it is now employed.

The semicolon, as well as all the ordinary points, is used in a work entitled *Imagines Deorum,* printed at Leyden in the year 1581, in Roman characters. We likewise meet with them in the translation of a book written in French by Philip de Mornay, lord of Plessis; in the *Schoolmaster* of Roger Ascham, printed in 1570, with the exception of the semicolon; and in the *Trewnesse of the Christian Religion,* by Sir Philip Sidney, published in 1587, in which we find the asterisk, brackets, the interrogation, the comma, and the semicolon, all as we now use them, the colon and period being square dots. In an alchemical manuscript, of date 1572, the semicolon is said to be met with, as well as the other three points which are now in common use. The colon and period are abundant in a work entitled *Dionysius de Situ Orbis,* printed at Venice in 1498, but none of the other stops or points occur. The single point (·), appears to be the most ancient. Since the year 1485 the colon was introduced; the comma is first seen about the year 1521; and the more refined semicolon was brought into use about the year 1570. The invention of the semicolon is most probably due to the English; for, from the Leyden edition of Pliny, 1553, it is evident that the Dutch printers were not then in the practice of using it; and if they were in 1570, Roger Ascham would probably have employed it, since the Dutch were the principal classical printers in his time. But we find that some English books were marked with it at that period. The note of admiration was the last stop invented, and seems to have been added to the rest at a period not very far distant from our own time.

Thus we see that these notes of distinction came into use as learning gradually advanced and improved; one invention, indeed, but enlarged by several additions. But notwithstanding what has been said relative to the use of stops as being a modern invention, we shall find reason to be satisfied that the ancients were not unacquainted with the method of making pauses in speaking and writing, if we attend to the following investigation of Warburton:—

"Some species of pauses and divisions of sentences in speaking and writing must have been coeval with the knowledge of communicating ideas by sound or by symbols. Suidas says that the *period* and the *colon* were discovered and explained by Thrasymachus about 380 years before the Christian era. Cicero says that Thrasymachus was the first who studied oratorical numbers, which entirely consisted in the artificial structure of periods and colons. It appears from a passage in Aristotle that punctuation was known in his time. The learned Dr Edward Bernard refers the knowledge of pointing to the time of that philosopher, and says that it consisted in the different positions of one single point. At the bottom of a letter, thus (A.), it was equivalent to a comma; in the middle (A·) it was equal to a colon; at the top (A˙) it denoted a period, or the conclusion of a sentence. This mode was easily practised in Greek manuscripts, while they were written in capitals. But when the small letters were adopted, that is, about the ninth century, this distinction could not be observed; a change was therefore made in the scheme of punctuation. According to Cicero, the ancient Romans as well as the Greeks made use of points. He mentions these under the appellation of *librariorum notæ;* and in several parts of his works he speaks of '*interpunctæ clausulæ in orationibus.*' Seneca, who died A.D. 65, expressly says that Latin writers in his time had been used to punctuation. '*Nos, cum scribimus, interpungere consuevimus.*' Muretus and Lipsius imagined that these words alluded to the insertion of a point after each word; but they certainly were mistaken, for they must necessarily refer to marks of punctuation in the division of sentences, because in the passage in which these words occur, Seneca is speaking of one Q. Haterius, who made no pauses in his orations. According to Suetonius, Valerius Probus procured copies of many old books, and employed himself in correcting, pointing, and illustrating them; devoting his time to this and no other part of grammar. It appears from hence that, in the time of Probus, or about the year 68, Latin manuscripts had not been usually pointed, and that grammarians made it their business to supply this deficiency. Quintilian, who wrote his celebrated treatise on Oratory about the year 88, speaks of commas, colons, and periods; but it must be observed that by these terms he means clauses, members, and complete sentences, and not the marks of punctuation. Ælius Donatus published a treatise on Grammar in the fourth century, in which he explains the *distinctio,* the *media distinctio,* and the *subdistinctio;* that is, the use of a single point in the various positions already mentioned. Jerome, who had been the pupil of Donatus, in his Latin version of the Scriptures, made use of certain distinctions or divisions, which he calls *cola* and *commata.* It has, however, been thought probable that these divisions were not made by the addition of any points or stops, but were formed by writing, in one line, as many words as constituted a clause, equivalent to what we distinguish by a comma or a colon. These divisions were called στίχοι or ῥήματα, and had the appearance of short irregular verses in poetry. There are some Greek manuscripts still extant which are written in this manner."

PUNDERPOOR, a town of British India, in the presidency of Bombay and province of Sattara, stands on the Beema, an affluent of the Kistna, 112 miles S.E. of Poona, and 185 S.E. of Bombay. It is well and regularly built, containing several palaces, and a celebrated temple of Vishnu, which is an object of great reverence to the Brahmins. There is here a large market, which is well supplied with the produce of the country and with British goods. Pop. about 20,000.

PUNISHMENTS. See LAW, and PRISONS.

PUNJÁB.

Extent and boundaries.

The Punjab, or more properly *Panjáb*, so called from the Persian words, *panj*, "five," *áb*, "water," in allusion to the five rivers, the Jílam[1] or *Hydaspes*, the Chenáb or *Acesines*, the Raví or *Hydraotes*, the Beah or *Hyphasis*, and the Satlej or *Hysudrus*, which water it, is bounded on the W. by the Sulaimán Mountains and that part of Afghánistán which adjoins the Khaibar Pass, on the N. by the dominions of the Rájá of Jamú, on the E. by the Himálya Mountains, and on the S. by the Satlej. According to this limitation, the Panjáb does not coincide with the dominions of Ranjít Singh; the Jamú territory and Kashmír having been formed into an independent kingdom under Guláb Singh in March 1849, when the main portions of the Panjáb were annexed to the British empire. It is further to be observed that the portions then annexed are called the Panjáb proper, in contradistinction to two provinces, the Jalandar Doáb, or Trans-Satlej states, with the adjoining hill district of Kángra, and the Cis-Satlej states which had been annexed previously. The Cis-Satlej states not properly belonging to the Panjáb, are excluded altogether from consideration here.

The *Jalandar Doáb* is the rich tract lying between the Beah and the Satlej, or between N. Lat. 30. 57. and 32. 5., E. Long. 75. 4. and 76. 38. It contains an area of 374 square miles; and Jalandar, the chief town, has a population of 40,000.

The *Kángra Valley*,[2] divided into three portions,—the western or Rihu valley; the middle or Kángra valley, properly so called; and the eastern or Páhlam valley, is about 60 miles long, and averages 10 in breadth. These valleys are surrounded by hills. The complete area of the Kángra district, including both hills and valleys, has not been accurately ascertained.

The *Panjáb proper* extends from the 34th to the 29th degree of N. Lat., 344 miles in its greatest length, and from the 70th to the 75th meridian of E. Long., 293 miles in its greatest breadth. Its area is about 66,700 square miles. It is of a triangular shape, the apex being to the south, where the Panj-nad unites with the Indus. It is divided into four *doábs* or valleys, interjacent between two rivers. These doábs are—1. The Barí,[3] between the Beah and Raví; 2. The Rechnah, between the Raví and the Chenáb; 3. The Chaj, between the Chenáb and the Jílam; and 4. The Sindh Ságar, between the Jílam and the Indus. Besides these doábs, the *Hazára* country and the Trans-Indus frontier must likewise be included in the Panjáb proper. The Hazára country has an area of 2500 square miles. It constitutes the extreme north-west angle of the Sindh Ságar Doáb. It consists of a series of valleys encircled by hills, the most remarkable of which are the Dond and Satí, on a spur of which latter range the sanatarium of Marrí (*Murree*) was built in 1852, at the height of 7330 feet above the sea. In this delicious climate every kind of European and tropical fruit may be successfully cultivated. The station is fast becoming populous, and houses are rising in every direction. North-west of Hazára, and separated from it by the Indus, is the province of Peshávar, divided into the Yúsufzye country, Hashtnagar, the Doába, and Peshávar proper; the total area being about 2400 square miles. Yúsufzye is bounded on the south by the Indus, north and east by the Swát Mountains, and west by the Kábul River, and the Mehra, or desert, between it and Hashtnagar. Hashtnagar, or "Eight Cities," is a narrow but fertile tract on the Swát River, and has its name from eight large villages in that locality, of which the chief is Tungí. Doába is inclosed by the Swát and Kábul rivers. Peshávar proper is divided into two districts,—one on the right bank of the Kábul River, and adjoining the Khatak and Afrídí Hills, which run down to a point at Atak; the other of a triangular shape, the base being the Khaibar Hills, and the two sides the Kábul River and the Bara, one of its tributaries. South of Peshávar is Kohat, a valley 30 miles long, and on an average 4 miles broad. Its other boundaries are the Bannu valley to the south, the Wazírí and Bangash country to the west, and the ridges which overhang the Indus to the east, which are inhabited by the Khataks, a valiant Afghán tribe. The Kohat valley is continued by the valley of Hangu, 20 miles long by 3 broad, which opens into the plains of Míránzye. This plain is 9 miles square, and is bounded on the south-west by the Khuram River, 20 miles from where it emerges into the Bannu plain.

South of Kohat is the valley of Bannu, which is rich, fertile, and well irrigated. The capital is Dhalípgarh, where there is a substantial fort with a cantonment. Still more to the south are the valley of Marwat, and the adjoining valley of 'Isa Khail, containing 45 villages. The Tánk valley comes next, and in fertility equals Bannu. South-east of Tánk is Derah Ism'aíl Khán; 60 miles south of this, Derah Fath Khán; and 70 miles farther in the same direction, Derah Ghází Khán; all three formerly the camps of powerful Afghán chiefs who three centuries ago invaded the Panjáb. After passing Derah Ghází Khán, the country of the Bílúchís is reached. Of these, there are the Ushtaránís, the Bozdárs, the Laghárís, Bugtís, Marís, and Ghurchánís, all valiant and refractory tribes.

The total area of the Panjáb, and the allied state of Jamu, is about 126,000 square miles.

General aspect of the country.

The Panjáb is a country of extensive plains, but little above the level of the sea, bounded on the N. and N.E. by hills which unite with the spurs of the gigantic Himálya Mountains. The slope of the whole region is from N.E. to S.W., as is shown by the uniform course of the rivers. Jacquemont[4] argues, from barometric and other observations, that the plain of the Panjáb is lower than that of Eastern Hindústán, and supposes that the beds of the rivers from the Jamná to the Indus are successively lower than one another.

According to Elphinstone[5] the fertility of the Panjáb has been exaggerated; and, except near rivers, no part is comparable to the British provinces in Hindústán or Upper India, far less with Bengal. Of the four doábs east of the Jílam, the two nearest that river are chiefly pasture grounds; the third, though most sterile, is best cultivated. The two former are flat, the latter undulating. To the east of the Jílam there is scarce a hill or a tree except the mimosa.

According to the General Report,[6] "the face of the country presents every variety, from the most luxuriant cultivation to the most sandy deserts, and the wildest prairies of grass and brushwood. A traveller, passing through those lines of communication which traverse the northern tracts, would imagine the Panjáb to be the garden of India; again, returning to the road which intersects the central tracts, he would suppose it to be a country not worth annexing. The culture manifestly depends upon two causes—the lower Himályan range and the rivers. From the base of the hills southward there stretches a strip of country from 50 to 80 miles broad, watered by mountain rivulets, and for fertility and agriculture unsurpassed in Northern India. In their downward course the rivers spread wealth and fruitfulness on either side, and their banks are enriched with alluvial deposits, and fringed with the finest cultivation. These tracts, though unadorned with trees, and unrelieved by any picturesque features, are studded with well-peopled villages, are twice a year covered with waving harvests, and are the homes of a sturdy, industrious, and skilful peasantry. Within this tract are situated the sister capitals of Láhor and Amritsir, and most of the chief cities, such as Dínanagar, Battála, Siyálkot, Wazírábád, Gujaránwálá, Rámnagar, and Gujarát. Far different is the scene which meets the eye in the centre of the Barí, the Rechnah, and the Chaj Doábs. Here are interminable wastes, overgrown with grass and bushes, scantily threaded by sheep-walks and the footprints of cattle. These parts are chiefly tenanted by nomad pastoral tribes, who, knowing neither law nor property, collect herds of cattle, stolen from the agricultural districts. Here and there a hamlet stands alone in the wilderness, whose semi-barbarous inhabitants are the aborigines of the land." Around the homesteads are patches of good cultivation, for the soil repays irrigation, though water must be raised from a considerable depth. But there are many proofs that these regions were once thickly populated. Everywhere are the ruins of cities, villages, temples, tanks, and water-courses. Even now these tracts are not without their practical value. They yield an abundant supply of grass, on which vast herds of cattle and buffaloes, and flocks of sheep and goats, are pastured, and firewood is collected from them sufficient for the requirements of all the neighbouring towns and villages. Camels, too, in great numbers, are fed in these plains, and form the carriage for the traffic with Kábul and the rest of Afghánistán. The Sindh Ságar Doáb is far less productive, being in fact little better than a sandy desert, within which the famous fort of Mankhera is the only spot where men seem to have a fixed abode.

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[1] M'Gregor's *History of the Sikhs*, p. 1. If the Indus be included in the five rivers, the Beah and Satlej must be reckoned as one, which in fact they become in Lat. 31. 11., Long. 75. 4. It is certain, however, that the Indus is not reckoned one of the five rivers by the natives, as the united rivers mentioned in the text, before their confluence with the Indus, are called *Panjnad*, which is equivalent to the Persian *Panjáb*.

[2] *Selections from the Public Correspondence for the Affairs of the Panjáb*, vol. i., p. 293 (Dr Jameson's Report).

[3] It will be seen that the names of three of these Doábs are composed of consonants taken from the names of the rivers that form their limits; thus, Barí takes *B* from Beah, and *R* from Raví.

[4] *Voyage*, v. 188.

[5] *Account of Kábul*, 81.

[6] *On the Administration of the Panjáb*, printed for the court of directors in 1854, p. 2.

The Salt Range.

But the want of vegetable products in this doáb is more than made up by its richness in minerals. The line of mountains called the Salt Range present an inexhaustible supply of salt, which, at its western extremity, near Kálábágh, is thus described by Elphinstone:[1]—"The road beyond was cut out of the solid salt at the foot of cliffs of that mineral, in some places more than 100 feet high above the river. The salt is hard, clear, and almost pure. It would be like crystal, were it not in some parts streaked and tinged with red. In some places salt springs issue from the foot of the rocks, and leave the ground covered with a crust of the most brilliant whiteness. All the earth, particularly near the town, is almost blood-red; and this, with the strange and beautiful spectacle of the salt rocks, and the Indus flowing in a deep and clear stream through lofty mountains past this extraordinary town, presented such a scene of wonder as is seldom to be witnessed." The Cis-Indus salt mines, seven in number, have long been known, and are mentioned in the Ayín i Akbarí.[2] Burnes[3] states that in 1832 the quantity of salt dug out was 80,000,000 lb. The salt is either found cropping out in all directions, or else lies in strata, commencing near the surface, and extending downwards in deep veins of inexhaustible fecundity. The salt is brought to the mouth of the mine for less than 2 ánás (3d.) a *man* of 80 lb., but is sold at the government depôts at 2 ánás. The mines now worked are five,—Khewra, near Pind Dádan Khân (which is the principal one), Makrách, Sardí, Chuá Varchá, and Kárábágh. The total yield for 1851 was 51,249,440 lb.; for 1855–6, 77,268,800 lb., yielding a revenue of L.193,000. In 1857–58 the revenue from the salt mines was L.207,500. The mineral in all its varieties is a nearly pure chloride of sodium with a trace of sulphate of lime.[4] For consumption it requires no preparatory process, except pounding. It is of excellent flavour and purity, of transparent brilliance and solid consistency; but it assumes a reddish hue,[5] when, as is sometimes the case, veins of iron lie adjacent to the strata. The Trans-Indus salt has a darker tinge than the Cis-Indus, and is generally of inferior quality. Some useful works have lately been executed to facilitate the mining operations. Roads have been cut, and a gallery carried through the heart of the mountain to the Longewala, the chief of the Khewra mines. Fresh water has also been brought to the mines by a canal, as the miners suffered greatly from the use of brackish water in former years.

Mountains.

The mountains in the Panjáb increase gradually in height as they approach the Himálya. In Kángra, for example, the greatest altitudes are between 3000 and 4000 feet. Thus, Barwánah, about 20 miles E. of Kángra, is 3198 feet high; Baijnàth, 15 miles E. of Barwánah, 3357; and about 30 miles E. of this, again, are the snowy peaks, of which the nearest are 14,886, and the more remote 16,017 feet high. Beyond these, again, are the Great Himálya, rising to from 20,000 to 25,000 feet.

In the Rájá of Jamu's country, in N. Lat. 33. 20., E. Long. 73. 50., is the isolated peak of Chan Mukh, 4461 feet high. Not very far to the N. the barrier-line of mountains on the S. of Kashmír is more than double this altitude. Thus, Tikhear peak, in this range, is 15,305 feet; the Barina Sákal is 15,483 feet; the Kohnárdwa, 12,746 feet; and the Didgun Mountain is 14,952 feet. In the N.W. angle of the Panjáb, where the province joins the Afghân hills, the heights range from 4000 to 8000.

Rivers and canals.

The Panjáb is a land of many rivers. Of these, the most eastern, the Satlej, has its source in Thibet, in N. Lat. 30. 8., E. Long. 81. 53., and after a course of 550 miles, receives the Beah near Harekí, in Lat. 31. 12., Long. 75. 3., whence the united stream of the two rivers is called Ghárá, until it joins the Chenáb, after which it bears the name of Panjnad to its confluence with the Indus, a distance of 60 miles. The Beah, which comes next, following the order from S.E. to N.W., rises in Lat. 32. 24., Long. 77. 12., and joins the Satlej after a winding course of 290 miles. The next stream in the same direction is the Raví, which rises in a lake in the Himályas, in Lat. 32. 30., Long. 77. 1., and after a tortuous course of 420 miles, runs into the Chenáb. The Chenáb rises in Lat. 32. 48., Long. 77. 27., and after a course of 600 miles unites with the Jílam at Trimu Ghát. From this point it is called the Trimáb. It receives the Raví after a further course of 50 miles, and after 110 miles more the Ghárá. Hence to the Indus it is called the Panjnad or "Five Rivers," being the united streams of the Beah, the Satlej, the Raví, the Chenáb, and the Jílam. The Jílam rises in Kashmír, and, as above mentioned, joins the Chenáb after a course of 490 miles. The Indus, which is properly the boundary of the Panjáb to the W., washes the confines of the province for 500 miles, in a course nearly due S. from Darband to its confluence with the Panjnad, a few miles N. of Mithankot.

The canals in the Panjáb are classed under two heads,—Inundation canals, which are full during the latter part of spring,[1] the summer and autumn, and empty during the winter. The fertility of the province, particularly of the S.W. portion, depends greatly on these canals, which, though individually insignificant, are in the aggregate of great importance. Permanent canals are full all the year round, and are adapted for navigation as well as irrigation. Of these, the principal is the Barí Doáb Canal, running from N. to S. right down the centre of the tract between the Raví and Satlej. It leaves the Beah exactly in Lat. 32., about 9 miles E. and by S. of Ghordáspúr, and passing 3 miles to the E. of Amritsir, enters the Raví in 30. 32. between Chichawatrú and Burjí. This is called the main branch, and is 265 miles long. It throws off 28 miles S. of the place, when it leaves the Beah, a branch to the W. called the Láhor branch. This will be 74 miles long, and of this distance 60 miles have been excavated. There are to be two eastern branches, one of which, called the Kassúr branch, is to be 84 miles long, and of this about 30 miles are finished; the other is an offshoot of the Kassúr branch, and when finished will be 61 miles long. At intervals of 2½ miles above Láhor, and of 4 miles below that latitude, there will be bridges, in all 115. The main channel is 120 feet broad, and 8½ deep. After the divergence of the Kassúr branch it is 85 feet broad, with the same depth; and after the Láhor branch leaves it, 68 feet wide and 4½ deep. The last report on the administration of the Panjáb speaks of only 133 miles of the main branch being opened by the present year, down to the tail of the Láhor branch. It adds that the canal is eventually to be carried to Tolamba, near Multán. In connection with the canal, 500 miles of road have been completed, and 440,000 trees have been planted along its banks. Permanent workshops are in course of erection at Mádhupúr, the canal head station. The total cost of this grand canal is estimated at L.1,350,000 sterling. The Haslí Canal was made in 1633 A.D. by command of Sháh Jahán, to supply the royal gardens near Láhor. When the Sikhs rose to power they carried a branch from it to Amritsir. It has a winding course of 110 miles, and is from 50 to 15 feet broad, from 7 to 2 feet deep. In the Pák Patan district of the Barí Doáb is the Khánwa Canal, 54 miles long. The canals in the Multán districts are particularly numerous.

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[1] *Account of Kábul*, p. 36.

[2] ii. 100.

[3] *Bukhára*, i. 35.

[4] Dr Fleming's Rep., p. 270.

[5] *Report on the Panjáb*, p. 76.

Roads. Up to May 1854 roads to the extent of 5229 miles had been constructed, at a cost of L.545,000. Since that time very great progress has been made. The Panjáb section of the grand trunk road from Calcutta to Peshâwar is the most important. This would probably have been nearly finished ere this, but owing to the mutinies and the expenses they entailed, no progress worth mentioning has been made during the last two years. The portion from Firúzpúr to Láhor, 45 miles, is still unfinished. Much remains to be done on the part from Láhor to Peshâwar; and, according to the estimates, L.535,000[2] are required to complete the works, and the whole road will then have cost 1¼ million. Along this road the main forces of the Panjáb army are massed; and its military and commercial importance cannot be exaggerated. Minor roads have been made in many directions; and since May 1854 the extent of new-made roads amounts to 3542 miles.

Railroads. The first sod of the intended railway between Láhor and Amritsir, a distance of 35 miles, was turned by Sir J. Lawrence on the 8th of February 1859. Amritsir is the northern terminus of the Multán and Láhor Railway, which will join or cross the Great North-Western line between Calcutta and Peshâwar. From Multán to Karáchí, the port of the Indus in Sindh, 425 miles, the communication will be continued in the first instance by steamers to Haidarábád, the capital of Sindh, 302 miles, and thence by rail to Karáchí. Ultimately the railway will be continued from Multán to Haidarábád. By this line the whole commerce of the Indus valley will be drained. In a military and political view, the line between Láhor and Peshâwar, as yet uncommenced, is of hardly less importance.

Climate. The climate of the Panjáb is very trying to European constitutions. In the northern parts the fall of rain[3] exceeds that at Delhi, but towards Multán there is hardly any at all, and in the central districts the rain is scanty. The average fall for the whole province was in 1853-54 only 39·38 inches; in 1854-55, 23·84; and in 1855-56, 15·18 inches. The general character of the climate may indeed be inferred from a well-known oriental couplet, often quoted by natives:—

> "Dust, beggars, dog-days, dead men's graves—these four
> Blessings, are the greetings of Láhor."

The months from October to March are pleasant; but during the rest of the year the heat is inconvenient, and at times almost insupportable. The thermometer then rises to 112° in a tent, with all cooling appliances. In the winter months, viz., December, January, February, the thermometer is some nights as low as 34°. In the northern and hilly parts it occasionally falls several degrees below the freezing-point. Fevers and ague are very common in the Panjáb, and may decidedly be attributed to the climate, the intense heat rendering the body susceptible of such complaints.

Zoology. The beasts of prey ordinarily found in India are to be met with in the Panjáb. Tigers are not uncommon. The lion, which was some years back occasionally seen, is now extinct. Panthers, chítás, bears, and hyænas, are by no means scarce; and lynxes, foxes, jackals, otters, martins, storks, nílgáes, wild hogs, porcupines, deer, and monkeys are found, as in India; but wolves are very numerous, and in some years have committed great ravages, even entering the villages and carrying off the children. Of birds there are many varieties, particularly of water-fowl, such as pelicans, cranes, herons, and ducks; eagles, vultures, hawks, pheasants, jungle-fowl, pea-fowl, parrots, partridges, quails, snipe, magpies, hoopooes, pigeons, doves, the bulbul, kokil or Indian cuckoo, and bats are also seen in great numbers. Alligators and the sharp-snouted porpoise of the Indus are plentiful in the rivers, which abound with fish, particularly with the *palla*, which in flavour somewhat resembles the salmon. Snakes are rather common, and some kinds, as the cobra, are deadly. The silk-worm thrives; and the bees produce honey of the finest quality. Amongst domestic animals, the horse is very much cared for, and the breed is fine. Great herds of buffaloes are fed on the rivers' banks; and the camel seems to find the country and climate congenial.

Natural produce. About one-fourth of the whole area of the plains is under cultivation, but the cultivated land is now continually increasing. The crops are much dependent upon rain; and, besides, in most places constant irrigation from wells or canals is requisite. The great staples are cereals, three-fourths of the produce consisting of wheat, barley,[4] Indian corn and maize of all sorts, and rice. In various districts sugar of excellent quality, *gram* (*Cicer arietinum*), cotton, indigo, linseed, turnips, pepper, tobacco, turmeric, poppy, hemp, and vegetables are largely grown, and one or other of these crops in detailed patches is to be found everywhere. All these miscellaneous products, however, united, do not cover more than one-fourth of the cultivated area, the rest being occupied by cereals. There is vast pasturage; and enormous numbers of sheep, goats, camels, and horned cattle are supported on it. Wheat is exported to the Mauritius; and upwards of 5000 tons of produce are annually carried from the Panjáb down the Indus, consisting of cereals, indigo, sugar, cotton, flax.[1]

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[1] *Report of the Administration of the Panjáb* from 1844-45 to 1855-56, p. 58.

[2] *Report for* 1857-58.

[3] Elphinstone's *Account of Kábul*, i. 130.

[4] *General Report from* 1854-55 to 1855-56, p. 22.

In the Kángra valley, at Nagrota and at Bowarnah, in the eastern portion of the valley, are tea plantations, and excellent Pouchong, Souchong, and Bohea are made there. At Holta, in N. Lat. 32. and E. Long. 76. 30., also in Kángra, another plantation has been formed. The height of the tract above the sea is from 3500 to 4000 feet, and the teas at this height are said to be very highly flavoured.

The cultivators of the Panjáb are essentially peasant proprietors. There are no farmers or middle-men, and generally no great landlords. As a rule, each man owns and tills his own glebe, upon which he pays the revenue and pockets all the profits. In the Panjáb one and the same man is usually absolute proprietor, and generally the sole cultivator, though he may occasionally lease out a few fields to tenants. He is saddled with no rents. He has to provide for the cost of cultivation and for the government demand; and the rest of the produce is his own. But these men, while maintaining their individuality, do yet belong to village communities. A village is not inhabited by a certain number of peasants, unconnected with each other, but by a number of persons of common descent, forming one large brotherhood, having their own headmen, accustomed to joint action and mutual support.

Territorial divisions.

The Panjáb beyond the Beah is divided for administrative purposes into five provinces. Between the Beah and the Satlej are the Trans-Satlej states, which may be viewed as one large province with five divisions. The whole country may be classed therefore under the following heads, the order being from S.E. to N.W. :—

Divisions.	Area in Square Miles.	Revenue.	Population.	Pop. per Sq. Mile.
		L.		
TRANS-SATLEJ STATES.				
1. Kángra......... 2. Hushyárpúr ... 3. Phagwára....... 4. Jalandar........ 5. Kapurthala	6,791·83	339,129	2,273,037	334·67
PANJAB PROPER.				
1. Láhor	11,627·88	431,711	3,458,694	297·41
2. Multán............	15,494·00	237,730	971,175	62·68
3. Leia...............	15,271·70	169,666	1,122,621	73·50
4. Jílam	16,761·22	237,730	1,762,488	105·35
5. Peshávar.........	7,588·50	95,164	847,695	111·70
NATIVE STATES.				
1. Trans - Satlej principalities	5,316·00	81,828	498,163	54·68
2. Mahá Rájá Rambír Singh's territories	60,000·00	800,000	3,000,000	50·00
Total.......	138,851·13	2,402,958	16,933,873	136·24625

From this calculation the Cis-Satlej states and principalities, and Bháwalpúr, and the hill states near Simla, are excluded. They are given in the Panjáb Reports; but not properly belonging to that country, are here omitted.

The following table gives the income and expenditure for the three years from 1855 to 1858 of the Panjáb territories, including the Cis- and Trans-Satlej states :—

	1855–6.	1856–7.	1857–8.
Income..................	L.2,012,693	L.2,037,779	L.2,053,071
Expenditure..........	1,632,974	1,650,007	1,766,676
Surplus..........	L.379,719	L.387,772	L.286,395

The various sections of the income and expenditure for the last of these years were as follows :—

Revenue, 1857–8.

Ordinary—	
Land tax..	L.1,546,752
Excise and stamps..........................	275,123
Nuzurana tribute, &c.........................	42,025
Postal, &c.	31,894
Miscellaneous..................................	47,552
Toshakhana......................................	9,976
Total ordinary..............................	L.1,953,322
Extraordinary..................................	522
Local funds	99,227
Grand total...................................	L.2,053,071

Expenditure, 1857–58.

Ordinary—	
General...	L.60,421
Judicial...	229,995
Revenue	148,573
Excise and stamps...........................	31,508
Postal, &c..	152,485
Miscellaneous..................................	46,591
Military...	771,704
Toshakhana.....................................	9,923
Total ordinary...............................	L.1,451,200
Extraordinary—	
Settlement and survey......................	15,942
Public works....................................	224,994
Miscellaneous	3,643
Total extraordinary	L.244,579
Local funds	70,897
Grand total	L.1,766,676

The expenditure for the year 1857–8 was considerably affected by the unsettled state of the country at that time. There was an increase of 8 per cent. on judicial charges for extra police; and on the other hand there was a more than corresponding reduction in public works. In military charges the difference was great; some 77 lakhs being charged this year, instead of 50 lakhs in the preceding years. It is to be observed, however, that the income did not materially fall off during that year. Under the expenditure are included all charges for civil and political establishments, works of public improvements, &c., but not charges for the regular army or the construction of cantonments. The outlay on public works for the last two years, together with the total previous expenditure, was as follows :—

	1856–7.	1857–8.	Previous Expenditure.	Total.
	L.	L.	L.	L.
Roads	60,141	55,162	1,122,460	1,237,763
Canals............	171,841	127,000	715,300	1,014,141
Miscellaneous...	17,433	7,147	265,500	290,080
Military	207,526	114,097	1,142,100	1,463,723
Total......	456,941	303,406	3,245,360	4,005,707

Principal cities.

In the Trans-Satlej states the only town of any importance is Jalandar, which contains a population of about 40,000. In the Láhor division the two principal cities are Láhor and Amritsir. Láhor, in N. Lat. 31. 36., E. Long. 74. 21., is situated a mile E. of the Raví River. It is surrounded by a fortification 7 miles in circuit. The citadel is on the N.W. angle of the city, and contains vast magazines of stores. There are many fine mosques, of which the *Pádsháh masjid*, built by Aurangzíb, and the mosque of Vazír Khán, are the most remarkable. Three miles to the west, across the Raví, is the mausoleum of Jahángír, quadrangular, with a minaret 70 feet high at each corner, and built of red sandstone. About the same distance to the N.E. is the famous garden of Sháh Jahán, called the *Shálinár*, or "House of Joy." It contains 450 fountains, and has three terraces rising one above the other. The population of Láhor is reckoned at 95,000. This city was taken byMahmúd of Ghazní in 1009, and in 1152 became the capital of the Ghaznivite dynasty. In 1186 it was taken by Sáhibu'd-Dín, of the House of Ghor, and in 1523 by Bábar. In 1748 it fell into the hands of Ahmad Sháh Durrání; and in 1799 Ranjít Singh was made governor by Zamán Sháh, and soon established his independence.

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[1] *General Report from* 1854–55 *to* 1855–56, p. 72.

Amritsir (" The Fount of Immortality"), in N. Lat. 31. 40., E. Long. 74. 45., is situated about 30 miles E. of Láhor. It has its name from a sacred tank made by Rámdás, the fourth *guru*, or spiritual teacher of the Sikhs, in 1581. The tank is 150 paces square, and is filled with beautifully clear water. In the centre is an island with a temple to Vishnu, which blazes with gold and ornaments. The trade of the place is very great, and some of the richest merchants in India reside here. One of this class about twenty-five years ago established a banking-house at St Petersburg, and died worth millions of rubles. The city is completely commanded by the huge fortress of Govindgarh, built by Ranjít Singh in 1809, under the pretence of protecting the sacred spot, but in reality to overawe the turbulent multitudes that assembled there. The population of Amritsir is reckoned at 90,000. Siyálkot, in N. Lat. 32. 29., E. Long. 74. 33., with 20,000 inhabitants; Rámnagar, in N. Lat. 32. 20., E. Long. 73. 50, a large town; Wazírábád, with 17,000 inhabitants, in N. Lat. 32. 27., E. Long. 74. 10.; and Gujaránwálá, in N. Lat. 32. 10., E. Long. 74. 13., the original residence of Ranjít Singh's family, are also in this division. Wazírábád is the handsomest town in the Panjáb, having been rebuilt on a regular plan, with wide streets and a fine bázár, by General Avitabile.

In the Multán division the city of that name is the only one of great note. It stands in N. Lat. 30. 12., E. Long. 71. 30., 3 miles E. of the Chenáb. According to Burnes, its name is properly *Mallithán* (" The City of the Malli"), taken by Alexander. It is more certain that it was captured by Muhammad-bin-Kásim in the close of the eighth century, by Mahmúd of Ghazní at the beginning of the eleventh, and by Tímúr in the fourteenth. In 1828 it was stormed by Ranjít Singh with great slaughter on both sides. The conqueror is said to have lost 10,000 men out of 25,000 during the siege, and the garrison of 3000 Afgháns were all put to the sword. In 1848 the Governor Múlráj murdered two British officers, which led to the campaign in which Major Edwardes so much distinguished himself. On the 2d of January 1849 the city was taken by General Whish; and the citadel surrendered on the 22d. The population is reckoned at 81,000.

The towns in the province of Leia are none of them very large or populous, but their size and population are increasing with most rapid strides, and under the peaceful rule of the English it may be predicted they will soon grow up into great cities. Leia, in N. Lat. 30. 57., E. Long. 71. 4., has now 15,000 inhabitants, though Elphinstone in 1807 describes it as a poor place, of about 500 houses; but situated in the midst of a country producing great quantities of indigo, sugar, silk, and cotton, and being on one of the principal roads from India to Afghánistán by the Kahirí ferry, the trade of Leia, both direct and transit, is very great. In the Deraját, the slip of country across the river from Leia, and between the Indus and the Sulaimán Mountains, the principal towns are Derá Ghází Khán, in N. Lat. 30. 4., E. Long. 70. 54.; Derá Fath Khán, in N. Lat. 31. 9., E. Long. 70. 50.; and Derá Isma'íl Khán, in N. Lat. 31. 50., E. Long. 70. 58. These places were originally, about three centuries ago, mere encampments of Bilúch chiefs, but grew up into towns, and are now places of great trade. Derá Ghází Khán has a population of about 15,000; the bázár containing 1600 shops, of which about 600 belong to weavers and cloth-sellers. The Lohání Afgháns carry on a brisk transit trade through this town. Of the other two Derás, that of Isma'íl Khán has a population of about 10,000. The trade in grain and in salt from Kálá Bágh is very considerable; but the most important dealings are in cotton cloth, of which two millions of yards are annually sold here, while eighteen millions of yards pass through.

Jílam, in the division so named, is a large town on the right bank of the River Jílam, in N. Lat. 32. 56., E. Long. 73. 47. The steamers from Karáchí are to ascend as far as this place. The river is crossed here in the cold season by a dangerous ford, which is 500 yards across, and has about 3 feet water running like a sluice. In December 1839, when the English army crossed here on their return from Kábul, an officer and ten men were drowned at this ford. Pind Dádan Khán, in N. Lat. 32. 36., E. Long. 73. 5., also on the right bank of the Jílam, is a town with 14,000 inhabitants. It is close to the Salt range, and a vast quantity of salt is raised in the vicinity. Ráwal Pindí, in N. Lat. 33. 37., E. Long. 73. 6., between the Indus and the Jílam, has a population of 16,000, with a considerable transit trade. It is the capital of a large district. Here Sháh Shujá, on his expulsion from Kábul, long resided, and a brick building erected by him is still dignified with the name of " The Palace."

Peshâwar, the capital of the division so called, lies in N. Lat. 34., E. Long. 71. 38. It is the portal of the Khaibar Pass, being 18 miles E. of the eastern extremity of that formidable defile. At the beginning of the present century the city was thought to contain 100,000 inhabitants; but it suffered much from Ranjít Singh, who, after his victory over the Afgháns at the battle of Naushahra, on the 14th of March 1823,[1] sacked Peshâwar, demolished most of the fine buildings, and laid waste the surrounding country. The population at present is reckoned at 541,000, exclusive of a very strong British force in cantonments, numbering about 10,000 men.

Races.

The cradle of the Sikhs is the tract called the Mánjha, or " Middle Land;" the Barí Doáb, between the Beah and the Raví; and to the south of the former river the district called Málwah, around Bhutinda and Sunâm. There are, however, in both the Mánjha and Málwah, many Bhattís, Dogras, Patháns, and Gujars, who are numerous everywhere in the Panjáb, but came originally from Gujarát. In the territory of Rambír Singh the mass of the population are Dogras and Kanets to the east; while in the hills south of Kashmír, and west to the Indus, are Gikkars, Gujars, Khatirs, and Awâns. The people of Kashmír are a very mixed race;[2] their language is Hindú, their faith that of Islam. Among the agricultural population Jats are numerous, and there are besides many wandering tribes, of whom the Changgars are thought to be the same as the Zigeuners, Gitanos, or Gypsies.

History.

The country through which the Indus flows is repeatedly mentioned in the *Vedas*. It was at the Vaidik era the abode of the Aryan nation, which was then passing slowly into India, which it now so completely occupies. The brief notices in the *Vedas* of the countries bordering on the Indus prepare the inquirer to believe the accounts of the teeming population and abundant resources those countries are said to possess in the chronicles of the campaigns of Alexander the Great. After Taxilas and Abisares, kings of the most western part of the Panjáb, had submitted, Porus, King of the Jech Doáb, encountered Alexander on the eastern shore of the Jílam. He had with him about 30,000 foot,[3] 4000 horse, and 200 elephants; and his troops fought with a courage not inferior to that of their hardy descendants in these more recent times. It is impossible to trace the exact progress of the Macedonians after the defeat of Porus. Suffice it to say, that it was successful, and that the Græco-Bactrian kings exercised a powerful influence, if they did not actually govern, some provinces of the Panjáb for centuries after the death of Alexander. The Muslimán first made their appearance in the Panjáb in the seventh century, when, under the generals of the Khalífah Walíd, they conquered Multán. In 977 A.D., Sabuktagín, King of Ghazni, ravaged the Panjáb, and subsequently several times invaded that country, over detached provinces of which he established his rule, as at Peshâwar, where he left a governor. Mahmúd, son of Sabuktagín, commenced his celebrated invasions of India in the year 1000 A.D. He repeatedly overran the Panjáb, incorporated the province of Multán and some other districts with his dominions, took many cities and forts, including Láhor, and established a continuous rule over the greater part of the kingdom of the Five Rivers. In 1152 A.D. Bahrâm, a descendant of Mahmúd, was expelled from Ghazní by Alláh of the House of Ghor, but retained Láhor and his Indian dominions, which thus became a separate monarchy until 1184 A.D., when Muhammad Ghori, King of Ghazní, took Láhor from Khusrau II., and extinguished the so-called dynasty of Ghazní. His career of victory was terminated in 1205 A.D. by the Gikkars, a wild tribe who raised a rebellion in the Northern Panjáb, and twenty of whom, having pledged themselves to destroy the king, forced their way into his tent at night, and stabbed him to death. From this date commenced the rule of the Pathán kings of India. Two of the great officers—Eldúz and Kutb—succeeded Muhammad, and divided his empire; Eldúz keeping all to the west of the Indus, and Kutb the Indian territories of which he was already viceroy. As he was originally a slave, the dynasty he founded was called that of the Slave Kings. Their capital was Delhi; and thenceforward the Panjáb sank into a province, until raised by Ranjít into an independent kingdom. In order to trace the rise of the Sikh power, it is necessary to begin with the history of the founder of their religion. Nának, their first *guru*, or teacher, was born in 1649 A.D. at Talwandí, a village on the Raví, above Láhor; or, according to one good authority,[1] at Kánakásh, 15 miles S. of Láhor. He died A.D. 1539 at Kartárpúr, on the Raví, 40 miles above Láhor, leaving many disciples or "Sikhs," a term which is now generally applied to all Hindú Panjábís. He taught belief in one God the Creator, self-existent, incomprehensible, sole, timeless, everlasting; that good deeds are nothing of themselves, and that the only true wisdom is the knowledge of God; that this knowledge is only attainable through the grace of God, but that it must be linked with good works for the attainment of salvation. He adopted the Hindú idea of the transmigration of the soul, and regarded beatitude as the dwelling with God after this punitory course is over. His doctrines have been handed down in a book called the *Granth*, which was composed not many years after his death, and is still revered as the scripture of the Sikhs. Nának left two sons, of whom one, named Shrí Chand founded the Hindú sect of *Udásís*,[2] ascetics who renounce the world. Angad was the second Sikh guru. He occupied himself chiefly with committing to writing the doctrines of Nának, and died in 1552 A.D. at Kaddúr, on the Beah. He was succeeded by Amardás, who composed part of the *Granth*, and died in 1574 A.D. The fourth guru was Rámdás, who established himself at Amritsir, and died in 1581. He is said to have been much esteemed by Akbar the Great. Arjun his son became the fifth guru, and arranged and published the *Granth*. The Emperor Jahángír imprisoned him on a charge of treason, and impaled 700 of his followers. He died, probably from the rigour of his confinement, in 1606, and was succeeded by his son Har Govind, the sixth guru, who first laid aside the peaceful tenets of Nának for the warlike principles of the modern Sikhs. He died in 1645 at Kíritpúr, on the Satlej, after repeatedly defeating the imperial troops. Under his chieftainship the Sikhs had grown up to a numerous and martial community. His son Har Ráe succeeded as seventh guru, and died in 1661. His younger son Har Kishan, a boy of six, was the eighth guru, and died in 1664 at Delhi. Tegh Bahádur, son of Har Govind, was the ninth guru, and having opposed and defeated the imperial troops, was ignominiously put to death by Aurangzíb, and his body exposed in the streets of Delhi. That circumstance was one of the main inducements to the Sikhs to join the English in capturing Delhi and crushing the Bengal mutineers. Tegh Bahádur was executed in 1675, and for more than twenty years after his death his son Govind, the tenth and most famous of the gurus, lived in retirement, pondering revenge and the means of raising his oppressed followers to independence and power. It was he who instituted the Páhal or initiatory ceremony of the Sikhs, taught his disciples to call themselves Singhs or Lions, to let their locks grow, and to devote their energies to steel, which they were always to wear about their persons. He thus established the Khálsa or special government of the Sikhs, and soon entered upon a war with the troops of Aurangzíb. His two sons were slain, his followers dispersed, and he himself was obliged to fly to the deserts of Bhutinda, where he composed the tenth chapter of the *Granth*. After the death of Aurangzíb, Govind took service with Bahádur Sháh, and was murdered in 1708 at Nadarh, on the banks of the Godávarí, by the sons of an attendant whom he had himself put to death. A disciple named Bandah now headed the sect, and after a fierce struggle with the Muhammadans, was taken at Ghordáspúr in the Panjáb, which he had made his stronghold, carried to Delhi, and torn to pieces with hot pincers, after he had been first compelled to murder his own son. This was in 1716; and so hot was the persecution of the Sikhs that followed, that they are scarce heard of till 1738, when the invasion of Nádir Sháh gave them courage to re-appear as combatants. After various vicissitudes, they in 1756 captured Láhor; and their chief Jassá Singh struck a coin with the inscription, "Coined by the grace of the Khálsa in the country of Ahmad, conquered by Jassá the Kalál." They were soon after, however, compelled to surrender Láhor to the Maráthas, who in turn were crushed by Ahmad Sháh Abdallí at the decisive battle of Pánipat in 1761. During this campaign the Sikhs hung round the Durrání army, and plundered stragglers. They began, too, to erect forts; and Charat Singh, the grandfather of Ranjít, made his stronghold at Gujránwálá, whence in 1762 he repulsed the Afgháns. That year, however, Ahmad Sháh inflicted a terrible chastisement on the Sikhs at the battle of Ghalú Ghárá,[3] south of the Satlej, where 20,000 of them fell. Nevertheless in 1764 they recovered Láhor, struck coins, established a general assembly, and divided themselves into twelve *Misls*, or "confederacies." Ahmad Sháh made his last inroad in 1766, and the next year Charat Singh took the great fort of Rhotas, and the Bhangí Misl conquered as far as Ráwal Pindí. Charat Singh was killed in 1772 by the bursting of his matchlock, and was succeeded by his son Mahá Singh, who in 1784 rose to pre-eminent power. His son Ranjít was born in 1780, and was but eleven years old when his father died, and left him the first position in the Khálsa, to be still further improved by his own abilities. In 1798 Sháh Zemán, King of Kábul, took Láhor, but was compelled to retire by the rebellion of his brother Mahmúd. As a reward for transporting his guns over the flooded Jílam, he bestowed Láhor upon Ranjít. In 1802 Perron, Sindhia's general, made an engagement with Ranjít for a joint expedition to the Indus, and the partition of all the country south of Láhor; but this agreement came to nothing, and Perron was soon afterwards disgraced by Sindhia, and obliged to fly. In 1805 Jeswan Rao Holkar retreated before Lord Lake into the Panjáb; and by the treaty of the 24th of December of that year, was allowed to retire to his dominions. In 1806 Ranjít took Lodiána, and in 1807 Kassúr, whither in September 1808 Mr Metcalfe proceeded to form a league between the English and the Sikh ruler. It was not, however, till the 25th of April 1809 that a treaty was made between the two powers, which precluded Ranjít from extending his territory to the south, and which inaugurated a lasting friendship between him and the British. The Sikh chiefs of Sirhind and Málwa were declared independent of Láhor; and this was further confirmed by the proclamation of August the 22d, 1811, which also forbade them to encroach on one another. From that time till 1818 Ranjít was occupied in consolidating his power. In June 1818 he took Multán; and in July 1819 annexed Kashmír, and a few months afterwards Derah Gházi Khán. On the 14th of March 1823 he defeated the Afgháns in the great battle of Naushahra, and sacked Peshávar. The French generals Ventura and Allard had taken service with him the year previous, and his troops had now all the discipline of regular battalions. In October 1831 an interview took place between Lord W. Bentinck and Ranjít at Rúpar on the Satlej; and on the 17th of July previous a present of horses from the King of England arrived at Láhor, under the escort of Lieutenant Burnes. On the 26th of June 1838 the famous tripartite treaty between the English government, Sháh Shujá, and Ranjít, was concluded, which led to the Afghán war, the restoration of Sháh Shujá to his kingdom, and in the end to his murder and the expulsion of his English allies. Ranjít died before these events, on the 27th June 1839, and was succeeded by his only legitimate son Kharg Singh; but on the 8th of October Kharg Singh was seized and confined by his son Náo Nihál Singh, and died on the 5th of November 1840, poisoned by small doses of corrosive sublimate.[1] On the same day, as Náo Nihál Singh was returning from attending the funeral rites to his father, a gateway fell on him, killed the son of Rájá Guláb Singh, who sate by his side, and so injured him that he expired a few hours afterwards. This accident was owing to the treachery of Dhyán Singh, the prime minister, brother of Guláb Singh. Chand Kunwar, widow of Kharg Singh, now assumed the government; but on the 18th of January 1841 Sher Singh, an illegitimate son of Ranjít, attacked the citadel where Chand Kunwar was, and compelled her to recognise him as supreme. Chand Kunwar was murdered in June 1842, and Sher Singh on the 15th September 1843, by Ajít Singh; while at the same moment Pratáp Singh, the son of Sher, was killed by Lehna Singh. These murders were committed with the aid and assent of the minister Dhyán Sing, who was immediately afterwards shot by the conspirators. Hírá Singh, the son of Dhyán, a few days after revenged his father's death by killing both the above-named assassins; and Dhalíp Singh, said to be a posthumous child of Ranjít, was proclaimed king, with Hírá Singh as minister. Many murders and insurrections followed; and on the 21st December 1844 Hírá Singh was put to death. He was succeeded by Jawáhir Singh, who was shot by the soldiery on the 21st of September 1845; and Lál Singh was then made by them prime minister. The Sikh army had now for some time been utterly unmanageable; the English agent for Sikh affairs, Major Broadfoot, rather urged on than deprecated a collision; and on the 17th of November 1845 the Khálsa declared war against the English, and the Sikh troops crossed the Satlej on the 11th of December. On the 18th the battle of Mudkí was fought. The English under Lord Gough numbered 11,000; and had 215 killed and 657 wounded. The Sikhs had about 4000 infantry, 10,000 horse, and 22 guns, of which 17 were taken by the English. On the 21st Sir J. Little joined Lord Gough with a fresh division, and the English advanced to storm the Sikh position at Fírúzshahr, where they had 12 regiments of infantry,[2] 10,000 horse, and 100 guns. The combat ended doubtfully, though the English captured many guns, and 2000 of the Sikhs fell. But the English lost 694 killed and 1721 wounded; and nothing but the treason of the Sikh general Tej Singh, whose object was to crush his mutinous army, alone saved them. The campaign was closed by the decisive battle of Sobráon on the 10th of February 1846. The English loss was 320 killed and 2083 wounded; but the Sikhs had at least 5000 killed, and all their guns and baggage taken. On the 9th of March 1846 a treaty was concluded between Dhalíp Singh and the English, by which the Maharájá renounced all claim to territory south of the Satlej; ceded the Doáb between the Beah and Satlej, and the hilly countries between the Beah and Indus, including Kashmír and Hazára; paid 5,000,000 rupees; disbanded all but 25 regiments of infantry, and 12,000 horse, recognised the independence of the Jamu state; and agreed to other terms which placed the Panjáb in dependence on the British government. This treaty, however, was soon disturbed by an outbreak in Multán. Sáwan Mall, the able governor of this province under Ranjít, was murdered in September 1844, and was succeeded by his son Múlráj. His exactions and misrule led to an order for his deposition; and in 1848, when the English were acting as advisers to Dhalíp Singh, Mr Vans Agnew and Lieut. Anderson were sent to depose him, and instal Khán Singh as his successor. On the 18th of April 1848 they were attacked and murdered; and the second Sikh war broke out. The news reached Lieut. Edwardes on the 22d at Derah Fath Khán, where he was on political employ. He had with him 1 infantry regiment, with 4 extra companies, 2 guns, 20 swivels, and 350 horse. On the 25th he reached Leia, and commenced raising levies; and, being joined by the troops of Bháwalpúr, held Múlráj in check. Ere long, however, the old Sikh army joined the rebels, and Multán was not taken by the English till the 2d of January 1849. On the 15th of that month the indecisive battle of Chiliánwálá was fought, in which the English under Lord Gough had 22 European officers and 580 men killed, 67 European officers and 1678 men wounded or missing. The Sikhs under Sher Singh suffered far less. Several other sharp actions were fought; and the campaign ended on the 21st of February 1849 by the decisive victory of Gujarát, in which the English loss was 5 European officers killed and 24 wounded, 93 men killed and 677 wounded or missing. The Panjáb was then permanently annexed, and has ever since continued under the British government. The news of the outbreak of the late rebellion reached Peshávar on the 11th of May, the very day it occurred at Mírat.[3] There were then at Peshávar H.M.'s 70th and 87th regiments, 2 troops of European horse artillery, 2 companies of artillery, the 5th Bengal light cavalry, the 21st, 24th, 27th, 51st, 64th Bengal native infantry, the regiment of Khiláti Ghilzye, the 7th and 18th Bengal irregular cavalry; in all about 12,000 men, of whom 2570 were Europeans. At Naushahra were her H.M.'s 27th regiment, the 55th Bengal native infantry, the 10th irregular cavalry, and an artillery mountain train. At Atak were a detachment of the 58th Bengal native infantry, a company of artillery, and one of sappers and miners; and close by at Shamsábád the 17th irregular cavalry. At Mardán, in the Yúsufzye country, was the now famous corps of guides. At Ráwal Pindí was H.M.'s 24th regiment, the 58th Bengal native infantry, the Kumáon battalion of Gorkhas, the 16th irregular cavalry, and 1 troop of native horse artillery. Jílam was garrisoned by the 14th and 39th native infantry, and a native light field battery. H.M.'s 52d regiment, and a European troop of horse artillery held Siyálkot with the 35th and 46th Bengal native infantry, and 9th light cavalry. At Láhor were H.M.'s 81st regiment, with 2 troops of horse artillery and 4 companies of reserve artillery,—all Europeans; with the 16th and 26th light infantry, and 8th light cavalry. Close by at Amritsir were the 59th Bengal native infantry, with a light field battery, and a company of European reserve artillery in the strong fort of Govindgarh. Ghordáspúr was held by the 2d irregular cavalry; Kángra by the left wing of the 4th Bengal native infantry and half a company of native artillery; Núrpúr by a similar force of artillery and the other wing of the 4th native infantry; Hushyarpúr by the 33d native infantry, 9th irregular cavalry, and 1 troop of native horse artillery; Phillaur by the 3d native infantry; Jalandar by H.M.'s 8th regiment, a troop of European horse artillery, the 36th and 61st native infantry, and 6th light cavalry. At Fírúzpúr were H.M.'s 61st regiment, a European light horse battery, a company of European artillery, the 45th and 57th Bengal native infantry, and 10th light cavalry. At Multán were the 62d and 69th native infantry, 1st irregular cavalry, and a troop of native horse artillery. At Ambálah were H.M.'s 9th dragoons, 2 troops of European artillery, the 5th and 60th native infantry, and 4th lancers natives. In the adjoining Himálya range were the Nasírí battalion, H.M.'s 75th regiment, the 1st and the 2d Bengal fusiliers. To sum up, there were from Karnál to Pesháwar about 36,000[1] native troops, most of whom were Púrbiyahs from the same localities as the Mírat aud Delhi mutineers. Against these were 11 regiments of European infantry, 1 of cavalry, and 2000 artillery; in all about 10,500 men. There were, besides, 22,000 Panjáb troops interspersed with a fourth part of Hindústánís. Immediately after the outbreak 3 regiments of European infantry and 1 of cavalry marched against Delhi, leaving 7500 Europeans to watch 33,000 Hindústánís, for only 2 native regiments went to Delhi. The whole province of the Panjáb was to be held against such odds, the besieging army at Delhi was to be re-inforced, and the surrounding martial tribes kept in check. It was a prodigious task that was imposed on Sir John Lawrence, the chief civil officer in the Panjáb; but he nobly and successfully accomplished it. It was soon seen that the Hindústání regiments were ripe for revolt. On the 14th of May the 45th and 57th native infantry mutined at Fírúzpúr, and attempted to seize the great arsenal. The attempt failed, but most of the mutineers escaped. An outbreak at Láhor was prevented by dexterously disarming the native corps at Miyán Mír, the cantonment of Láhor, on the 13th of May. On the 21st the 55th mutinied at Mardán on seeing Europeans advancing to take their arms, and fled to the hills, but nearly all perished. On the 22d, the 5th light cavalry, the 24th, 27th, and 51st, were disarmed at Pesháwar, and the 10th irregular cavalry at Naushahra on the 26th. On the 7th and 8th of June the 3d, 36th and 61st native infantry, and 67th light cavalry, in the Jalandar Doáb, rose in revolt, and marched to Delhi. On the 1st the troops at Multán were disarmed; the 5th native infantry at Ambálah on the 15th; the 33d and 35th in Jalandar on the 25th; the 58th and part of the 14th native infantry at Ráwal Pindí on the 7th of July, on which day, however, the bulk of the 14th, seeing the Europeans approach, broke out, and were nearly all destroyed. Two days afterwards, the 46th and a wing of the 9th light cavalry mutinied at Siyálkot, and after murdering Brigadier Brind, Captain Bishop, two Drs Graham, the Rev. Mr Hunter, and others, the mutineers marched for Delhi by way of Ghordáspúr and Phillaur. They were overtaken at Núrpúr, 15 miles beyond that station, and, after a sharp struggle, all put to the sword. On the 30th of July the disarmed 26th fled from Láhor, but were overtaken and destroyed. The 10th light cavalry escaped from Fírúzpúr on the 19th of August. The 51st mutinied, and were destroyed at Pesháwar on the 28th of that month. On the 15th of July 259 men of the 4th light cavalry were disarmed at Ambálah; the 59th at Amritsir, seven days previous; the 4th at Hushyárpúr, three days previous; the 39th in the Deráját, one day previous. Thus 18 regiments, numbering 13,000 men, were disarmed without resistance; the native gunners of four batteries were removed from their guns, and their places supplied by European volunteers. The 21st native infantry, the regiment of Khil'ati-Ghilzye, and the 1st, 2d, 6th, 7th, 16th, 17th, and 18th regiments of irregular cavalry alone remained armed, and continue so to this day. But not only did Sir J. Lawrence hold the vast force of mutinous Sipáhís garrisoning the Panjáb in check, but he also detached powerful reinforcements to Delhi, without which that city would not have been taken, and India might have been lost. The first body of troops detached to act against Delhi were the 1st and 2d Bengal European regiments, and H.M.'s 75th, which went with General Anson. The siege train was then sent from Phillaur. Then followed a wing of H.M.'s 8th, and one of H.M.'s 61st, the guide corps, the 4th Sikhs, the 1st Panjáb infantry, the 1st, 2d, and 5th Panjáb cavalry, 300 Sikh artillerymen, and 1200 Sikh sappers and miners. General Van Cortlandt, with 1000 irregulars, cleared the western part of the Delhi territory. Lastly, General Nicholson led the remainder of H.M.'s 8th and 61st, the 52d, the 2d, 4th, and 7th Panjáb infantry, a siege train from Fírúzpúr, and the Kashmír contingent, against Delhi, leaving but 4500 European soldiers, sick included, to hold the Panjáb. Not a day had been lost in calling on the rájás of the protected Sikh states for their contingents. They nobly obeyed, to the number of eighty chiefs: the Rájá of Basáhir alone remained inactive. The Rájá of Jhínd was actually *the first man*, European or native, who took the field against the mutineers. He openly declared at once that he should side with the British, under whom he had lived happily for fifty years,—a speech which powerfully influenced the popular opinion. He marched with 800 men to Karnál, and thence in the van of the British troops advancing against Delhi, clearing the road for them, and procuring supplies. He held an exposed post during the siege; his troops guarded the ferry over the Jamná, on the road to Mírat, and shared in the final assault on the Kashmír gate. The Máhárájá of Pattiála supplied 5000 men, and kept open the road from Láhor to Delhi. The Rájá of Nabah held the fort of Lodiána. The Rájá of Kapúrthala, of high rank among Sikhs, next perhaps to the Rájá of Pattiála, furnished 2000 men, and, after serving in Jalandar, marched with his contingent into Oudh. The Rájá of Jamu supplied 2000 men. In short, the Sikh nation threw their sword into the scale against the rebels. A long-nourished hatred to Delhi and its people influenced them no doubt in this decision; but the stupendous fact remains, that England recovered her Indian empire mainly by the hands of those whom she had ten years before vanquished in many bloody battles. That administration must have been just, politic, and prosperous that could produce such a result. (E. B. E.)

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[1] Cunningham's *History of the Sikhs*, p. 164.

[2] Ibid. p. 5.

[3] Arrian, b. v. ch. xv.

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[1] Cunningham's *History of the Sikhs*, p. 37.

[2] *Asiatic Researches*, xvii. 232.

[3] "Great disaster."

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[1] Smyth's *Reigning Family of Láhor*, p. 33.

[2] Cunningham's *Sikhs*, p. 303.

[3] *Report on the Administration of the Punjáb*, 1856–58, section x.

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[1] *Report on the Administration of the Punjáb*, 1856–58, section xi.

PUNNAH, a town of British India, capital of a territory of the same name in Bundelcund, near a large *jhil*, or artificial lake, on the north-eastern slope of the barren range of the Punnah Hills, 130 miles S. of Calpee, 173 S.W. of Allahabad, and 668 N.W. of Calcutta. Though once a fine town, it is now quite ruinous. Many of the streets, well paved and lined with handsome, substantial houses, are tenanted only by monkeys, which grin on the passers-by from the roofs and windows. The large and elegant palace of the rajah, and many Hindu temples, are the chief buildings in the town; and the people being almost all Hindus, there are no mosques here. Punnah was formerly an important place, chiefly on account of the diamond mines in the vicinity. Although the gems are still found here, the business is now much less profitable than it once was. On the shores of the *jhil*, or tank, near the town, there are many fine mausoleums. The alligators in the water are considered sacred by the Hindus.

PUNO, a department of Peru, bounded on the N.W. and N. by the department of Cuzco, E. and S.E. by Bolivia, S. and W. by the departments of Moquegua and Arequipa; area 25,918 square miles. It is partially occupied by a range of the Andes, extending northwards from the province of Carangas in Bolivia to Lampa in this department. The principal rivers are the Ramis, Coata, and Ilave, all flowing into Lake Titicaca, which lies to the S.E. of the department, separating it from Bolivia. Puno contains extensive and good pasturages; and cattle, potatoes, and barley are among it products. The silver mines in the department were at one time second only to those of Potosi; but they have been for some time very little attended to. The department is divided into five provinces, as follows:—

	Districts.	Population.	Capital.
Carabaya	13	22,605	Crucero.
Azángaro	16	54,333	Azángaro.
Lampa	18	76,488	Lampa.
Guancané	11	56,765	Guancané.
Chucuito	12	75,957	Juli.
Total	70	286,148	PUNO.

The town of Puno, the capital, stands on a bay of the same name on the western shore of Lake Titicaca, 12,832 feet above the sea, 90 miles E. by S. of Arequipa. It is regularly and well built, chiefly of stone; and contains a cathedral, high school, hospital, &c. Puno is the seat of a superior court of law. Pop. 8000.

PURBACH, George. See Dissertation Fourth, section iv.; and Astronomy, *History of*.

PURBECK. See Dorsetshire.

PURCELL, Henry, the most celebrated of English musicians, was born at London in 1658, and died there on the 21st of November 1695. His father was a gentleman of the chapel royal, who died in 1664. It appears that Purcell received lessons in music from Cook and Humphrey and Dr Blow; and at the early age of eighteen was appointed organist of Westminster Abbey. In 1682 he was made organist of the chapel royal on the death of Low, the successor of Dr Christopher Gibbons. He began very early to compose music for the church, as well as for the theatre and the chamber; and superior genius and skill were shown in all his compositions. His music for the theatre and the chamber was exceedingly popular, and many of his compositions for the church still hold their place in the chapel royal and in English cathedrals.

Unlike some other English composers, Purcell was always ready to confess his obligations to those Italian models which he had studied. In the preface to his first set of Sonatas, 1683, he tells us that "he has faithfully endeavoured at a just imitation of the most famed Italian masters; and he thinks (though unskilled in the language of that country) he may warrantably affirm that he is not mistaken in the power of the Italian notes, or elegancy of their compositions." And again, in the dedication of the Score of his opera of *Dioclesian* (1691) to the Duke of Somerset, Purcell says,—"Musick is yet but in its nonage; a forward child, which gives hope of what it may be hereafter in England, when the masters of it shall find more encouragement. 'Tis now learning *Italian*, which is its best master. We must shake off our barbarity by degrees." If we find occasional crudity and harshness in the music of Purcell, we must consider that in his time musical composition was in a state of transition from rigid scholastic rules to the freedom of musical fancy. Dr Burney severely blames Purcell for using the chord of minor 6th with major 3d, and calls it "jargon;" but it so happens that this chord was freely used afterwards by the Bachs, Haydn, Mozart, Beethoven, Cherubini, and other eminent composers. Purcell's tomb and monument are in Westminster Abbey. His fertility in composition was wonderful. A great quantity of sacred music by Purcell remained in manuscript, when Mr Vincent Novello of London undertook to collect and edit the whole of Purcell's church music. This work appeared in 1826–36, in large folio, with a portrait, and an essay on the life and works of the composer. (G. F. G.)

PURCHAS, Samuel, an English divine, famous for compiling a valuable collection of voyages, was born in 1577 at Thacksted in Essex. After studying at Cambridge, he obtained the vicarage of Eastwood in his native county; but leaving that cure to his brother, he settled in London, in order to carry on the great work on which he was engaged. He published the first volume in folio in 1613, and the last four twelve years afterwards, under the title of *Purchas, his Pilgrimage, or Relations of the World, and the Religions observed in all Ages and Places.* Meanwhile he was collated to the rectory of St Martin's, Ludgate, in London, and made chaplain to Dr Abbot, Archbishop of Canterbury. His *Pilgrimages*, and the learned Hakluyt's *Voyages*, led the way to all the other collections of the same kind, which have been so justly valued and esteemed. (See Hakluyt, *Richard.*) But unhappily, by publishing, he involved himself in debt, and died in embarrassed circumstances about the year 1628. He likewise wrote *Microcosmus, or the History of Man*, 8vo, 1619; *The King's Tower and Triumphant Arch of London*, 8vo, 1623; and a *Funeral Sermon on Psalm* xxxix. 5, 8vo, 1619. A foreign writer describes him as "an Englishman admirably skilled in languages and human and divine arts; a very great philosopher, historian, and theologian; a faithful priest of his own church; very widely known for his many excellent writings, and especially for his large volumes pertaining to the East and West Indies."

PURGATORY, a place in which the just, who depart out of this life, are supposed to expiate certain offences which do not merit eternal condemnation. Broughton has endeavoured to prove that this notion was held by Pagans, Jews, and Mohammedans, as well as by Christians; and it cannot be questioned that, in the days of the Maccabees, the Jews believed that sin might be expiated by sacrifice after the death of the sinner. The following view of it is taken from a work which is considered as a standard by Roman Catholics:—First, every sin, how slight soever, though no more than an idle word, as it is an offence to God, deserves punishment from him, and will be punished by him hereafter, if not cancelled by repentance here. Secondly, such small sins do not deserve eternal punishment. Thirdly, few depart this life so pure as to be totally exempt from spots of this nature, and from every kind of debt due to God's justice. Fourthly, few will therefore escape without suffering something from his justice for such debts as they have carried with them out of this world, according to that rule of divine justice by which he treats every soul hereafter according to its works, and according to the state in which he finds it in death. From these propositions, which the Roman Catholic considers as so many self-evident truths, he infers that there must be some third place of punishment; for since the infinite goodness of God can admit nothing into heaven which is not clean and pure from all sins, both great and small, and as his infinite justice can permit none to receive the reward of bliss who as yet are not out of debt, but have something in justice to suffer, so there must of necessity be some place or state where souls departing this life, pardoned as to the eternal guilt or pain, yet obnoxious to some temporal penalty, or with the guilt of some venial faults, are purged and purified before their admission into heaven. This is what the Roman Catholic is taught concerning purgatory; and though he knows not where it is, of what nature the pains are, or how long each soul is detained there, yet he believes that those who are in this place, being the living members of Jesus Christ, are relieved by the prayers of their fellow-members here on earth, as also by alms and masses offered up to God for their souls. And as for such as have no relations or friends to pray for them or give alms, or procure masses for their relief, they are not neglected by the church, which makes a general commemoration of all the faithful departed in every mass, and in every one of the canonical hours of the divine office. The Protestant Church considers this doctrine to be "grounded on no warranty of Scripture."

PURITANS. See Nonconformists.

PURNEAH, a district of British India, in the presidency of Bengal, bounded on the N. by Nepaul and Sikhim, E. by the district of Dinagepore, S. by those of Malda and Bhaugulpore, and W. by that of Bhaugulpore: length, from N.E. to S.W., 117 miles; breadth, 105; area, 5878 square miles. It is low and flat, having no mountains or hills more than 275 feet above the sea. It is watered by the Ganges at its south-eastern extremity, and by the Kosee, Gogaree, and Mahanunda, affluents of that river. These and other smaller rivers are generally navigable for vessels of considerable size. The climate in the end of spring and beginning of summer is hot and dry; in the latter part of summer the rainy season sets in, and in winter the cold is often considerable. Rice is the principal crop raised; but wheat, barley, pulse, maize, millet, &c., are also cultivated. Sugar, cotton, tobacco, &c., are grown; and indigo is the chief article of commerce produced in the district. Some trade is carried on with the adjacent British districts and with Nepaul; cattle, grain, cotton stuffs, silks, and indigo being the chief exports. Pop. 1,600,000.

Purneah, the capital of the above district, on both sides of the Little Kosee, 283 miles N.W. of Calcutta. It covers a wide space of ground, but this is partly occupied by gardens and plantations. The principal street, which is on the left side of the river, is broad, straight, and lined with good tiled houses. The only public building of importance is that which accommodates the civil establishment for the district, and which stands in one of the suburbs. Pop. nearly 50,000.

PURSER. See Navy, "Paymaster."

PUSHKIN, Alexander Sergejewitsh, the most distinguished poet of Russia, was born on the 26th of May (June 7) 1799. He was sprung from an ancient Russian family, whose name figures in the history of the country, and who is introduced among the *dramatis personæ* of one of the poet's historical plays. He was likewise of Moorish descent. The daughter of Hannibal, a Moor whom Peter the Great bought and bred into a general, had married the great-grandfather of the poet, and, if we may trust the testimony of a bust, transmitted a tint of the Moorish blood to the young genius, who, in a few generations, was to render her family immortal. During his early education he seems to have showed capabilities of the first order. He entered the lyceum at Tsarskoe-selo in 1811, where he was distinguished for general ability and for an excellent memory; but he seems to have been deficient in concentrative power (such, at least, as the lyceum required), and too frequently squandered his time in aimless pleasures. Here he began to sow his wild oats, and wrote, amid much youthful fervour and excitement, numerous poetical pieces. His *Ruslan and Ljudmila*, a tale in verse after the manner of Ariosto's *Orlando Furioso*, closed the first period of his irregular poetical career. He had for his teachers at the lyceum Dershawin, Shukowski, and Kunitzin, men whom the poet ceased not to mention with respect and admiration, and two of whom were then the most celebrated poets of Russia. At the age of eighteen (1817) he left the institution and entered the civil service. He obtained a situation in the department for foreign affairs, and, full of the ardour of youth and of a fiery, poetic temperament, he found himself at once amid the gay and brilliant circles of the northern capital. The poem just referred to was written at the age of one-and-twenty. It was a real work of art. The critics attacked it because it was new and out of their line, and the public devoured it. It may be considered as the first great poetical work in the Russian language, and from it dates an important era in Russian literature. He now entered on his second period—a period characterized by a revolutionary spirit and a tone of disappointment and scepticism. It begins with *Plennik Kavkaskoi*, or "Prisoner of the Caucasus" (1822), and ends with the greatest and most remarkable of his works, *Eugene Onegin* (1825–1828). His *Ode to Liberty* cost him his freedom, and he was exiled to Bessarabia from 1820 to 1825. During this period his lyrical pieces give us his mental autobiography. In his more deliberate compositions Lord Byron exerted a great influence over the poetical development of Pushkin. The poets are similar in their form; their heroes and heroines resemble each other; and Pushkin's gloomy colouring and mysterious connection between guilt and fate always remind the reader of the great English poet. This Byronic phase of Pushkin's development closed with this second period, when he stepped forth into entire artistic independence and nationality. The poet returned from his Caucasian retirement at the invitation of the new emperor Nicholas, shorn of much of his bacchanalian wildness and license, and prepared to enter upon the third and the closing period of his career. He accepted, under a regime of terrorism, the office of historiographer of Peter I., with an annual salary of 6000 rubles (L.1350). He was now looked upon as a traitor to the cause of liberty; but three years of exile to the mouths of the Danube had probably cooled his enthusiasm. As the first fruits of his new office, he, in 1827, wrote a history of the insurrection of Pugatsheff. He passed the season of autumn, his favourite period for literary production, at his country seat, Michailowsk, in the province of Pskoff, in the company of an old nurse to whom he read the MSS. of his new works. In 1829 he published his historical poem *Poltawa*, a highly poetical representation of the time when his country began its great development under Peter the Great. To the same period also belongs his historical drama of *Boris Godunoff*, which some critics place next *Onegin* in point of poetical beauty. As a dramatic work, however, it is inferior to his *Stone Guest* (1836). During the same year (1829) he followed the triumphant march of Field-Marshal Paskiewitsch to Erzeroum, and in February 1831 he married. The handful of years which were yet in store for him were years of unmingled happiness. He wrote the charming novel, *The Daughter of the Captive*, and took an active share in the publication of a periodical called *The Reading Library*. He likewise published some of his most finished poems, and kept working at his *History of Peter the Great*, an achievement which he was not destined to complete. On the 27th of January 1837, Pushkin, who had become involved in a duel with one Van Heeckerin, a foreigner, received a wound which proved mortal on the 29th of the same month (February 10). Thus died the greatest poet which Russia has yet known, in the prime of his manhood and in the meridian of his genius. The emperor showed great kindness to the poet's widow and family, and commanded a splendid edition of his whole works to be published at his own expense. See *Sotchinenia A. Pushkina, isdanie Anenkova* ("The works of A. Pushkin, edited by Anenkov"), 7 vols., St Petersburg, 1854–57. (See the *National Review* for 1858.)

PUTEOLI (the modern *Puzzuoli*), a maritime city of Campania, was situated on the eastern shore of the Gulf of Baiæ. A colony from the neighbouring Greek city of Cumæ founded it. It was originally called *Dicæarchia*, and it afterwards acquired the name of Puteoli, from the wells (*putei*) in the vicinity. But the town was of no note in the history of the country until the second Punic war. At that time the Romans began to take advantage of its finely-sheltered harbour. They first used it in their warlike operations against Hannibal. After the war was finished, they made it the emporium of their eastern commerce. A powerful stimulus was in consequence given to the prosperity of the city. Its shore and vicinity, after the lapse of several years, presented a pleasing picture of thriving opulence. Some ships bound for the Turdetanians in Spain, with Italian produce, were hoisting their sails in the bay; others from Alexandria were unlading their cargoes of corn and costly wares along the arch-supported mole which ran out into the sea. From the extensive docks rose the huge skeletons of the vessels which were being built for the purpose of transporting the large obelisks from Egypt. Conspicuous among the houses on the shore, and surrounded with busy traffic, stood the factories of merchants from the Phœnician cities of Tyre and Berytus; while, studding the hills in the background were seen the palatial villas of the Roman patricians, and among others the famous *Academia* of the great Cicero. This prosperity seems to have continued during the entire period of the supremacy of the Romans. On the dismemberment of the empire, however, Puteoli began to sink in importance, and a series of dire calamities accelerated its decline. Alaric and Genseric plundered it in the fifth century. The devastation was completed not long afterwards by an earthquake and the subsidence of the land. It was re-peopled in the eighth century only to be assailed once more with severe disasters. In the ninth century the Lombard dukes of Benevento reduced it. In 1198 the eruption of the volcano of Solfatara damaged it considerably; and in 1538 the upheaval of Monte Nuovo caused it to suffer again under volcanic agency. The Puzzuoli of the present day is a poor unhealthy town of 10,000 inhabitants. The only traces of its ancient grandeur are some ruins, consisting of a building commonly called the temple of Serapis, a range of baths, a temple of Neptune, a mole, an amphitheatre, and a theatre.

PUTIVL, a town of European Russia, in the government of Kursk, on the Seim, 100 miles W.S.W. of Kursk. It is an ancient place, pretty well built, for the most part of wood; and it contains numerous churches, a convent, school, and two benevolent institutions. Vitriol, saltpetre, tiles, &c., are manufactured here; and an active trade in rural produce is carried on. Pop. (1849) 4310.

PUTNEY, a village and parish of England, in the county of Surrey, on the right bank of the Thames, opposite to Fulham, with which it is connected by a wooden bridge, 6 miles S.W. of St Paul's. The old church, which was partially rebuilt in the time of Henry VII., contains some interesting tombs and monuments. Besides places of worship for Independents and Wesleyans, Putney has national infant, and endowed schools. It is celebrated as the birth-place of the historian Gibbon. Pop. of the parish (1851) 5280.

PUTREFACTION. See Fermentation.

PUTTEE, a town of British India, in the Punjab, about 12 miles from the W. bank of the Beas, and 38 S.E. of Lahore. The most of the streets are paved, and the houses built of brick. The fertile and populous country in the vicinity is thought to be peculiarly suited for breeding horses, and there is a large government stud at Puttee. Pop. about 5000.

PUTTEEALA, a town of British India, capital of a dependent native state of the same name, in Sirhind, on the Kosilla, 1023 miles N.W. of Calcutta. It is walled, and has a citadel of no great strength, where the rajah resides. The town is compactly built of brick; and has a more neat and cleanly appearance than most Indian towns, notwithstanding its dense population. The territory of the state, which has an area of 4682 square miles, is very fertile, and exports grain in large quantities. It was taken possession of by the British in 1809; but the rajah retains the sovereignty, on condition of furnishing a certain number of troops in case of war to the British government. Pop. of the state 1,310,960.

PUTTUN, a town of British India, in the presidency of Bombay, and province of Guzerat, on the Saraswati, an affluent of the Banas, 63 miles N.W. of Ahmedabad. It is surrounded by a wall, partially built from the ruins of the ancient city of Anhulwara, whose site can still be traced. Several important manufactures are carried on at Puttun, especially those of swords, spears, pottery, silk and cotton cloth. Pop. estimated at 30,000.

PUTTY is a kind of paste compounded of whiting and linseed oil, beaten together to the consistence of a thick dough. It is used by glaziers for fastening in the squares of glass in sash-windows, and by painters for stopping up the crevices and clefts in timber and wainscots.

PUY, Le, a town of France, capital of the department of Haute-Loire, on the Borne, near the left bank of the Loire, 68 miles S.W. of Lyons. It presents an exceedingly picturesque appearance from a distance, on account of its remarkable and striking situation. Nearly the whole of the town is built on the steep slopes of a hill, which rises up in the centre to a scarped and flat-topped summit, crowned with an ancient castle. This rock, which is of volcanic formation on a calcareous base, is called the Rock of Corneille. A still more remarkable, though not so high rock is that of St Michael, which rises from the bank of the Borne, a short distance off. It is needle-like in shape, and its sides are almost perpendicular. The top is occupied by a small chapel dedicated to St Michael, to which access is gained by a winding stair partly cut in the rock. On a near view, Le Puy does not present so many charms to the visitor as at a distance, for it is ill-built, with narrow, irregular, steep, and ill-kept streets. In the loftiest part stands the cathedral, a heavy inelegant edifice in the Romanesque style. It is of considerable antiquity, and contains a richly-ornamented altar and a miraculous image of the Virgin. The Gothic church of St Laurent is chiefly remarkable for containing a monument of the celebrated Du Guesclin, whose entrails are buried here. Near the foot of St Michael's Rock stands an octagonal Romanesque building, long supposed to be a temple of Diana, but probably in reality a Christian baptistery. Le Puy has a good museum, especially rich in mineralogical and geological specimens, a public library, college, two hospitals, &c. Many of the women of the town are employed in making cotton lace. Woollen cloth, leather, nails, &c., are also manufactured; and an active trade is carried on here. Pop. (1856) 14,428.

PUY-DE-DOME, a department of France, lying between N. Lat. 45. 18. and 46. 16., E. Lon. 2. 27. and 3. 57., bounded on the N. by the department of Allier, E. by that of Loire, S. by those of Haute-Loire and Cantal, and W. by those of Corrèze and Creuse: length, from N.W. to S.E., 85 miles; average breadth, about 50; area, 3002 square miles. The surface is undulating, and has a general slope towards the north, a great part of the area being occupied by the valley of the Allier, which is known by the name of La Limagne. This valley extends from S. to N., and is bounded on either side by lofty branches of the Cevennes, from which smaller valleys descend, each watered by an affluent of the Allier. The western part of the department is mountainous, and contains two volcanic groups called the Monts Dômes and the Monts Dores. The former, which is also called the Chain of Puys, lies more to the north than the other, and reaches its culminating point in the Puy-de-Dôme, which gives its name to the department, and attains the height of 4805 feet above the sea. It has the form of a truncated cone, and has an uneven summit, with no trace of a crater. The whole mountain is covered with green and luxuriant vegetation; and the only traces of volcanic agency are the projecting blocks of lava here and there to be seen. The other summits of this group, about sixty in number, are of the same form and character, and in general have open craters. Of the Monts Dores the highest summit is the Puy de Sancy, 6196 feet above the sea. The slopes of all these mountains, as well as of those of Forez, which bound the Limagne on the E., are exceedingly fertile and beautiful; and the whole valley of the Allier, diversified with isolated hills and slopes, covered with corn-fields, vineyards, and meadows, and studded with towns and villages, presents a most picturesque appearance. The rivers of the department are the Allier, with its affluents, the chief of which are the Dore on the E., and the Sionte on the W. The Dordogne rises in this department, and forms part of its western boundary. The mineral riches of Puy-de-Dôme are very great; antimony, argentiferous lead, iron, coal, marble, granite, basalt, &c., being among its productions. The extent of arable land in the department is about 677,000 acres, of meadow land 165,000 acres, of vineyards 52,000 acres, of wood 151,000 acres, and of waste land 361,000 acres. Although agriculture is in a backward state, from the unwillingness of the people to depart from their old methods, yet the fertility of the soil prevents any deficiency in the quantity of the crops; corn, wine of good quality, potatoes, fruits, hemp, &c., are produced. Cattle are raised in large numbers, as well as horses of a small size, but much esteemed for riding. Silk-worms and bees are also reared. Puy-de-Dôme contains about 13,000 horses, 198,000 horned cattle, 528,000 sheep, 68,000 pigs, and 21,000 goats. Boars, deer, hares, rabbits, foxes, and other wild animals, are found here. Wolves, also, though much diminished in numbers, are still to be met with; and eagles, vultures, &c., haunt the mountainous districts. The forests produce large quantities of timber and firewood, especially pine, oak, and beech. The climate of the department is different in its different parts. In the Limagne the summers are very warm, and the winters short, though sometimes severe; but the higher regions are exposed to cold and inclement weather, often to violent storms. Besides farming, the industry of the people is chiefly employed in the working of mines and quarries. The manufactures of the department are not of much importance; cutlery, nails, paper, woollen cloth, hempen stuffs, &c., are the chief articles produced. A great number of the inhabitants of the mountainous districts leave their homes during the winter season, and travel through France in the pursuit of their several occupations. The principal articles of commerce are agricultural produce, cattle, hides, confectionary, paper, timber, &c. Numerous fairs and markets are held in the department. Puy-de-Dôme forms the diocese of Clermont, and has at that town a Protestant minister and a Jewish rabbin. There is an imperial court at Riom, five tribunals of the first instance, and other courts of law in the department. Its educational establishments include an academy, a lyceum, five colleges, and 508 primary schools. It is divided into five arrondissements as follows:—

	Cantons.	Commnnes.	Pop. (1856).
Claremont-Ferrand	14	108	177,834
Ambert	8	52	86,210
Issoire	9	116	97,670
Riom	13	128	152,323
Thiers	6	39	76,025
Total	50	443	590,062

PUYLAURENS, a town of France, in the department of Tarn, arrondissement and 13 miles S.E. of Lavaur. It has silk-mills, and a considerable trade in horses and mules. Pop. 6095.

PUZZUOLI, or POZZUOLI (anciently *Puteoli*), a town of Naples, in the province and 6 miles W.S.W. of Naples, on the E. side of the Gulf of Puzzuoli. It is slightly fortified, and contains a cathedral and several other churches and convents. It is chiefly interesting on account of the remains of the ancient town which it contains. The harbour is natural and well sheltered; and an active fishery is carried on here. The reddish volcanic gravel found in the vicinity is formed into a fine cement called *pozzolana*, after the name of the town. Pop. 10,000.

PWLLHELI, a sea-port town, municipal and parliamentary borough of Wales, in the county of Cærnarvon, on the N. side of Cardigan Bay, 21 miles S.S.W. of Caernarvon. Its situation is very fine, commanding a view of the whole of Cardigan Bay in one direction, and of Snowdon and other mountains in another. There is one principal street, which is lined with neat and well-built houses. The town contains places of worship belonging to the Church of England, Presbyterians, Independents, Baptists, and Methodists; national and other schools, a poor's-house, and a town-hall. A large number of the people are employed in ship-building; and there is a considerable coasting trade. The harbour is large enough to admit vessels of sixty tons burden. Excellent salmon is caught here; and also oysters, lobsters, crabs, and other shell-fish. Pwllheli unites with Caernarvon, Bangor, Conway, Crickcieth, and Nevin in returning one member to the House of Commons. Pop. (1851) 2331.

PYCNOSTYLE. See *Glossary* to ARCHITECTURE.

PYGMALION, a king of Cyprus, who, being disgusted at the dissolute lives of the women of his island, resolved to live in perpetual celibacy; and making a statue of ivory, he fell so passionately in love with it that he besought Venus to give it life. On his return, he embraced, as usual his ivory form, when he perceived that it became sensible by degrees, and was at last a living maid, who found herself in her lover's arms the moment she saw the light. Venus blessed their union; and he became by her the father of Paphus.

PYLADES, was a son of Strophius, King of Phocis, by one of the sisters of Agamemnon. He was educated together with his cousin Orestes, with whom he formed the most inviolable friendship, and whom he assisted to revenge the murder of Agamemnon, by assassinating Clytemnestra and Ægysthus. He also accompanied him into Taurica Chersonesus; and for his services Orestes rewarded him by giving him his sister Electra in marriage. Pylades had by her two sons, Medon and Strophius. The friendship of Orestes and Pylades became proverbial. (See ORESTES.)

PYLADES, a celebrated pantomimic dancer in the reign of Augustus Cæsar at Rome. (See BALLET.)

PYLUS (*Navarino*), an ancient town of Messina. Originally it seems to have stood at the foot of Mount Ægaleos. In that situation it was probably the "Sandy Pylos" so often mentioned in Homer as the city of Nestor.

Pym.

Thither the venerable patriarch returned after the siege of Troy, and there he was found several years afterwards by the wandering Telemachus, still enjoying a green old age amid a family of valiant and intelligent sons. When the Nestorian capital was destroyed, the name Pylus was transferred to a new city on the neighbouring promontory of Coryphasium. This town in its turn was left to fall into decay and ruin when its inhabitants, at the end of the second Messenian war, emigrated in a body. Pylus then remained desolate and unfrequented until, in 425 B.C., it became the scene of one of the severest checks which Sparta received in the Peloponnesian war. In that year a fort, built on the site of the ruined city, and garrisoned by a small Athenian force under Demosthenes, was unsuccessfully attacked by a body of Lacedæmonians. The assailants found themselves foiled on all hands. On attempting to land in front of the stronghold, they were repulsed. Equally vain was their endeavour to maintain a blockade by settling down on the wild and rugged island of Sphacteria to the south of the fort. In course of time an Athenian fleet arrived, and, taking up its position in the Bay of Pylus, between the island and the mainland, blockaded them in their turn. They were now completely at the mercy of their enemies. In vain did they sue for a truce. Much harder conditions were in store for them. In no long time they were surprised in their strong position by a body of troops under Cleon, and were forced to give up their arms. (See NAVARINO.)

PYM, JOHN, an English patriot and orator, was the son of a Somersetshire squire, and was born at Brymore in 1584. Having prepared for college, he entered Broadgate Hall (now Pembroke College), Oxford, where he equipped himself with all the resources and accomplishments of polite learning. On leaving the university he repaired to one of the inns of court, and stored his mind with the principles and details of common law. It was his good fortune to be appointed to an office in the Exchequer, where he could acquire business tact and financial skill. At length, in 1614, as member for the borough of Colne, he tested his political knowledge and oratorical powers on the great field of parliamentary debate. But it was not until 1620 that Pym began to take an active part in the resistance which the House of Commons was then making to the crooked and arrogant policy of James I. He placed himself by the side of those earnest men who were then forming themselves into a country party. The details of his deeds, it is true, have not been described; but at intervals his name becomes audible, and his form is seen amid the turmoil of the contest. At one time the monarch, balked by the Parliament in his schemes of kingcraft, is heard calling him "a very ill-tempered spirit." Shortly afterwards, he is found in the number of the twelve commissioners, or (as James in a mood of silly sarcasm designated them), "the twal kynges," who went to his majesty at Newmarket with a vindication of the privileges of Parliament. Then he is seen along with Coke, Philips, and Mallory, standing before the council-table, and receiving a sentence of imprisonment in the Tower for his incorrigible opposition to the court. The parliamentary activity of Pym increased after the accession of Charles I. in 1625. The cause of his country then became the task of his life. At all times, and in every place, his vigorous mind was still occupied with the one great object. He studied his speeches late into the night, at his house in Gray's Inn Lane. He explored, in search of precedents, every state-paper in the manuscript collections at Lambeth. He was found in the chair at every religious meeting which the serious-minded politicians of those troublous times convened. There was not an important discussion in the House in which his eloquent tongue was not heard vindicating the liberties of the people against the pusillanimous stratagems of the crown. At the bar of the Lords, too, he sometimes appeared to plead the cases which the Commons had taken up. It was there that he impeached Buckingham, the favourite of the king, for embezzling the public property; it was there that he arraigned Mainwaring, a creature of Laud, for employing all the persuasions and fulminations of the pulpit to advocate despotism. Nor when Charles brought affairs nearer to a crisis, by abandoning the custom of convoking Parliaments, and by governing by prerogative, did he bate one jot of his opposition. He opened a communication with the protesting covenanters of Scotland. He rode with Hampden through several of the counties, instigating the people to petition the coming Parliament. His weapons of eloquence also seem to have been diligently prepared; for on the meeting of the Short Parliament in 1640, he delivered a speech of the length of two hours, which immediately brought the court party to bay, and gave occasion for a speedy dissolution.

Pym.

It was, however, as a member of the Long Parliament that Pym rose to the height of his influence. The title of "King Pym," which was applied to him in ridicule, well describes the authority which he now began to wield. To lead was a duty for which his genius and multifarious acquirements well fitted him. The Parliament had not long commenced before he arraigned the Earl of Strafford at the bar of the House of Lords, on the charge of high treason. The legal evidence was not sufficient; but recourse was had to a bill of attainder. Concluding the impeachment on the 13th of April 1641, he triumphantly proved that the earl's government in Ireland had been subversive of "the fundamental laws" of the kingdom; and he demanded in works of terrific directness and emphasis that sentence of death should be passed upon the prisoner. "Nothing," said he, "can be more equal than that he should perish by the justice of that law which he would have subverted. Neither will this be a new way of blood. There are marks enough to trace this law to the very original of this kingdom; and if it hath not been put in execution, as he allegeth, these 240 years, it was not for want of law, but that all that time hath not bred a man bold enough to commit such crimes as these." Judgment was given in accordance with this demand; and the champion of the popular cause soon proceeded to assail other pliant servants of the king. He again appeared at the bar of the House of Lords to press the impeachment of Laud, on the charge of high treason. Not long afterwards he was the mover of the Grand Remonstrance to the monarch and the people, which, after enumerating a long list of grievances, concluded with the petition that the bishops should be deprived of their votes.

After the civil war had commenced, Pym continued to maintain his prominent position and influence. While the other chiefs of the Parliament were advocating their principles on the field of battle, he was in London ably conducting the executive. With masterly eloquence, he calmed the fears and conciliated the affections of the popular meetings in the Guildhall. With vigorous tact he defeated Waller's plot, and dragged the conspirators forth to punishment.

By this time, however, the continual toils and anxieties of Pym were fast bringing his career to a close. In November 1643 royalist horses were standing constantly saddled and bridled in the stables at London, ready to ride with the news of his death to the king at Oxford. On the 8th of December intelligence was brought to the Commons that their leader had just died at Derby House. They resolved to pay him the last honours with all the marks of esteem which lay in their power. On the 15th of the same month ten of the chief gentlemen among the Commons carried his bier on their shoulders; both Houses of Parliament walked before in mourning; and he was buried "with wonderful pomp and magnificence" in Westminster

Abbey. The nation erected a monument over his tomb, and appointed themselves the guardians of his family.

(See an able and erudite Life of John Pym, containing numerous interesting extracts from his speeches, in Forster's *British Statesmen*, published in Lardner's "Cabinet Cyclopædia.")

PYNAKER, ADAM, an eminent Dutch landscape-painter, was born in 1621 at Pynaker, the village whose name he afterwards assumed. His style was formed during a residence of three years in Italy. Accordingly, on his return to his native land, he painted landscapes very different in character from those of his fellow-countrymen. His favourite subject was a wild mountain scene enlivened by the sheen of a rushing cascade, and softened by silvery birches and other trees. Occasionally there were introduced ruined castles crowning the heights, and solitary herdsmen tending their cattle in the plain below. He was also fond of representing evening scenes on the Tiber. The golden glow of the sunken sun was still lingering on the tops of the trees; barges were sailing down the stream laden with goods and passengers; and flocks were grazing and peasants were sauntering among the luxuriant herbage on the banks. Pynaker had executed about seventy pictures at his death, which took place in 1673.

PYRAMIDS. See EGYPT, § iii.

PYRENEES, a mountain chain in the S.W. of Europe, separating France from Spain, and extending from Cape Creux on the Mediterranean, westwards to the neighbourhood of Fuenterrabia on the Bay of Biscay. It lies between N. Lat. 42. 26. and 43. 23., E. Long. 3. 10. and W. 0. 48. Its length is about 270 miles; and in the centre, where its width is greatest, it has a breadth of 60 miles. It does not consist of a single chain of heights, but of two parallel ranges about 20 miles distant, connected near the centre by a transverse ridge. It is near the middle of the range that the highest elevations occur; from this point it gradually slopes downwards to either extremity. From the central ridge numerous spurs project, both to the north and to the south; between which lie the principal valleys of the Pyrenees. These valleys do not extend, like those of the Alps, in the direction of the principal chain, but at right angles with it; and they terminate in what are called necks (*cols*) or gates (*portes*), where there are frequently passes over the mountains. The length of the valleys varies from 10 to 40 miles, and many of them terminate in vast circular basins called *cirques* or *oules*, surrounded on three sides by steep precipices. The slope of the mountains on the side of France is much more gradual than on the other side. On the former side there are gentle declivities and terraces, which lead down to smooth and verdant meadows; while on the Spanish side the scenery is wild and rugged, and the precipices steep. The principal summits and ridges of the Pyrenees are the following, beginning from the Mediterranean :—

	Height in feet.		Height in feet.
Le Canigon	9,051	Port Viel d'Estaube	8,323
Pic Pedroux	9,511	Port de Pinede	8,122
Col de Puymoren	6,240	Mont Perdu	10,891
Pic du Port de Siguier	9,523	Le Cylindre	10,796
Montcalm	10,663	Port de Gavarnie	7,582
Nethou	11,063	Passage de Tourmalet	7,075
Maladetta	10,764	Vignemale	10,718
Port d'Oo	9,756	Pic du Midi	9,350

The chain of the Pyrenees has very much the appearance of a huge wall between the two countries which it separates, as the ridge has almost everywhere a height little less than that of the lofty summits. The passes of the mountains are at a much greater height than many of those across the Alps, and they are in consequence much less accessible. Although there are as many as seventy or eighty passes in the whole range, many of them are both difficult and dangerous, and there are but few practicable for carriages, such as that of the Bidassoa near the Bay of Biscay, and that of the Col de Pertus along the shore of the Mediterranean. The snow-line of the Pyrenees has an elevation of about 9000 feet on the northern slope, and 8000 on the southern; being considerably below that of the Alps. There are numerous glaciers in these mountains, but they are in general of small size and widely removed from each other. They only occupy the higher slopes of the mountains, and not like those of the Alps the deep glens and valleys. The most important of the glaciers are those of Maladetta, Cabridoul, Mont Perdu, Vignemale, and Neouvielle. The most of the glaciers, as well as of the lakes, which are generally of a small size, lie on the French side of the mountains. Numerous streams take their rise in the Pyrenees, but the most of them are small and insignificant. Each of the valleys is traversed by a brook, called in French *Gave*, in Spanish *Gaba*, and these again unite to form larger rivers. Those on the north side form the Adour, the Ariège, and the Garonne, flowing into the Bay of Biscay; and the Aude, Gly, Tet, and Tech, into the Mediterranean. Those on the Spanish side, with the exception of the Bidassoa, which falls into the Atlantic, and a few small streams into the Mediterranean, join the Ebro on its left bank. There are many mineral springs, both cold and hot, especially on the French side of the mountains. The principal of these, which are much frequented by visitors, are Bagnères de Luchon, Bagnères de Bigorre, Barège, Cauterets, St Sauveur, Eaux Bonnes, and Eaux Chaudes. In geological formation, the nucleus of the mountains is granitic, and the highest summits of the chain are of this nature. Micaceous schist, limestone, sandstone, oolite, and calcareous strata also occur on the lower slopes; and trap, basalt, porphyry, &c., are scattered about in different places. Iron, copper, zinc, and lead are among the mineral riches of the Pyrenees; but iron is the only one of these that has been profitably worked. The climate of the mountains varies considerably in different parts: towards either extremity the lower elevation of the range, and the vicinity of the sea, renders it more mild than it is in the centre. Vegetation ascends to a higher altitude here than in the Alps; and the immense forests which cover the sides and sometimes the tops of the mountains, not only of firs, but of oaks and beeches, form one of the most characteristic and beautiful features of the Pyrenees. The timber has, however, suffered much from the carelessness and waste of the people of the country. These vast forests are filled with wild animals of many different kinds, the bear, the boar, the wolf, the lynx, and the fox, being among the number. The izard, an animal like the chamois, but of smaller size, and the wild goat, form a great attraction for the sportsman. The rivers abound in trout, and those that flow into the Atlantic in salmon. The inhabitants of the Pyrenees include several races that are remarkable for their antiquity or peculiarities of dress and manners. At the western extremity, partly in France and partly in Spain, dwell the Basques, the descendants of the ancient Cantabrians, who so stubbornly resisted the Roman arms, and have since kept their position in these mountain fastnesses against all invaders. Further east, on the French side, are the simple and primitive people of Béarn, from among whom Henri IV. sprung; and in the eastern part of the mountains the inhabitants of the French side have much resemblance to the Catalans of Spain. The people on the Spanish side of the Pyrenees are a bold hardy race, living by smuggling and the chase, with an invincible hatred to the French, and forming excellent guerilla soldiers, as has often been proved. The Pyrenees have been the scene of several important historical events. Hannibal crossed them by the Col de Pertus, just before his more celebrated passage of the Alps; and Cæsar afterwards did so at the same place. In 778, Charlemagne, advancing into Spain, crossed by the Pass of Roncesvalles, where he suffered a defeat and lost many of his peers at the hands of the Basque mountaineers. The same pass was again surmounted by an English army under the Black Prince, invading Navarre; and in 1813, after the victory of Vittoria, the British army under Wellington drove the French across the Pyrenees into their own country. It was on this occasion that the battle of Roncesvalles, the assault and capture of St Sebastian, the passage of the Bidassoa and of the Nivelle, and other actions, took place.

Pyrénées, *Basses*, a department of France, in the south-western corner of the country, lying between N. Lat. 42. 47. and 43. 35., E. Long. 0. 2. and W. 1. 45.; bounded on the N. by the department of Landes, E. by those of Gers and Hautes-Pyrénées, S. and S.W. by Spain, and N.W. by the Bay of Biscay: length, from E. to W., 88 miles; greatest breadth, 54; area, 2900 square miles. It lies in the lower slopes and at the foot of the Pyrenees, from which it derives its name; and a part of its surface is occupied by the offsets and valleys which extend northwards from these mountains. The department is watered by the streams which rise in the Pyrenees, and flow down these valleys; most of them, except the Nivelle, and the Bidassoa which rises in Spain, and forms the frontier between the two countries, flow into the Adour. This river, which only washes the department at its N.E. corner, and again at the N.W. near its mouth, receives, among other affluents from Basses-Pyrénées, the Gave de Pau, the Gave d'Oloron, and the Nive. Of these rivers, the Adour, Nive, and Nivelle, are navigable for some distance above their mouths; but all are employed for floating down timber and other articles almost from their very sources. Though the soil is in general not very remarkable for fertility, the lower valleys are richly productive, and the loftier slopes and mountains, besides their vast and valuable forests, afford excellent pasturage. The hillsides are covered with excellent vineyards, and with plantations of fruit trees. There are, however, some tracts of barren or marshy ground, especially in the N.W. and near the Adour. The climate of the lower regions is temperate and healthy, though very variable; but in the more elevated parts the *goître* is not unfrequent. The department is calculated to contain 386,072 acres of arable land, 321,671 acres of wood, 57,266 of vineyards, 163,720 of meadows, and 841,995 of heaths and waste land. Agriculture is in a very backward state, and the produce of corn is not at all adequate to supply the wants of the people. Besides maize, which forms a principal article of food here, wheat and flax are the chief crops raised; while rye, barley, and millet are also grown. The quantity of wine produced in the department is upwards of 6,500,000 gallons annually. Horses, mules, and cattle are raised here in considerable numbers, as well as sheep and pigs; the latter of which supply the much-esteemed hams of Pau and Bayonne. The mineral riches of the country are very great, including iron, salt, marble, alabaster, slate, limestone, and potter's clay, which are worked to some extent. Manufactures have made considerable progress in the country, especially those of linen and woollen stuffs; as well as leather, paper, pottery, hardware, chocolate, and brandy. Ship-building is carried on along the coast, the timber of the forests being excellent for that purpose. The commerce is very active; horses, cattle, hams, hides, wool, wines, brandy, timber, and other produce of the country are exported; while colonial wares, whale and seal oil, &c., are imported. A great deal of trade, chiefly contraband, is carried on with Spain. The department forms the diocese of Bayonne; and besides the places of worship of the established church, contains a Calvanistic church at Orthez, and several Jewish synagogues. There is at Pau a court of appeal for the three departments of Landes, Hautes, and Basses-Pyrénées; five tribunals of the first instance, and two of commerce, being the other courts of justice in the department. For educational purposes there are a normal school, a college, a lyceum, six superior communal schools, and 914 elementary schools. The capital is Pau, and there are five arrondissements as follows:—

	Cantons.	Communes.	Pop. (1856).
Pau	11	185	127,771
Oloron	8	80	73,675
Orthez	7	135	78,929
Bayonne	8	52	86,996
Mauléon	6	108	69,071
Total	40	560	436,442

Pyrénées, *Hautes*, a department of France, lying between N. Lat. 42. 39. and 43. 34., E. Long. 0. 30. and W. 0. 20.; bounded on the W. by the department of Basses-Pyrénées, N. by that of Gers, E. by that of Haute-Garonne, and S. by Spain: length, from N. to S., 48 miles; greatest breadth, 45; area, 1790 square miles. The surface is very mountainous, being almost entirely occupied with the Pyrenees and their branches. In many of the glens and valleys the scenery is of the most sublime and beautiful character. The country slopes gradually towards the north; and a chain of hills running in the same direction separates between the valley of the Adour on the W. and of the Garonne on the E. These rivers receive all the numerous brooks which flow down from the mountains; the chief affluents of Adour being the Gave de Pau, which waters the south-west of the department, and the Arros, which flows northward, and joins it from the E. The Garonne, rising in the valley of Arau, which belongs to Spain, receives from this department the Neste in the south-east, the Gers, and the Baise, which water its north-eastern portion. The principal plain in the Hautes-Pyrénées is that of Bigorre, which lies between two branches of the Pyrenees, and slopes gradually towards the north. With the exception of this plain, there is very little good soil, from the rugged and mountainous character of the country. The pasture grounds, however, are good, and the forests valuable. The extent of arable land is estimated at 235,000 acres; of meadow land, 123,000 acres; of vineyards, 37,000 acres; of wood, 200,000 acres; of waste land, not less than 395,000 acres. The principal crops are maize and wheat, but the quantity produced is insufficient for domestic consumption; of the wine grown, however, there is a surplus for exportation. The climate varies with the varying elevation of the country; but it is on the whole salubrious. On the plain of Bigorre it is mild; but in the higher regions changeable and inclement weather prevails. Besides agriculture, the peasantry are actively employed in pastoral pursuits. Large numbers of horses, which are much valued for cavalry, as well as horned cattle, mules for export into Spain, sheep and pigs, are raised here. Much attention is also paid to poultry, especially geese, and to bees. The mineral wealth of the department is great, including iron, copper, zinc, lead, &c.; but these are only worked to a small extent. Granite, marble, chalk, limestone, and slate, are quarried. Manufacturing industry is not very active here. It consists chiefly in the working of iron, and producing woollen and cotton fabrics, the stuffs called *barège* (from the town of that name), paper, and leather. There is a considerable trade in timber for ship-building, cattle, salt provisions, cheese, &c. Hautes-Pyrénées forms the diocese of Tarbes, and contains three courts of the first instance, 4 colleges, 4 upper schools, and 768 elementary schools. The capital is Tarbes; and there are three arrondissements as follows:—

	Cantons.	Communes.	Pop. (1856).
Tarbes	11	195	111,997
Argelès	5	91	41,682
Bagnères	10	195	92,177
Total	26	481	245,856

PYRÉNÉES-ORIENTALES, a department of France, lying between 42. 20. and 42. 55. N. Lat., 1. 44. and 3. 10. E. Long., bounded on the W. and N. by the departments of Ariège and Aude, E. by the Mediterranean, and S. by Spain: length, from E. to W., 75 miles; greatest breadth, 35; area, 1585 square miles. Though the greater part of the surface is occupied by mountains, yet there is a wide plain stretching along the shore of the Mediterranean. In the interior there are two nearly parallel chains of hills which run from E. to W., and divide the country into three long valleys, watered by the Gly, the Tech, and the Tet respectively. These rivers, none of which is navigable, fall into the Mediterranean, and water the greater part of the country; while the Aude, which rises in the east of this department, flows northward through the department to which it gives its name, and it too falls into the Mediterranean. The natural fertility of the soil is by no means great, and a large portion of it is unfit for cultivation; but the plain along the sea-shore is so well watered by a system of irrigation from the rivers that traverse it as to produce a supply of corn more than enough to meet all domestic wants. In the western portion of the department, which is very hilly, vines thrive well on the high ground, while the valleys are little inferior to the eastern plain; and even along the southern frontier, rye, oats, maize, pulse, &c., may be grown, where neither wheat nor the vine could flourish. The department contains about 346,000 acres of arable land, and 395,000 of heaths and waste land, the rest being occupied with forests, vineyards, &c. The annual produce of wines is about 8,800,000 gallons, and more than a third of this quantity is exported. The wines of Collioure, Port-Vendres, Rivesaltes, &c., which come from this country, are very highly esteemed. The extent of the pasture-grounds enable the people to keep large numbers of live stock,—horses, mules, horned cattle, sheep, and goats. Like the other Pyrenean departments, this region contains many valuable minerals. There are numerous iron mines here, as well as smelting-houses and forges for the metal. Coal, marble, alabaster, granite, and sulphur are also worked. The manufactures of Pyrénées-Orientales include those of leather, broad cloth, hosiery, corks, brandy, pottery, and bricks, besides those connected with the production of wine and iron. The fisheries of tunny, anchovies, sardines, &c., along the coast are very productive; and there is an active coasting trade. The exports considerably exceed the imports in value; and consist of wine, brandy, cattle, salt provisions, linen and woollen stuffs, iron, and marble. The department forms the diocese of Perpignan, and contains three courts of the first instance and one of commerce. For the purposes of education it has a college, a normal school, a superior communal school, and 313 elementary schools. It is divided into three arrondissements as follows, and the capital is Perpignan:—

	Cantons.	Communes.	Pop. (1856).
Perpignan	7	85	90,099
Céret	4	42	42,181
Prades	6	101	50,776
Total	17	228	183,056

PYRITES. See CHEMISTRY, §§ *Iron*, and *Copper*.

PYRITZ, a town of Prussia, in the province of Pomerania and government of Stettin, in a fertile plain 24 miles S.E. of Stettin. It is surrounded by walls, with five lofty towers, now the only remains of its ancient fortifications, and entered by three gates decorated with antique ornaments. There are here a town-hall, churches, schools, and hospitals, as well as manufactures of leather and cloth. Not far off is a fountain where the earliest converts to Christianity in Pomerania, 7000 in number, were baptized by Otto of Bamberg in 1124. A monument was erected here in 1824 to commemorate the event. Pop. 5807.

PYROMETER.

PYROMETER (from πῦρ, *fire*, and μέτρον, *a measure*), an instrument for estimating high degrees of temperature, such as the heat of furnaces and the fusing-points of many of the metals. The scale of a common thermometer is graduated on the supposition that equal increments of heat produce equal amounts of expansion; but this is only true within moderate ranges of temperature; for as we increase the heat, most fluids leap forward, as it were, to meet their boiling points, and cease to be trustworthy as measurers of temperature. Thus, according to Regnault, the total expansion of mercury for three progressive intervals of 180° Fahr. is as follows:—Between 32° and 212° it is 1 part in 55·08 parts; between 212° and 392° it is 1 in 54·61; and between 392° and 572° it is 1 in 54·01. Thus, at various times, instruments have been contrived for measuring temperatures above the boiling-point of mercury (662° Fahr.), the term *pyrometer* having been first used by Muschenbroek about the year 1730. His instrument consisted of a metallic bar, about six inches long, one end of which was fixed, while the other was free to move as the metal increased in length, from the effect of a number of spirit-lamps placed beneath it, and charged with a known quantity of highly-rectified spirits of wine. As the bar increased in length, it moved a pinion and wheel, and the latter moved an index over a graduated circle, each degree of which corresponded to a linear expansion of $\frac{1}{12500}$ths of an inch. The instrument was improved by Desaguliers, who substituted fine cords and friction rollers for the wheel and pinion. Pyrometers were also contrived by Ellicott, Graham, Smeaton, Ferguson, and others. These do not differ from Muschenbroek's instrument, in which the minute expansion of a bar of metal is multiplied by means of a succession of levers, or a system of wheels and pulleys, a method which must be very liable to error, in consequence of the bending of the parts, obliquity of action, and other causes. Besides this, the substance itself, if liable to be softened by heat, would undergo compression in moving the machinery, an objection which, to a certain extent, applies to the more refined apparatus employed by Lavoisier and Laplace, in which the expansion of the metal bar deflected a telescope from the position that it had at the beginning of the experiment, and the absolute expansion was deduced from the extent of this deflection, which was read off upon a graduated scale placed at a considerable distance in front of the telescope. In 1794 Troughton contrived an apparatus somewhat similar; only, instead of a telescope, he used a spirit-level, the deviations of which from the horizontal determined the expansion of the metal.

Pouillet's method may also be referred to for measuring directly the linear expansion of solids, and it has the advantage of being applicable to very high temperatures. It consists of a solid plate of metal, on which is placed a radius turning on a centre, and traversing a graduated arc, the divisions of which are read off by a microscope. The radius carries a telescope of short focus, fixed at right angles to its direction, while a similar telescope is fixed to the plate itself, allowing the radius to traverse under it. The bar which is the subject of experiment is placed in a copper trough furnished with parallel plates of glass, through which its ends can be seen. Now, if one extremity of the bar be kept opposite the fixed telescope, while the moveable telescope is directed to the other extremity at the commencement of the observation, any expansion of the bar caused by raising its temperature may be estimated by the arc through which the radius must be turned, in order to bring the moveable telescope to bear on the other extremity in its new position, the distance of the radius from the bar being accurately known. For very high temperatures, the bar may be placed in a furnace, and when raised to the required temperature, apertures may be opened in the furnace walls, so as to give a view of the ends of the bar, and allow its expansion to be measured as before. By means of this apparatus an expansion in the bar of $\frac{1}{1980}$th of a millimetre, or about $\frac{1}{50000}$th of an inch, can be appreciated.

In the measurement of the base-line for the great French survey, Borda used rods consisting of a rule of brass placed upon a somewhat longer rule of platinum, and attached at one extremity. The portion of the platinum rule not covered by the brass one was divided into millionths of the entire length of the rule, and further subdivided by means of a vernier and microscope adjusted to the extremity of the brass rule. The value of each of these divisions was first ascertained by surrounding the compound rule with melting ice, and afterwards with boiling water, when it was only required to observe the indications of the vernier to apply the requisite correction for reducing the length of the rod to the standard temperature. Ramsden's contrivance, used by General Roy in determining the expansion of the rods employed in measuring the base-line on Hounslow Heath was as follows:—The rod was immersed in water, and over each extremity was placed a microscope, to which a slow motion could be given in the direction of the length of the bar by means of a micrometer-screw. The lines of collimation of the microscopes having been adjusted so as to coincide with two points near the ends of the rod, the temperature of the water was gradually raised any required number of degrees, as indicated by a thermometer, when the elongation of the rod destroyed the coincidence of its extremities with the lines of collimation of the microscopes, which was re-established by turning the micrometer-screws, and noting the number of turns and fractions of a turn required for the purpose. In this way a direct measure of the expansion was obtained, free from the errors of levers, wheels, and pinions.

In the measurement of the base-line of Loch Foyle for the ordnance survey of Ireland, General Colby employed a compound bar of iron and brass, so arranged that their different powers of expansion and contraction should preserve exactly the same distance between two points at the extremities of the bars, instead of the usual method of allowing for the change in length according to the temperature at which each rod was laid. The two bars, one of iron, the other of brass, each ten feet long, were placed parallel to each other, and riveted together at their centres, and coated with a non-conducting substance, to equalize the susceptibility of the two metals to change of temperature. It was ascertained, by numerous experiments, that the iron and the brass bars expanded and contracted, in their transitions from cold to heat and from heat to cold, in the proportion of 3 to 5. Across each extremity, therefore, of these combined bars was fixed a tongue of iron, with a minute dot of platinum, so situated that under every degree of expansion and contraction of the rods the dots at each end always remained at the constant distance of 10 feet.

In the *Philosophical Transactions* for 1782, 1784, and 1786, is a description of Wedgwood's pyrometer. This was based upon the property possessed by clay to contract and harden by exposure to a high temperature, the clay, under such circumstances, losing a portion of its combined water, exactly proportioned, as it was thought, to the intensity of the heat. The clay was punched out into small cylinders, with one side flattened, and having been exposed to the temperature which it was desired to measure, the amount of the contraction was determined by sliding the cylinders along a metallic groove or gauge, the sides of which gradually converged until they arrived at a point beyond which they would not descend. The gauge was divided into 240 parts or degrees, each of which was calculated to be equal to 130° Fahr., while the zero of the scale, indicating a red heat, corresponded, according to Wedgwood's experiments, to 1077°. The difficulty of obtaining clay of uniform composition is one objection to this method of measuring high temperatures; different kinds of clay afford very different results, as does also the same kind of clay prepared with a little more or less of mechanical force; but the most fatal objection is, that clay will contract as much by the long continuance of a comparatively low heat as by the short continuance of a high one. This accounts for the enormous exaggeration of Wedgwood's degrees, and the disuse into which the instrument has fallen.

Achard contrived a pyrometer in the form of the common thermometer, consisting of a bulb and graduated tube of semi-transparent porcelain highly baked, and containing a fusible alloy of bismuth, lead, and tin, which liquefied at about 212°, and by its expansion noted higher temperatures, the semi-transparent material allowing the rise of the metal to be seen.

The method contrived by Messrs Dulong and Petit for measuring the absolute expansions of different substances deserves notice. By observing the difference in height at which mercury stood in the two limbs of a U tube, when of different temperatures, they obtained the absolute expansion of the mercury, and by comparing this with the apparent expansion of mercury in a glass tube, they deduced the absolute expansion of the glass. When the expansion of a metal was to be estimated, a cylinder of it was put into a glass tube, closed at one end, and drawn to a capillary opening at the other, while the rest of the tube was filled with mercury. On heating the tube, a portion of the mercury was expelled, equal to the excess of the absolute expansions of the mercury and the metal above that of the glass; and as the expansions of the mercury and of the glass had already been determined, the weight of the mercury expelled determined the expansion of the metal.

In 1803 M. Guyton de Morveau submitted to the National Institute a pyrometer, consisting of a bar of platinum, about 2 inches long, placed in a porcelain groove, one end resting against the solid end of the groove, while the other, pressed upon the short arm of a lever, the longer arm of which moved a vernier over a graduated circular arc. The indications of the vernier at the beginning and end of an experiment furnished the means for determining an expansion. This instrument, however, was not applied to the determining of higher temperatures than that of the melting point of antimony, in consequence of the softening which platinum undergoes at a red heat.

In the *Philosophical Transactions* for 1830 is a description of Professor Daniell's pyrometer, which deserves special notice, as being the first instrument constructed for determining high temperatures with anything like accuracy. It consists of two parts, the *register* and the *scale:* the register is a solid bar of black-lead earthenware highly baked; in this is drilled a hole, into which a bar of any metal 6 inches long may be dropped, so as to rest upon its solid end. A cylindrical piece of porcelain, called the *index*, is next placed on the top of the bar, and confined in its place by a ring or strap of platinum passing round the top of the register, which is partially cut away at the top for the reception of a wedge of porcelain. When this arrangement is exposed to a high temperature, the expansion of the metallic bar forces the index forwards to the amount of the excess of its expansion over that of the black lead, and on cooling, the index will be left at the point of greatest elongation. It is the function of the scale to measure the distance which the index has been thrust forward from its first position. The scale, which is independent of the register, consists of two rules of brass joined together at a right angle by their edges, and fitting square upon two sides of the black-lead bar. At one end of this double rule projects at a right angle a small plate of brass, which may be brought down upon the shoulder of the register, which is formed by the notch cut away for the reception of the index. Attached to this frame is a moveable arm turning near one end upon a centre, and carrying at its other end an arc of a circle, the radius of which is 5 inches, and divided into degrees and thirds of a degree. Upon this arc, at the centre of the circle, turns another lighter arm, to the further end of which is attached a vernier moving upon the face of the arc, and subdividing it into minutes of a degree: the other end passes beyond the centre, and terminates in a steel point turned inwards at a right angle.

The various parts of the instrument are represented in figs. 1 and 2. Fig. 1 represents the register, in which A is the bar of black lead, *aa'* the cavity for the reception of the metal bar, *cc'* is the porcelain index, *d* the platinum band, with its wedge *e*. Fig. 2 represents the scale by which the expansion is measured, *ff'* is the greater rule upon which the smaller one *g* is fixed square. The projecting arm *h* is also fitted square to the ledge under the platinum band *d*. D is the arm which carries the graduated arc attached to the rule *ff'*, moving on the centre *i*. C is the lighter bar moving on the centre *k*; H is the vernier, *m* the steel point. The rule *g* can be adjusted upon *ff'*, so that the arm *h* may be adjusted to the centre *i*, in order that at the commencement of an experiment the vernier may rest at the beginning of the scale.

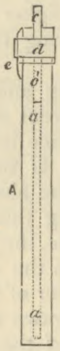

Fig. 1.

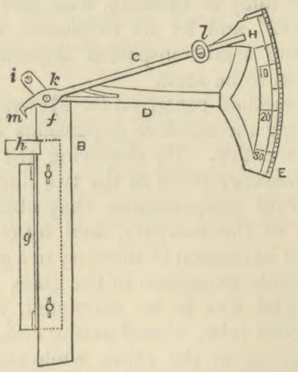

Fig. 2.

When an observation is to be made, the metallic bar is placed in the cavity of the register at the ordinary temperature; the porcelain index is pressed down upon it, and firmly fixed in its place by means of the platinum strap and the porcelain wedge. The scale is then applied by carefully adjusting the brass rule to the sides of the register, and fixing it by pressing the cross piece upon the shoulder, and placing the moveable arm so that the steel point of the radius may drop into a small cavity made for its reception, and coinciding with the axis of the metallic bar. The minute of the degree which the vernier indicates upon the arc must be noted; the scale is then removed, and the register exposed to the temperature which is to be measured. After it has been withdrawn and allowed to cool, the porcelain index retains the position corresponding to the maximum temperature of the rod; the scale being now again applied to the register in exactly the same position as before, the arc through which the radius must be moved to bring the point in the arm of the lever to bear against the index, measures the quantity by which the latter has been protruded. This quantity is the excess of the expansion of the metal rod over the black-lead envelope, or rather that excess diminished by the contraction of the index in cooling. The scale of this pyrometer is connected with that of the thermometer by observing the amount of expansion between two fixed points, such as the freezing of water and the boiling of mercury. The amount of expansion for a known number of degrees is thus determined, and the value of all other expansions may be considered as proportional. By means of this instrument, the melting-point of cast-iron has been ascertained to be 2786°, and the highest temperature of a good wind-furnace about 3300°, points which were estimated by Wedgwood at 20,577° and 32,277° respectively.[1]

M. Breguet has a pyrometer consisting of a compound ribbon of three metals, platinum, gold, and silver, rolled out into a very thin lamina, and coiled into a cylindrical spiral, to the lower extremity of which is attached an index, while the upper end of the spiral is fixed. The silver expands much more than the platinum, so that the coil twists and untwists as the temperature rises and falls. The degrees on this instrument are marked upon a horizontal circle, and their value is found by comparison with a standard thermometer.

In the *Philosophical Transactions* for 1828, Mr Prinsep describes a method of measuring high temperatures based upon the fixed value of the fusing-points of pure metals. The noble metals alone embrace a range from the low melting-point of silver to the very high one of platinum, and although there may be only three fixed points in the scale thus furnished, intermediate links may be supplied by alloying the three noble metals together in different proportions. When such a series has been prepared, the heat of a furnace may be expressed by the alloy of least fusibility which it is capable of melting. As the melting-points of silver and of gold are comparatively near to each other, ten intermediate gradations were assumed, the lowest of which corresponded to the fusing-point of pure silver, and the others to the fusing-points of silver alloyed with 10, 20, 30, &c., per cent. of gold. From the melting-point of gold to that of platinum 100 gradations were assumed, which were the melting-points of pure gold, and of gold alloyed with 1, 2, 3, &c., per cent. of platinum. The only apparatus required for this method is a small cupel, containing in separate cells 8 or 10 pyrometric alloys, each about as large as a pin's head, and when the specimens had been once used, they could be used again by simply flattening them under a hammer. The notation is equally simple, since two letters and the decimal of alloy would express the maximum heat; thus S . 3 G gives the temperature of the fusing-point of silver when alloyed with gold in the proportion of 7 to 3, and G . 23 P expresses the fusing point of gold when alloyed with platinum in the proportion of 77 to 23. Mr Prinsep endeavoured to connect the fusing-points of his alloys with the thermometric scale by employing the expansion of air on the principle of the differential thermometer, assuming that the increase of temperature is proportional to the expansion of the air, which, however, is not the case.

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[1] An able article on pyrometers contained in the *Penny Cyclopædia* has a mathematical investigation of the correct formula to be used with Professor Daniell's instrument, and shows that the formula employed by him, "though probably sufficiently correct for all practical purposes, gives the expansions one per cent. too great without exception, and in many cases much more. . . . The error thus introduced is perhaps within the limits of the error to which the instrument itself is liable."

A trial of Mr Prinsep's method was made some years ago at Sèvres for the purpose of determining the temperatures of the ovens used for baking porcelain. It was found necessary to expel silver from the short list of available metals, on account of the peculiar property possessed by this metal of absorbing oxygen during its fusion, and *spitting* it out again during the cooling. The small tubes or globules of the melted metal, which are forcibly expelled by the escaping oxygen, are more fusible than the principal alloy, and disturb its fusing-point. The presence of 1 or 2 per cent. of copper might have neutralized this property if it did not interfere with the other results. The experiments were therefore limited to the alloys of platinum and gold in various proportions. It was found, however, to be very difficult to determine in a close furnace the exact moment when the alloys fused; moreover, it was found that similar alloys did not always melt at the same moment, although apparently placed under precisely the same circumstances. It was also found impossible to use the same bead of alloy more than once, the action of the fire effecting some molecular change which led to an alteration in the fusing-point; still, however, M. Laurent (whose results were subsequently confirmed by M. Salvétat) was able to determine that the highest temperature attained in the kiln at Sèvres was represented by the alloy $\left.\begin{matrix}P\ .\ 53\\ G\ .\ 47\end{matrix}\right\}100$, when a well-fused button was formed, while, with 54 parts platinum, there was only a softening perceived. M. Brongniart remarks on this result,—"When we succeed in being able to determine exactly and promptly the moment when complete fusion takes place in these alloys, we shall have comparable measures of high temperatures, but not a method fit to be employed habitually in industrial operations, in which it is not required to know the temperature in one single spot, or at the end of an operation, but in various places and at various times in order to manage the fire as equably as possible, and to arrest it at the proper moment.[1]

A good pyrometer is still a desideratum in the useful arts for regulating the heat of furnaces, &c. It should be easy of application in the hands of common workmen, prompt in its results, exact in its indications, so as not only to serve as a guide to the particular process in hand, but to give information to manufacturers in all places and at all times of the temperature required for the successful conducting of a particular process. The unalterable nature of platinum would seem to point out this metal as a desirable pyrometer, especially since it is more equable in its expansion than any of the other metals, but is not free from that increasing rate of expansion with increasing temperatures which belongs to most substances. The small amount of dilatation of platinum is an objection to its use, especially when that dilatation has to be communicated to a distance through rods of various kinds which act upon the measuring apparatus, all of which are liable to error. Herr Wurm has endeavoured to employ platinum in the form of a moderately strong wire stretched across a strong massive frame of iron, furnished with a handle; the wire is kept in a state of tension by a spring or otherwise, and when it becomes relaxed by expansion, an index in the handle connected with it shifts and marks the amount of extension. When it is required to ascertain the temperature of a furnace or oven, the whole frame is introduced into it, the wire instantly acquires the temperature of the furnace, but the massive frame does so slowly; relative expansion of the wire, therefore, takes place, and when this has attained its maximum, the index is read off.

As long since as the year 1805 M. Brongniart constructed a pyrometer for measuring the comparatively moderate heat of the gloss oven or muffle furnace (see Pottery and Porcelain) by means of the dilatation of a bar of silver. The advantages of this metal are stated to be its resistance to the highest temperature of the muffle furnace, the facility with which it may be obtained pure, so that the results of two instruments will be comparable; it resists an incandescent heat, and is more dilatable than any other metal possessing all these advantages. The only inconvenience accompanying its use is the impossibility of applying it to measure higher temperatures. The bar of silver is two decimetres in length; it is placed in the muffle in the midst of the articles which are being fired, and is inserted through one of the sight-holes used for watching the progress of the vitrification; its dilatation serves to note the rise of temperature and the point at which the heat ought to be arrested. In order to measure this dilatation, the bar is placed in a groove of hard porcelain, one end of which is turned up to serve as a fulcrum to the inserted end of the bar. The near end of the bar presses against a porcelain rod which gives motion to a needle over a graduated arc, so graduated as to multiply a hundred-fold the dilatation of the bar of silver. This arc is divided into 300 parts; from 27° to 30° of this arc are about equivalent to 100° of the centigrade thermometer. The firing of the colours upon porcelain varies from 200° to 280°C. Silver fuses between 300° and 325° of this pyrometer, so that the maximum heat for vitrifiable colours is not far short of the fusing-point of silver. M. Brongniart modestly remarks that this instrument is imperfect, since it does not register absolute measures of temperature, but only the difference between the dilatation of a bar of silver two decimetres long, and that of a bar of hard porcelain of the same length. The dilatation of the porcelain at this temperature is not known, except that it is very small; we have therefore only the difference between two quantities, of which one only has been ascertained.

In the year 1835 Mr Adie of Edinburgh read a paper before the Royal Society of Edinburgh (*Trans.* xiii.) on the expansion of different kinds of stone. His pyrometer consisted of a vertical metal cylinder about 2 inches in diameter, and about 27 or 28 inches long, for containing the stone rod which was to be measured. The cylinder was surrounded by a steam jacket, through which was passed a current of steam for the purpose of raising the temperature of the cylinder and the rod. The case contained windows of plate glass, through which both ends of the rod could be seen; the lower end rested on a support which could be adjusted in height by means of a screw passing through the bottom of the cylinder, and steadied against the sides by means of springs and friction-rollers. Two silver studs were fixed in each rod that was to be operated on, at the exact distance of 23 inches, at the ordinary temperature. The cylinder and case were attached to a vertical oaken beam, to which were fixed two microscopes, with their axes horizontally directed to the studs. The lower miscroscope kept the lower stud stationary in view, while the upper one measured the expansion of the bar by means of a micrometer. The oaken beam was screened from the radiation of the heat of the steam jacket, and the current of steam was maintained therein until the rod ceased to increase in length, when its expansion was measured. The rods were generally raised to about 207° or 208° Fahr., and about four hours were required to raise a rod from 50° to this temperature, the section of the rods varying from a square half-inch to an inch. From the amount of expansion for the observed changes of temperature, a table of expansions for 180° Fahr. was calculated. All the stones operated on contained moisture, the effect of which, in the case of greenstone and some marbles, was to increase the amount of expansion; in other instances no such effect was observed. In white Sicilian marble a permanent increase in length was produced every time its temperature was raised, the amount of increase diminishing each time.

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[1] *Traité des Arts Céramiques*, i. 235.

In the Great Exhibition of 1851 Mr Ericsson exhibited in the United States department a pyrometer for measuring temperatures from the freezing-point of water to the melting-point of iron, as indicated by the tension of a permanent volume of air or of nitrogen gas, which is measured by the reading of a column of mercury under a vacuum. The instrument is intended for the regulation of processes in the useful arts in which great heat is required, and an evenly-regulated temperature is of importance. In the formation of the scale, 32° and 212° have been taken for the points of freezing and of boiling water. The instrument consists of a chamber containing mercury, with a flexible bottom composed of a steel spring, or of india-rubber held between steel plates, and capable of being raised or lowered by means of a screw. Into this chamber a glass tube filled with mercury is plunged to within $\frac{1}{16}$th of an inch of the base. Into the mercurial cistern is inserted a short glass tube connected with a platinum bulb by a small passage, the base of which is nearly filled by a silver wire and a stop-cock. A coupling-joint is affixed to the bulb, so that it may be removed at pleasure. The top and sides of the mercurial chamber are surrounded by a cistern for the reception of pounded ice; the whole being encircled by double plates of iron to be filled with clay or some other badly-conducting substance, for the purpose of shielding and supporting the instrument. The screen itself is supported upon a base-plate. Two scales are graduated for reading off the height of the mercury in the tube, as determined by the temperature of the medium in the platinum bulb. The graduation of the smaller of these scales extends only to 700°, but that of the larger includes the melting-point of iron. There is also a spirit-level for placing the instrument in a vertical position. The graduation of the scale is independent of any imperfection in the bore of the tube, and is not affected by the expansion of the bore from heat, the volume for measuring which, being permanent and not expanding, affords greater accuracy in the readings at high temperatures. The pyrometer comes into action when the thermometer ceases to be effective; the air or nitrogen in the bulb of the former allowing it to remain unchanged under extreme variations of temperature, whilst the latter explodes on being thrust into an ordinary flue or vessel of over-heated lead. The Jury Report from which this description is abstracted, offers no opinion as to the value of the instrument, nor does it appear that the jury tested its value by experiment. (C. T.)

PYROTECHNY

PYROTECHNY (from πυρ, *fire*, and τέχνη, *art*). The usual modern meaning of the word is the art of making fireworks, and of disposing them to the best advantage when exhibited on occasions of rejoicing, or in theatres, gardens, and other places. A moment's consideration will show how very comprehensive a term *pyrotechny* may become if extended to all operations in which the skilful management of fire is required. It was anciently confined chiefly to alchemy, or incipient chemistry.[1]

Under the term of pyrotechny we may properly enough include the making of the different sorts of gunpowder, and the preparation of all those combustible or detonating materials and projectiles used in war; but then it should be distinguished by the adjunct *military*. Military pyrotechny will then serve only to indicate a portion of one of the most deplorable arts ever invented,—that is, the art of war. The miserable necessity of this art is, however, a matter of daily experience in the present state of human nature and unsocial relations; also the unhappy and slavish condition of all nations which are not able, by skill in this diabolical art, to resist effectually the aggressions of their invaders.[2]

We do not mean to give an account of the various substances, mixtures, and manipulations necessary in the construction of different fireworks; but, for the reader's amusement and instruction, we shall mention a few things which are not generally known, and then conclude with the titles of a few works upon pyrotechny.

The combinations of the different substances employed in the pyrotechny connected with fireworks ought to be guided by a chemical knowledge of these substances. The want of this knowledge causes most of our fireworkers to compound ineffective mixtures, and to follow old and absurd recipes. Great skill in pyrotechny, in its more general sense, was possessed by the Chinese long before the art was known in Europe. The invention of gunpowder seems to be due to them, and perhaps also the invention of fireworks. All those persons we ever conversed with who had been in China concurred in assuring us that the Chinese fire-works are at this day quite unrivalled in variety, splendour, and beauty. In the account of Lord Macartney's embassy to China there is an amusing passage describing the contempt of the Chinese for the best English fireworks that were exhibited to them, and the astonishment of the embassy on witnessing the superb display of fireworks given by the Chinese in return. The most imposing exhibitions of European fireworks used to be those that took place annually at Rome, during certain holidays, on the ramparts of the Castle of St Angelo.

We shall now give a very few notices of practical pyrotechny.

Lightning.—The fine seeds of the *Lycopodium clavatum*, or common club-moss, are extremely inflammable, and are used in theatres to imitate a vivid flash of lightning, by blowing them from a tube, &c., through the flame of a lamp, &c. These seeds are also used in the composition of some fire-works.

Red Fire.—The nitrate of strontia is the chief ingredient in the composition. A beautiful purplish flame is produced by a composition containing chlorate of strontia. To aid in reddening the flame of the former composition, a little lamp-black of the finest quality is generally used; for a red jet of fire from a paper case formed like that of a serpent, or of a Roman candle, &c., fifteen parts of pulverized gunpowder and four parts of dry nitrate of strontia; a slow and bright red fire, forty parts of nitrate of strontia, thirteen of pulverized sulphur, five of chlorate of potash, and four of sulphuret of antimony. In this last mixture, to avoid the danger of premature combustion, the chlorate of potash must not be ground in a mortar with the other ingredients, but ground separately, and afterwards mixed with them by shaking and stirring upon a sheet of paper.

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[1] See Davidson's *Philosophia Pyrotechnica*, &c., 1635; and G. Starkey's *Pyrotechny Asserted and Illustrated*, &c., 1658.

[2] See the articles GUNNERY, GUNPOWDER, WAR.

Green Fire..—Seventy-seven parts of nitrate of barytes, thirteen of pulverized sulphur, five of chlorate of potash, three of charcoal in powder, and two of pure arsenic. The same precautions to be taken as before with regard to the chlorate of potash. The effect of this composition, when burned on the stage of a theatre, is to give a cadaverous and unearthly aspect to the aetors. It occurred to us many years ago that an extension of some of the effects of De Loutherbourg's *Eidophusikon* might be easily and effectively adapted to the stage. Where the foot-lights are, or else above the proscenium or front of the stage, an apparatus might be contrived to throw variously-coloured lights upon the actors and the scenery in the representation of magical incantations supernatural appearances, &c. The disposition and reflection of these variously-coloured lights might be diversified in such a manner as to produce the most singular contrasts and unexpected effects.

Brilliant and sparkling Jets of Fire.—These are produced from compositions rammed into paper cases of various sizes. One of these compositions may consist of eighteen parts of pulverized gunpowder, five of bright steel-filings, and two of saltpetre; another of sixteen parts of pulverized gunpowder, seven of steel-filings, one of saltpetre, and one of sulphur.

Sparks.—The composition for these is mixed with pure alcohol. Small pellets of cotton are steeped in this mixture, and dried, after rolling them in pulverized gunpowder.

Stars.—Very brilliant stars, such as we see issue from sky-rockets, Roman candles, &c., may be made from a composition of one part of antimony in powder, two of pounded crystal, two of pulverized gunpowder, fifteen of saltpetre, six of sulphur, and two of zinc-filings. The composition for these and other stars is made into a stiff paste with gum-water or glue, and then cut into small cylindrical or square pieces, which are rolled in pulverized gunpowder and dried in the shade.

Brilliant Chinese Fire.—Four parts of charcoal, five of pounded cast-iron, eight of pulverized gunpowder, six of saltpetre, six of sulphur; or three parts of pounded cast-iron, eight of pulverized gunpowder, two of saltpetre, and one of sulphur; all rammed into paper cases or other cases.

Jasmine Flowers.—This beautiful fire is generally seen in the vertical fire-wheels, &c. When the composition is well made, the sparks drop down somewhat like burning flowers of the jasmine. Its excellence depends chiefly on the use, in the composition, of bright filings or raspings from the steel-springs of clocks or watches, carefully deprived of all the finer dust that may be amongst them. The minute shavings of steel, procured from turners in metal, may also be used. Compositions for this kind of fire, six parts of steel-filings or shavings, sixteen of pulverized gunpowder, one of saltpetre, one of sulphur; or five parts of same filings, &c., sixteen of pulverized gunpowder, one of saltpetre, one of sulphur; or four parts of filings, twenty of pulverized gunpowder, one of saltpetre, one of sulphur, and four of zinc-filings or raspings, or pounded zinc, rendered pulverized by being heated to about 205 of the centigrade scale. The compositions for the Chinese fire and the jasmine flowers are to be mixed up in the same manner. The sulphur, the pounded cast-iron, or the steel-filings, are mixed with the addition of a little pure alcohol, and then the other ingredients are added. It must be observed that the size of the particles of pounded cast-iron or of steel-filings should be proportioned to the size of the cases that are to be filled with the composition; the smallest filings, &c., being used for the smallest cases.

Bengal Lights.—The common ones are made of one part of antimony, five of saltpetre, and two of sulphur; the sparkling ones, of one part of antimony, two of fulminating composition (of fulminating mercury and gunpowder), four of saltpetre, and four of sulphur; or one, two, five, two parts of the same ingredients in their order; or one, two, six, one part of the same in their order. Vases are filled with these compositions, a light gunpowder dust sprinkled over the top, and the whole closed up by a piece of paper pierced with some holes from which pieces of quick-match project. These lights may be made of any size. They sometimes weigh upwards of 200 pounds.

It is necessary to warn the reader that fulminating mercury requires great caution in handling it; and, as it is so apt to explode, it had better be left out of the composition for these lights, or any other fire-works. Indeed the pyrotechnist has need to exercise the greatest possible caution in all his operations. For instance, it may, in ignorance, be imagined that no harm can happen from pounding gunpowder in a mortar along with iron or steel-filings, &c., and yet the most serious accidents may result from manipulations of this kind incautiously conducted.

One of the most formidable pyrotechnical inventions is the Congreve rocket. We have conversed with some officers who served in the war against the Burmese, and they described the effect of these rockets as appalling, not only to the Burmese, but even to the stout-hearted Britons who fired them off.

Without entering into any very minute description of the process of making such popular fire-works as the common sky-rocket, the Roman candle, &c., we shall content ourselves with a brief account of the general construction of these two. The common sky-rocket consists of a strong paper or thin pasteboard case, the lower end of which, where the cotton quick-match is inserted, is drawn so close by means of a cord as to leave only a circular opening of about one-third of the interior diameter of the case. This is technically called *choking* the case. The case, when dried after pasting, is placed in a hollow cylinder of wood, into which it fits. This mould is furnished with a moveable bottom having a central nipple and a tapering spike of iron, which last, entering the aperture at the lower end of the case, rises within it nearly to the top. The space left round this spike is filled gradually, and by repeated blows from a mallet upon a hollow rammer, with a composition of pulverized gunpowder, saltpetre, and charcoal, or of sixteen parts of saltpetre, twelve of elm charcoal, and four of purified flour of sulphur. The rammer, which fits the inner diameter of the case, and to which the mallet is applied, has in its centre a deep hollow adapted to the iron spike before mentioned. The composition which forms the charge of the case must be put in by small quantities at a time, and driven down compactly by regulated blows of the mallet upon the rammer. The filling of the case in this manner requires skill and experience, because if the charge is not uniformly compacted in the case the rocket will not rise evenly and regularly. When the charge has been driven a little higher than the top of the spike, a round piece of doubled paper is put in; and upon this one-half of the inner paper of the remainder of the case is folded down and rammed firmly, so as to close the case. This plug is then pierced with a few holes, and above it are placed, along with some of the composition, or with some gunpowder, the stars, sparks, &c., that are intended to appear when the rocket has reached its highest ascent. The top of the case is then covered in, and fitted with a paper cone. In signal-rockets, that are intended to end with a report without stars, &c., the round piece of double paper before mentioned is pierced with a hole in the centre, and a little gunpowder is pressed firmly in above it, but without crushing the grains. The top of the case is then choked *close*, and the paper cone fitted on. In some other rockets that contain what are called *decorations*,—that is, stars, sparks, serpents, crackers, &c.,—these are placed with meal-powder in a wider cylindrical case, which is fitted to the top of the case containing the charge. These rockets are also terminated by a conical cap. We may remark, that in our common rockets the conical cap is not sufficiently stiff to maintain its form invariably, and so to aid in the regular ascent of the rocket. The balance-stick has next to be fastened to the rocket. The length, thickness, and weight of this stick, require calculation to suit it to the dimensions and weight of the case. On the Continent, rockets have been made to ascend without sticks by means of a triangle of pasteboard passing round the case, or by means of three pasteboard wings glued to the case. Each of these wings forms an isosceles triangle, in height six interior diameters of the rocket-case, and a little more than two of these diameters at the base. Each of these wings must be glued on quite parallel to the axis of the case, otherwise the flight of the rocket will be irregular. A short stick with similar wings has also been employed for rocket-cases. It is stated that all these winged rockets rose beautifully, even in a violent wind and bad weather; but some allowance must surely be made for the lateral action upon them of a strong wind.

The Roman candle consists of a strong case of paper or of thin pasteboard, which is completely closed at the lower end. It is generally charged with the same composition as sky-rocket cases, alternating with gunpowder and stars, as follows:—First a small quantity of composition is placed at the bottom of the case, and rammed down compactly by a rammer and mallet; next a small quantity of gunpowder, and above that a star without any ramming, but a gentle push to secure the contact of the star with the gunpowder; then a quantity of the composition, which is rammed down as before; next a little more gunpowder and a star, and then more composition rammed down; and so on till the case is filled. The case is then closed by a piece of paper-match pasted round the outside, and twisted to a point at the top. The charges of Roman candles might be diversified by variously-coloured fires and stars, &c.

The reader may consult the works of which the titles are subjoined:—*Essai sur les Feux d'Artifice pour le Spectacle et pour la Guerre*, Paris, 1750; *Manuel de l'Artificier*, Paris, 1757; *L'Art de faire à peu de frais les Feux d'Artifice*, Paris, 1828; *Manuel de l'Artificier*, par A. D. Vergnaud, Paris, 1828; and *Pyrotechny*, by G. W. Mortimer, London, 1853. (G. F. G.)

PYRRHICA (Πυῤῥίχη), a celebrated dance among the Greeks, which, according to Plato (*Leg.* vii., p. 815), was the representative of all war-dances. It is usual to assign its origin to Crete or Sparta, and to the mythical age. Pyrrichos is said to be the inventor of it; and it is undoubtedly Doric in its origin. It has been also referred to Pyrrhus or Neoptolemus, the son of Achilles, by many who were probably misled by the name. This Byron does when he says—

> "You have the *Pyrrhic dance* as yet;
> Where is the Pyrrhic phalanx gone?"

It was danced to the sound of the flute or other musical instrument, with very quick and light time, as the Pyrrhic foot (⏑⏑), which is connected with this pastime, still testifies. Plato, in the passage above quoted, describes it as representing, by rapid movements of the body, the way in which missiles and blows from weapons were avoided, and also the mode in which the enemy were attacked. In the non-Doric states it was probably performed only as a mimetic dance; for we read of its being performed by women to entertain a company. It was performed at Athens at the greater and lesser Panathenæa; and Julius Cæsar introduced it into the public games at Rome. It was much admired by the Romans, and was exhibited by Caligula, Nero, and Hadrian.

PYRRHO, the founder of a sceptical school of philosophy, was the son of Pleistarchus, a native of Elis, and flourished B.C. 336, in the time of Philip the Great. He was originally a painter, but subsequently devoted himself to the study of philosophy, having been the pupil of Anaxarchus, whom he attended to India. There he became acquainted with the magi of Persia and the gymnosophists of India. On his return to Greece he acquired great renown, and was presented by the Athenians with the freedom of their city. He lived to the age of ninety. Pyrrho was the chief advocate of the sceptical school of philosophy; and from him all those who adhered to such doctrines were called Pyrrhonists. Quite groundless is the statement of the Abderite Ascanius, that he denied that it could be proved that there was any thing in itself just or unjust, honourable or dishonourable. The principle of his philosophy was, that there existed no motive for belief to which one cannot oppose a doubt of equal weight. Thus he affirmed nothing, and denied nothing. Amongst his disciples were Timon of Phlius, and Nausiphanes, who taught Epicurus. The Life of Pyrrho has been written by Sextus Empiricus, and by Diogenes Laertius.

PYRRHUS, King of Epirus, was the son of Æacides, and a descendant, according to the ordinary account, from Pyrrhus, the son of Achilles, and was born about 318 B.C. The early part of his life was involved in misfortune. Scarcely was he two years old when his father was deposed by rebel subjects, and a general massacre took place among the royal family and their adherents. The infant himself was snatched from the very hands of the assassins, and carried away with difficulty to the court of Glaucias, king of the Taulantians. It is true that the decline of Cassander's power in Greece opened up a way for him to his father's throne; but he had only reigned five years when the adverse party among his subjects suddenly gained the ascendancy, and drove him to take refuge with his brother-in-law Demetrius. So hard, indeed, did misfortune press upon him, that he was at last glad to go into Egypt as a hostage for the prince just mentioned. At this point, however, the tide of events began to turn in Pyrrhus' favour. Admiring his great abilities, and his pleasing and virtuous bearing, Berenice, the wife of King Ptolemy, took the charge of his fortunes. The hand of her daughter Antigone was given to him in preference to many princely rivals. Money and men were then placed at his disposal, to enable him to take possession of his hereditary kingdom. Nor did success fail to accompany him to Epirus. His subjects received him with acclamation; he was appointed colleague to Neoptolemus, the sovereign who then occupied the throne; and his power grew so great that, in 295 B.C., he ventured to make away with his rival, and to wield the sceptre alone.

In 294 B.C. Pyrrhus began his aggressive policy by acquiring an ascendancy over Alexander of Macedonia. The overthrow of that impotent prince soon afterwards by Demetrius did not long retard his ambitious designs. His admirable qualities proved too strong for his former friend and brother-in-law. In a battle fought in Ætolia in 289 B.C. against Pantauchus, the brave general of his enemy, he won from the Macedonian troops not only victory, but generous admiration. They went home lauding his wonderful achievements in the fight, comparing him to that favourite monarch, the dead Alexander, and desiring an opportunity to transfer to him their allegiance and their services. No sooner, therefore, did they see his lofty plume and his crest of goat's horns before the city of Berœa in 287 B.C., than they went over to him in a body. It is true that, changing sides once more, they soon deserted him for their old general Lysimachus, and left him no alternative but to abandon Macedonia. Yet his exploits in this campaign had gained for him a reputation which extended to other countries, and which, in course of time, was the means of opening up before him a new path to victory and glory.

It was in 281 B.C. that the Tarentines, attracted by the military renown of Pyrrhus, implored him to assist them against the aggressive tyranny of Rome. Too impatient to wait until the rude winter was past, he embarked early in 280 B.C., and after being nearly engulphed by the boisterous waves of the Ionian, he landed on the coast of Italy, and commenced his measures. He first applied a rigorous system of reform to the pleasure-seeking city of Tarentum. The theatres were closed; all revels were proscribed; and the lounging citizens were subjected to military drill. Then taking the field, he made a vigorous attack upon a Roman army under the consul Lævinus, as it was crossing the River Siris. The hardy legionaries, indeed, like men accustomed to conquer, were loath to yield. During a whole spring day did they stubbornly grapple with him for the prize of victory. But he routed them with great slaughter, and began to take measures to improve his victory. By the orator Cineas he offered terms of peace to the Roman Senate. When these were disdainfully rejected, he advanced by forced marches to within 24 miles of the enemy's capital. The intelligence, that the army of Etruria had just arrived in Rome, induced him to retreat to winter quarters in Tarentum; but did not make him slacken in his efforts to accomplish the object of his enterprise. He continued to ply the Senate with proposals of peace until the spring arrived. He then took the field, and defeated the enemy in a hard-fought battle at Asculum in Apulia. Nor was it until he discovered how fast his army was wasting away, and how difficult it was to obtain any reinforcements from home, that he desisted from the attempt to bend the Romans either by negotiation or by force.

From this period may be dated the decline of the power and reputation of Pyrrhus. Invited over to Sicily in 278 B.C. to aid the natives against the Carthaginians, he entered upon his first course of disaster. It is true that, for some time after his landing, his arms were victorious. The enemy was everywhere put to the rout before him; the strong town of Eryx was taken by a brilliant *coup de main;* and the Punic invaders were driven to sue in vain for peace. But the failure of his attack on Lilybæum turned the tide of fortune. So completely did he lose the good-will of the Sicilians that he was glad, in 276 B.C., to depart ingloriously for Italy. Nor was misfortune left on the shore behind him. As he was crossing the strait, the Carthaginian fleet, attacking him, destroyed seventy of his ships. When he landed, the warlike Mamertines, who had hastened from Sicily to intercept him, harassed his march towards Tarentum. The Romans also, two years afterwards, gained the complete mastery over him. His forces were cut to pieces at Beneventum by the consul Curius; and there was no alternative left for him but to return to Epirus, beggared in resources, and with a mere handful of soldiers. A short interval of prosperity intervened in the life of Pyrrhus after his arrival in his own kingdom. Invading the territories of Antigonus, King of Macedonia, and coming to an engagement with the troops of that prince, he routed the Gauls which formed the rear of the hostile army, brought the Macedonian soldiers over to him by holding out his hand invitingly, and thus gained a kingdom by one magnificent stroke of combined force and persuasion. But this success only tempted him to rush into new calamities. Consenting in 272 B.C. to interfere in the quarrels of Cleonymus, the ex-king of Lacedæmon, he hazarded a rash attack upon Sparta. The attack roused the deathless Spartan valour, and he was soon forced to desist. Still more unfortunate was the attempt which he then made to co-operate with Aristeas, the leader of one of the factions in Argos. Admitted by Aristeas during the night into the distracted city, he was immediately detected. The alarm was raised, those of the opposite party seized the strongest positions in the town; and he and his men were soon hemmed in on all sides. Day dawned, and found him fighting his way back amid a weltering sea of enemies. He had cut his passage as far as a narrow street, and was dealing blows of death upon all around him, when an old woman, looking down from a roof immediately above, and seeing him in the act of overpowering her son, seized a large tile with both her hands, and let it fall upon his head. The blow struck him senseless from his horse; and one of his antagonists, dragging him into a porch, despatched him with an Illyrian blade. (See Plutarch's *Lives.*)

PYTHAGORAS, a celebrated ancient philosopher, and, according to a well-known story related by Cicero (*Tusc. Quæst.* v. 3), the first who adopted that title, was a native of the island of Samos. Of the personal history of this man, to whom perhaps the most remarkable school of Greek philosophy owed its origin, and who, himself one of the earliest speculators in his country, plainly exercised no small influence over his successors, little can be known for certain, nor are his philosophical tenets free from much doubt and obscurity. From a time shortly subsequent to his own age the most improbable legends seem to have been connected with the name of Pythagoras, arising probably in a great part from the extravagant esteem and reverence in which he was held by his disciples. Even the period in which he lived cannot be determined with anything like accuracy; the different accounts, all of them long posterior to the time in question, exhibiting a variation of about forty years. The testimony of all these accounts, however, furnishes us with two historical landmarks by which we may date the principal event in his life, and thus, approximately, the time when he flourished. All our authorities agree in representing him as leaving Samos during the reign of Polycrates as tyrant there (B.C. 532–22); and settling in Italy while Tarquinius Superbus was king of Rome (B.C. 532–508). Thus, as these events could not have been far removed in point of time, we may assume as probable that they took place sometime between 530 and 520 B.C. If we credit the statements of Aristoxenus and Iamblichus, we shall place the birth of Pythagoras about 570 B.C.; but if, on the other hand, we incline to the views of Eratosthenes and Antilochus, we must carry back the date nearly to 609 B.C. Perhaps none of the authorities is worthy of implicit credit, but the former account certainly appears in itself to be more probable; for it is unlikely, as we must on the other alternative suppose, that Pythagoras did not begin the great work of his life till he was considerably above seventy. The date given by Ritter, on the authority of Clemens Alex. (Ol. 49, B.C. 584–80), does not materially differ from the former of the two above mentioned. His father's name was Mnesarchus (Herod. iv. 95), and his family is said to have sprung from the Tyrrhenian Pelasgians, who were largely intermixed with the Greek settlers in Samos.

Of the early life of Pythagoras our knowledge may be said to be absolutely nothing. The island where he probably spent the first years of his life was then in arts and commerce one of the most flourishing communities in the world. It lay, too, in the very region where the earliest of the Greek philosophers were then conducting their magnificent speculations, with which the young philosopher was no doubt familiar; and we can form some idea of the influences that prompted him, with high hopes and daring enterprise, to follow their footsteps into the new field, not then, as now, strewed with the ruins of theories and systems. Tradition has ascribed to Pythagoras, as instructors in philosophy, various of the early sages, and especially Pherecydes of Syros; but as far as opinions are concerned, he does not appear to be indebted to any of them. As little is there any ground for supposing that the philosophy of Pythagoras was of foreign origin, though he seems undoubtedly to have been an extensive traveller in foreign countries. His scientific attainments must have been great for that age; and in all probability he soon acquired a great reputation for wisdom and ability. The mathematical sciences were those that chiefly attracted his attention, and he is reputed to be the author of several discoveries in geometry, music, and astronomy. The travels of the philosopher are said to have extended to Egypt and the East; countries which were then regarded by the Greeks as the repositories of all the highest wisdom. They would naturally, therefore, attract the attention of a searcher after truth: while at Samos he would have the utmost facilities for acquiring geographical knowledge, and penetrating into the most distant regions. It is vain to conjecture what effect these travels might have on him, or what were the peculiar influences with which he was brought in contact. From the priests in Egypt or the Magi in Persia he may have acquired a knowledge of their hidden lore; but it is equally probable that he was not thus initiated, and it is not necessary to have recourse to any such sources for his opinions, so far as we know them.

On his return to Samos after his travels, Pythagoras seems to have fully formed his great project which he afterwards carried out. This project was more of a religious and political than of a philosophical nature. It was to establish a society on a religious foundation, and with an ethical end, for the moral improvement of its members, who were to be instructed in a peculiar mode of life. (See Plato, *Rep.* x. 600 B.) He probably found that such a scheme was impracticable under the government of Polycrates, and for that reason, rather than any personal dislike to him, left his native island and migrated to Crotona. We do not know what induced him to select this place in particular as the scene of his new experiment. It was one of the colonies which the Greeks had at this time sent out in such numbers to Southern Italy as to obtain for that part of the country the name of Magna Græcia. It was not unnatural that Pythagoras should look in this direction for a place to settle in. These colonies were comparatively young communities, many of them rapidly rising in importance, opening up to Grecian enterprise new and unexplored regions; and he might reasonably hope to find fewer obstructions to his plans there than among the intricate political relations of the eastern world.

Crotona itself stood in the country of the Bruttii, one of the most savage of the native Italian tribes. It was an Achæan colony, founded in 710 B.C., on a projecting headland nearly half-way between Sybaris on the N. and Locri on the S., while behind it stretched the primæval forests and mountain pastures of Sila. The government of the colony was at that time aristocratic, but the power of the nobility, though superior to any other, was not unquestioned; and the arrival of the philosopher added strength to the dominant party, whose cause he embraced; for he came with no small pretensions, and already many marvellous stories were in circulation about him. He was said to have received many of his doctrines from Empedoclea, the priestess of Delphi; to have been initiated into the mysteries of the Idœan cave in Crete; to have shown at Olympia a golden thigh rivalling the mythical shoulder of Pelops; to have received from Hermes the gift of recollecting all the stages of his previous existence; and to have given many other proofs of a supernatural intercourse with the unseen and celestial powers. These honours were undoubtedly claimed for him, either by himself or by his followers, and their effect is said to have been such, that he was reverenced by the Crotoniats as the Hyperborean Apollo. The accounts which we have of the wonderful change effected at Crotona after his arrival may be dismissed as belonging to the same class with those which narrate his superhuman dignity and exploits. We cannot doubt, however, that here Pythagoras so far succeeded in his designs as to form a secret society, partly religious and partly political, which exercised a great influence in the city, and spread the doctrines of its founder over the other cities of Magna Græcia, where branches of the original society were probably established.

The sudden and violent catastrophe which soon after befell these societies was the occasion of a wider dissemination throughout Greece of the opinions they maintained. The constitution of Crotona had become, since the arrival of Pythagoras, more decidedly aristocratic than ever: the Pythagoreans are said to have even entertained a project for abolishing altogether the popular assembly. Meanwhile the neighbouring city of Sybaris had undergone a revolution; the popular party gained the upper hand there; and one of their leaders named Telys established himself as tyrant. Five hundred of the opposite party left the city and took refuge in Crotona; and when Telys sent to demand them to be given up, the Crotoniats, at the instigation of the Pythagoreans, refused to do so. A war between the two cities was the result, in which the army of Crotona, under Milo, a Pythagorean, defeated a much superior force of Sybarites, and took and destroyed the city. A dispute then arose among the victors about the distribution of the spoil and conquered territories. The Senate, supported by the Pythagoreans, proposed to retain the whole as public property; but the people, indignant at this, rose in a body, and directing their rage mainly against the Pythagoreans, set fire to the house of Milo, where they were assembled, put many of them to death, and dispersed the rest. A general persecution of the sect throughout Magna Græcia ensued, and the disorder and bloodshed was only ended by the interference of the Achæans in Greece, who established in Crotona and the other cities, a democratic government. Whether or not Pythagoras was personally involved in the outbreak at Crotona, which happened in 504 B.C., is not certain; he is generally supposed to have retired to Metapontum, where he died, and where the exact spot of his death was still pointed out in the time of Cicero. (*De Finibus*, v. 2.) The date of his death, and the age to which he lived, are as variously reported as that of his birth. The earliest date given for his death is 510, the latest 472; while, according to another account, it took place in 500. According to Iamblichus, who takes the latest date for his death, Pythagoras presided in his school thirty-nine years; while his whole life is generally said to have been ninety years, though some make it only eighty, and others as much as one hundred and four.

Of the philosophy of Pythagoras, as a whole, it is not difficult to ascertain the general character and principles; but when we descend to the minute details, the notices that we possess are so obscure and unconnected, that it only requires a little ingenuity to find in the Pythagorean doctrines any preconceived system that the critic may prefer. This indeed has been attempted more than once in the interest of different schools. The Neo-Platonic philosophers saw their own peculiar tenets in the philosophy of Pythagoras; and some learned Christians have found there the doctrine of the Trinity, and have identified the celebrated *Tetractys* of the Samian with the *Tetragrammaton*, or incommunicable name of the Supreme Being among the Jews. The truth is, that we have not the materials to enable us to re-construct the system of Pythagoras, or to state very minutely any of its particular doctrines. It is all but certain that the founder of the school committed none of his speculations to writing; and our knowledge of his opinions is derived from the fragments that remain of the later Pythagoreans, and from the notices of other philosophers, especially of Aristotle. He indeed is by far our safest authority on the subject; for we cannot take the representations of later writers, especially those of the Neo-Platonic school, without making allowance for their remoteness in point of time, and for their own peculiar philosophical opinions.

The peculiar form assumed by the Pythagorean philosophy seems to have been derived from those mathematical studies in which its founder was proficient. The principles of mathematics were supposed to be the principles of all real existences; and as numbers are the primary constituents of mathematical quantities, and at the same time present many analogies to various realities, it was further inferred that the elements of numbers were the elements of realities. Now the elements of numbers were considered to be the odd and the even; the former of which was regarded as limited, and the latter as unlimited. (Arist. *Metaph.* i. 5.) Unity, again, seems to have been viewed in a twofold light: on the one hand as identical with the odd or the limited; and on the other as partaking of the nature both of the odd and of the even, and being the source of both. Thus all things depend on numbers; numbers themselves on the two principles odd and even; and these, again, on the primary unit. The doctrine was further illustrated by an arrangement of the principles of things in ten pairs, not as twenty distinct and separate principles, but as ten several ways of expressing the two great principles. The first three of these pairs are the most important, and they are—the limited and the unlimited,—the odd and the even,—the one and the many; while the peculiar character of the principles are brought out by the names which occur lower down in the list—light and darkness, good and evil. The latter member of each antithesis was regarded as inferior to the former (Arist. *Eth. Nic.* i. 6), and as being in fact somehow a mere negation of it. Thus the one, the odd, the limited, was in reality the only cause of all; the many, the even, the unlimited, being a mere nonentity, till called into existence by union with the other. We see then, under what to us appears a fanciful and cumbrous symbolism, a system of pantheism. As numbers are evolved from unity, so from the primary unit all the universe is evolved; or in other words, as we are told by Cicero (*De Nat. Deor.* i. 11), Pythagoras held that the Deity was the soul of the world, diffused throughout all its parts. The origin of evil was by this system referred not so much to the primary unit as to the second negative principle, without which it was impossible for the world to exist.

Such were the fundamental principles of the Pythagorean philosophy; and so far as they are concerned there is little doubt. But the theory of numbers was carried to a much greater length, and with much more minuteness of detail, for besides the unit, a special meaning was attached to each separate number up to ten. Here it is safest at once to confess our ignorance, for we leave the region of well-ascertained facts, and enter one where plausible conjecture is the best that we can put in their place. The view of Alexander Aphrodisiensis, followed by Ritter, that the monads being points, and the unlimited, void space; the duad is the line, composed of two such monads, with the intervening space; the triad, the surface, of three monads; and the tetrad, the solid, of four such; was probably held by some of the Pythagoreans, though it has been doubted whether Pythagoras himself taught it. We must suppose that his theory of the material world resembled it in this, that it was idealistic in its character, resolving matter into mere negative or immaterial principles. The pantheism of Pythagoras was certainly more akin to the idealistic than to the materialistic form of that theory. The way in which the principle of numbers was carried out by Pythagoras in natural philosophy is illustrated by his astronomical speculations. He assumed that the number of the heavenly spheres could be neither more nor less than the perfect number ten, which played an important part in his symbolism; and in order to make up this number, supposed the existence of another body, the counter-earth (ἀντίχθων), on the other side of this earth. Thus the ten spheres revolving round the central fire, which had the form of a cube, and was called the watch-tower of Zeus, were those of the counter-earth, the earth, the moon, the sun, the five planets in order, and the fixed stars,—the whole universe thus forming a sphere. The perfection and harmony of the whole was reconciled with the too obvious evils prevalent in this mundane sphere, by supposing that the earth was the principal seat of the imperfection in the world, being the second in number, and thus associated with the principle of evil in the Pythagorean system—the even, the many, the unlimited. Further, as the intervals between the several spheres and the velocities of their motions were regularly proportioned according to the musical scale, hence arose the doctrine of the music of the spheres (Cic. *De Nat. Deor.* iii. 11), which is inaudible to us, either from the effects of custom, or from being too powerful for our faculties. The doctrine of numbers, when thus carried into physical science, seems to have been regarded by the Pythagoreans rather as deriving illustration than scientific proof from the phenomena, for they considered objects to be an imitation of the numbers (*μίμησις τῶν ἀριθμῶν*. Arist. *Metaph.* i. 6).

The psychological opinions of Pythagoras were not less memorable or characteristic than the other parts of his system. In accordance with his theory, the soul was termed a number or a harmony, and was regarded as homogeneous with the divine soul of the world, from whence it sprung. An immaterial principle was thus asserted, capable of existing apart from the body; and indeed the pre-existence of the soul, before entering its present body, was with Pythagoras, as with Plato afterwards, a conspicuous article of belief. After its departure from the body at death the soul may, according to the celebrated doctrine of metempsychosis, pass into another body, and that not necessarily a human body, but often that of one of the lower animals. Pythagoras himself professed to have once animated the body of Euphorbus, the son of Panthus; and, as Horace says,—

> "Clypeo Trojana refixo
> Tempora testatus; nihil ultra
> Nervos atque cutem morti concesserat atræ." (*Od.* i. 28.)

There must indeed always be some sort of fitness or adaptation of the soul to the body it assumes, and it is as a punishment that it is compelled at all to assume a corporeal nature, in which it is, as it were, buried. Thus, while the wicked have their final place of abode in Tartarus (Arist. *Anal. Post.* ii. 11), the good on the other hand are raised to the highest position. The Pythagorean psychology, according to one account, recognised two, and, according to another, three parts in the soul. According to Cicero (*Tusc. Quæst.* iv. 5) it was divided into a rational and irrational part; the former peculiar to man, and the latter common to the brutes; but the account given by Diogenes Laertius, from its peculiar phraseology, is more likely to represent the views of Pythagoras. That part of the soul which is peculiar to man is there called φρένες, and located in the brain, the νοῦς, also placed in that organ, and the θυμός, which had its seat in the heart, were possessed also by the lower animals.

The science of ethics owed much to the Pythagorean school; for, according to Aristotle, they were the first who attempted anything in this field. It is impossible to ascertain with any certainty or distinctness, what were their peculiar opinions on this subject. The same peculiar phraseology was kept up here also, and they attempted to express, by means of numbers, such ideas as virtue, justice, marriage, and opportunity. (Arist. *Metaph.* i. 5; xii. 4.) The whole doctrines of the sect were probably made in some degree, like those of Platonism, subservient to ethical purposes, and the precepts that were inculcated seem to have been intended for the production in the soul of that order and harmony which characterize the external world. They partake very much of an ascetic character, recommending the controlling of the passions and desires, the endurance of bodily hardships of all kinds, and the observance of the duties of friendship, for which some of the sect became very celebrated. On political subjects the opinions of Pythagoras were, as we have already seen, inclined towards aristocratical institutions, in which he would probably see more of that order and harmony which constitutes excellence on his view, than in the more popular forms of government.

It now only remains to state briefly the chief facts known about the peculiar external observances of the Pythagorean societies. They possessed much of the character of the ancient mysteries or secret societies wherein peculiar doctrines were taught that were hidden from the vulgar eye. Candidates for admission were not initiated until they had passed through a lengthened course of probation, one part of which consisted in the injunction of silence for a period. The members admitted were divided into several classes, according as they were more or less intimately acquainted with the peculiarly sacred and mysterious doctrines of the sect; though, from the diverse statements of ancient authors, it is impossible to say for certain what was the number or names of these classes. They lived together, taking their meals at a common table, and engaged in common in those exercises, especially of gymnastics and music, which were held to be conducive to their bodily and mental wellbeing. Implicit faith in the founder of the system was inculcated; so that their formula of asseveration, "ἀυτὸς ἔφα," became proverbial. There were, besides, various symbolical observances enforced, such as abstinence from animal food, from fish, and from beans; but considerable doubt and obscurity hang over these injunctions, though they are noticed by several of the classical writers. Perhaps we will acquire the most correct views of the Pythagorean mysteries or orgies if we adopt the opinion of Herodotus (ii. 81), who identifies them with those of Orpheus and Bacchus, a view which seems to be confirmed by general similarity of the Pythagorean to what we know of the Orphic doctrines. Orpheus seems to have taught a system of pantheism; and it is remarkable that Virgil, in his description of the lower world, where he seems partially to adopt Pythagorean principles (*Æn.* vi. 724–752), introduces as an important personage the long-robed Thracian priest. On this view we may suppose that much of what Pythagoras embodied in his system formed part of a previously existing religion, and was made by him a vehicle for conveying his peculiar doctrines with more authority to his disciples. Thus perhaps the theory of metempsychosis was but a peculiar form into which the doctrine of immortality and a future retribution was cast. A very similar theory to that of the philosopher is certainly adopted by Pindar (Ol. ii.), within a time apparently too short for a totally new doctrine to have gained acceptance. All that belongs to the theory of number must evidently be ascribed to Pythagoras himself; but it is not improbable that many of his minor doctrines and peculiar precepts were borrowed from previously existing notions and observances. Even the scantiness of our knowledge of Pythagoras cannot conceal from us the fact that he must have been one of the most remarkable men that have ever lived. As to his philosophy, perhaps the highest praise we can give it is, that it contributed greatly to give rise to the lofty speculations of Plato, of whom he was the precursor; and as to his institutions, they long survived to perpetuate the memory and fame of their founder. (See Ritter's *History of Ancient Philosophy;* Smith's *Dictionary of Greek and Roman Biography;* Archer Butler's *Lectures on the History of Ancient Philosophy*, &c.)

PYTHEAS, an ancient navigator, was a native of Marseilles, and is supposed to have lived some time about the age of Alexander the Great, 330 B.C. We have no information respecting the private circumstances of his life, but we know that he explored the northern seas of Europe, though the ancient geographers appear to have placed little dependence on the statements which he made. Both Polybius and Strabo treat him with great severity, and ridicule his accounts as absurd and incredible. Modern writers are inclined to set more value upon the narrative of Pytheas. It would appear that he sailed through the English Channel, and, after leaving Britain, a voyage of six days to the north brought him to an island which he calls Thule, where he says that the sun never descends below the horizon for a certain period at the summer solstice. This statement would apply to Iceland, but then it seems unlikely that he could reach that island within six days. He next sailed to the N.E., and entering the Baltic, reached a river which he calls Tanaïs, and is thought by Ukert to be the Elbe. Here he found a people who made use of amber instead of wood; and as that substance is still found in large quantities in Prussia, there is little doubt that he must have visited this part of Europe. He gave an account of his voyages in two works which he published. The one was a *Description of the Ocean*, and contained his voyage from Gades to Thule; the other work was entitled *Periplus.* He appears to have been the first to determine the latitude of a place from the sun's shadow. It is said that Pytheas was the first who suspected that the tides were influenced by the moon. (See *Eclaircissements sur la Vie et sur les Voyages de Pythéas*, by Bougainville, in the *Récueil de l'Académie des Inscriptions*, xix. 46; also the discussions of D'Anville, of Ukert, of Arvedson, of Fuhr, and of Straszewick.)

PYTHIA. See Delphi, and Oracles.

PYTHIAN GAMES, one of the four great national festivals of the Greeks, was held near Delphi, anciently called *Pytho*, in honour it is said of Apollo, who slew Python, a monstrous serpent, near that place. The Crissæan plain, where those games were celebrated, contained a hippodromus, or race-course, a stadium of 1000 feet in length, and a theatre where were held the musical contests, the most important part of the Pythia. According to most legends, these games were instituted by Apollo himself. Previous to Ol. 48 they had been celebrated at the end of every eighth year; but afterwards, like the Olympia, they were held at the end of every fourth year. According to Böck, they were celebrated in the spring, in the month of Bucatius, which must have corresponded with the Attic Munychion. During the first Pythiad the victors received χρήματα as their reward, but in the second the reward was a laurel chaplet. The Pythian games were most probably held as long as the Olympic, that is, down to A.D. 394. (Krause, *Die Pythien, Nemeen, und Isthmien.*)

PYX, Trial of the. See Coinage.

Q.

Q, the seventeenth letter and thirteenth consonant of our alphabet, but one not to be found either in the Greek, old Latin, or Saxon alphabets; and indeed some would entirely exclude it, seeing that *k* fully supplies its place. The *q* is never sounded alone, but in conjunction with *u*, as in *quality*, *question*, *quite*, *quote*, and the like, and never ends any English word. As a numeral, Q stands for 500; and with a dash over it, thus, $\bar{Q}$, for 500,000. Used as an abbreviation, *q* signifies *quantity* or *quantum*. Thus, amongst physicians, *q. pl.* is *quantum placet*, as much as you please; and *q. s.* is *quantum sufficit*, as much as is necessary. Q. E. D. amongst mathematicians, is *quod erat demonstrandum*, which was to be demonstrated; and Q. E. F. is *quod erat faciendum*, which was to be done. Q. D. amongst grammarians is *quasi dictum*, as if it were said, or, as who should say. In the notes of the ancients, Q stands for *Quintus* or *Quintius*; Q. B. V. for *quod bene vertat*; Q. S. S. S. for *quæ supra scripta sunt*; Q. M. for *Quintus Mutius*, or *quomodo*; Quint. for *Quintilius*; and Quæs. for *quæstor*. (See ABBREVIATIONS.) For the changes to which this letter is liable, see C and K.

QUADI, a warlike German tribe, whose territories were situated between the Danube, the Bohemian mountains, and the River Marus. They make their first appearance in history in the first century as formidable foes of the Romans. Their bodies were covered with mail, consisting of plates of horn; their weapons were long spears; and each man had three swift horses for his use in battle. Thus equipped, they commenced the practice of making rapid and sweeping raids into Pannonia, Mœsia, and other neighbouring provinces. Sometimes they routed the imperial forces which tried to check their inroads. At all times they returned home with their predatory spirit unbroken. No reverses, in fact, however frequent, could daunt those wild border troopers of the Danube. The emperors Marcus Aurelius, Probus, Carus, and Valentinian I., defeated them without subduing or crushing them. The last glimpse that we get of them in history shows them in company with other barbaric hordes, in 407, overrunning Gaul, and revelling in boundless havoc and slaughter.

QUADRANGLE, or quadrilateral, a figure consisting of four sides and four angles situated in the same plane.

QUADRANT (*Quadrans*), in geometry, the arch of a circle containing ninety degrees, or the fourth part of the entire periphery. The name is also applied to a mathematical instrument, of great use in astronomy and navigation, for taking the altitudes of the sun and stars, as also for taking angles in surveying. This instrument is variously contrived, and furnished with different apparatus, according to the various uses for which it is intended; but they all have this in common, that they consist of a quarter of a circle, the limb of which is divided into ninety degrees. Some have a plummet suspended from the centre, and are furnished with sights to look through. The principal and most useful quadrants are the common surveying quadrant, the astronomical quadrant, Adams's quadrant, Cole's quadrant, Gunter's quadrant, Hadley's quadrant, horodictical quadrant, Sutton's or Collins's quadrant, and the sinical quadrant. The quadrant is now entirely superseded for astronomical purposes by the mural circle. (See MURAL CIRCLE, and SEXTANT.)

QUADRANTAL, the principal Roman measure of capacity for fluids. All the Roman measures were originally founded on weight. It was at first denominated *amphora*, and afterwards quadrantal, from its form, which was square every way, like a die. In capacity, it contained eighty *libræ* or pounds of wine, which made forty-eight *sextarii*, two *urnæ*, or eight *congii*.

QUADRATIC EQUATIONS. See ALGEBRA.

QUADRATURE, in geometry, denotes the reducing a figure to a square. Thus, the finding of a square which shall contain just as much surface or area as a circle, an ellipsis, or a triangle, is the quadrature of a circle, an ellipsis, or a triangle. The quadrature, especially amongst the ancient mathematicians, was a great postulatum. The quadrature of curvilinear spaces is of difficult investigation; and in this respect extremely little was done by the ancients, except the finding the quadrature of the parabola by Archimedes. In the year 1657, Sir Paul Neil, Lord Brouncker, and Sir Christopher Wren geometrically demonstrated the equality of some curvilinear figures to rectilinear spaces; and soon afterwards the same thing was proved both at home and abroad of other curves, and which were brought under an analytical calculus. The first specimen of this was given to the public in 1688 by Mercator, in a demonstration of Lord Brouncker's quadrature of the hyperbola by Dr Wallis's reduction of a fraction into an infinite series by division. Sir Isaac Newton, however, had before discovered a method of attaining the quantity of all quadruple curves analytically by his fluxionary calculus. It was disputed between Sir Christopher Wren and Mr Huygens which of them had first discovered the quadrature of any determinate cycloidal space. Leibnitz afterwards found that of another space; and in 1669 Bernoulli discovered the quadrature of an infinity of cycloidal spaces, both segments and sectors. (For the history of the quadrature of the circle, see the third supplement to the fourth volume of Montucla's *Mathematical Recreations.*)

QUADRATURE, in astronomy, that aspect of the moon when she is ninety degrees distant from the sun; or when she is in a middle point of her orbit, between the points of conjunction and opposition, namely, in the first and third quarters.

QUADRIGA (*quatuor*, four, and *jugum*, a yoke), in antiquity, a car or chariot drawn by four horses harnessed all abreast. On the reverses of medals we frequently see Victory in a quadriga, holding the reins; and hence these coins are called *nummi quadrigati* and *victoriati*.

QUADRIO, FRANCESCO XAVERIO, a learned Italian writer, was born in the province of Valtellina in 1695, and entered the order of the Jesuits at the age of twenty. His uneasy disposition drove him about from one pursuit to another, before it fixed its attention on any particular subject. He first taught humanity at Padua. Then he studied and taught theology at Bologna. His next vocation was that of a preacher at Venice and Modena. At length he was found once more at Padua engaged in literary labours. It was there that Quadrio undertook the arduous project of writing a History of Poetry under all its different forms in every age and country. At first the execution of the plan went on prosperously. Pope Benedict XIV., and the eminent writer Cordara, cheered him on in his toils. He was indefatigable in rummaging the libraries of Venice, Milan, and Bologna, and in collecting materials from all quarters, He stated his facts and opinions with as much fulness and exactness as could be expected in a work of such a general character. The only part of the subject in which he glaringly failed was that which related to modern foreign languages. In course of time, however, his success began to be seriously impaired. Want of money gave rise to melancholy, and melancholy deranged both mind and body. Nothing but change would solace him. He wandered restlessly from one European city to another. He threw off the garb of the Jesuits, and appeared as a plain secular priest. His book itself was for a time laid aside. Even after it was resumed, he did not show his former untiring energy. When the work was at length completed, under the title of *Storia e Ragione d'Ogni Poesia*, 7 vols. 4to, Bologna and Milan, 1741–52, it appeared that some portions of the later volumes were mere compilations. Quadrio died at Milan in 1756.

QUADRUPLE, fourfold, or something taken four times, or multiplied by four, on which account it is the converse of quadripartition, or division by four.

QUÆSTOR (*quæro*, I seek), a name given to two distinct classes of Roman officers. Varro defines both as: Quæstores a quærendo, qui conquirerent publicas pecunias et maleficia—"Quæstors (from their *seeking*), who collect the public monies and investigate crimes." The one class, the *quæstores classici*, therefore, had to collect and keep the public revenues; the other, called the *quæstores parricidii*, were public accusers who convicted those guilty of any capital offence, and carried the sentence into execution.

QUAIL. See ORNITHOLOGY.

QUAINI, LUIGI, an Italian painter, was born at Bologna in 1643, and studied his art under Guercino, Carlo Cignani, and his father Francesco. A lively and versatile disposition soon made him a man of accomplishment. He became an adept in history, architecture, and music. In painting especially he manifested his easy dexterity. Although employed for a great part of his life in working on the same canvas with his brother-in-law Franceschini, he always succeeded in giving a distinct embodiment to his happy and graceful conceptions. His beautiful landscapes and exquisite perspectives were interesting and important features in the pictures which the two painted at Bologna, Modena, Piacenza, Genoa, and Rome. Quaini died in 1717.

QUAKERS.

Ideas commonly entertained of Quakers and Quakerism.

QUAKERS, a body of Protestant Dissenters, so named by the public at large, but styled by themselves, "The Society of Friends." This society was founded by George Fox in the year 1647. The Friends are remarkable for differing from the community in religious doctrines, mode of worship, and social customs, more than any other body of Christians; and it may safely be asserted that their character has been less understood, and more seriously misrepresented, than that of almost any other religious association of modern times. Mosheim, Neale, Formey, Voltaire, and Hume have given us descriptions of the Society of Friends, of which it would be difficult to say which abounds most in ignorant mistakes or wilful distortions. Of late years a fairer estimate of these people has manifested itself in the public mind. Men of deep thinking and eminent genius have been led to examine their history and writings, and have pronounced decisions upon them very different from those of the authors just mentioned. Coleridge, in his *Biographia Literaria*, says, "One assertion I will venture to make, as suggested by my own experience, that there exist folios on the human understanding, and the nature of man, which would have a far juster claim to their high rank and celebrity, if in the whole huge volume there could be found as much fulness of heart and intellect as bursts forth in many a simple page of George Fox." Thomas Carlyle, in his *Sartor Resartus*, pronounces George Fox "the greatest of modern reformers;" and Charles Lamb, in the *Essays of Elia*, declares, that "Sewel's *History of the Quakers* is worth all other ecclesiastical history put together."

We shall now proceed to give such an account of the rise, progress, and opinions of this society as an intimate acquaintance with it and the writings of its members enables us to furnish, and as will be found amply borne out by a careful reference to the most authentic records, and to its existing condition.

It has commonly been stated that this society was, at its commencement, termed the *Family of Love*, or *Seekers*. But this is a mistake The *Seekers* were a people of prior origin, and of very different notions. From their peculiar extravagance, they acquired the name of *Ranters*, and seem to have been the very people that Butler had in his eye when writing his *Hudibras*. They held that

> Saints may do the same things by
> The spirit in sincerity
> Which other men are tempted to,
> And at the devil's instance do,
> And yet the actions be contrary,
> Just as the saints and sinners vary.[1]

Origin of the term Quaker.

The attempt to confound the Quakers with this sect was one of the first acts employed by the enemies of Quakerism to stamp it with opprobrium. Fox occasionally fell in with them in his travels, and sharply reproved them for their errors. The Friends, for some time after they had been gathered into a distinct body, were known only by the name of "the Professors of the Light," or "Children of the Light," from "their fundamental principle, which," to use the words of William Penn, "is as the corner-stone of their fabric; and, indeed, to speak eminently and properly, their characteristic or main distinguishing point or principle, viz., the light of Christ within, as God's gift for man's salvation; the root of the goodly tree of doctrine that grew and branched out of it."[2] They were known by no other name till 1650, three years after the commencement of their society, when George Fox being brought before the magistrates of Derby for preaching there, and telling them to "quake at the name of the Lord," one of them, Gervase Bennett, an Independent, caught up the word, and called him and his friends *Quakers*. That was the real origin of the term Quaker; "a term which," says Sewel, their historian, "so caught the public fancy, and especially that of the priests, that they sounded it gladly abroad, never after that time giving any other name to the professors of the Light, so that it soon ran all over England, and making no stand there, it quickly reached the neighbouring countries; and that English name sounding very oddly in the ears of foreigners, hath given occasion to many silly stories."[3]

Real character of George Fox.

Perhaps to no great reformer has so little justice been done as to George Fox. Beyond the pale of his own society his character has in fact never been understood. By some grave and even eminent writers he has been denounced as a silly enthusiast; by others as a blasphemer; and others, again, have denied that he was the founder of Quakerism at all. No statements can be more at variance with the truth. For three or four years after his first setting out he was the sole preacher of the society.[4] It was he, as may be abundantly seen in the histories of the society, and the writings of his most celebrated disciples, who gave its character and constitution to this religious association. They are his opinions, his feelings, his tone of mind, which stamped it with its peculiar form and spirit. That in the fervour of his enthusiasm, and the elation of brilliant success, he ran into some fanatical extravagances, and even absurdities, is what is perhaps inseparable from the career of a sanguine advocate of great moral and social changes; and we shall soon point to some of these, in tracing his exertions for the organization of his infant society. There have indeed been one or two documents, a letter to Cromwell, and a letter to himself from the wife and daughters of Judge Fell, raked up out of a vast mass of manuscripts left behind him, and eagerly and repeatedly pushed before the public by his enemies, and recently again by some seceders from the Quakers themselves, in order to stamp him as a blasphemer, and a man open to the silliest adulation. It is not by such a mode, however, that the genuine character of any man is to be decided, but by a careful examination and candid judgment of his whole life and works. Did we apply so one-sided and unphilosophical a test to that of any great reformer, what should we now think of Luther, Jerome of Prague, Calvin, Knox, Wesley, or many others? If we shut our eyes to the nobler points of their characters, and opened them only to their defects; if we estimated Jerome of Prague by his recantation, Luther by his notions of combats with the devil, Calvin by the burning of Servetus, Knox by his zeal in the demolition of cathedrals, or Wesley by his belief in omens and apparitions, what an absurd verdict should we pass upon these great men! Such, however, has generally been the mode of judging of George Fox; whilst his labours, and religious and moral doctrines recorded by himself and the historians of the society, mark him as one of the most extraordinary men of his age. We shall soon have to observe upon how many important points of morals and manners he called in question the received opinions of his time; for whatever his sagacious mind had once embraced as truth, he had the integrity and boldness to proclaim everywhere. He advanced into the presence of princes, and proclaimed it there in the same fulness, and with the same ease and freedom, as he did amongst his own peers. Yet with this daring and determined spirit, his contemporary disciples are unanimous in attesting his gentleness and unassuming modesty amongst them. The testimony of his eminent friend William Penn, who had seen much of society in all its gradations, is that of all those who knew him best. "He was a man that God endued with a clear and wonderful depth; a discerner of others' spirits, and very much master of his own. . . . He was of an innocent life, no busy-body nor self-seeker; neither touchy nor critical. . . . So meek, contented, modest, easy, steady, tender, it was a pleasure to be in his company. He exercised no authority but over evil, and that everywhere and in all; but with love, compassion, and long-suffering. A most merciful man, as ready to forgive as unapt to take or give an offence. Thousands can truly say he was of an excellent spirit and savour amongst them, and because thereof the most excellent spirits loved him with an unfeigned and unfading love."[1]

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[1] Penn's *Rise and Progress of the Quakers*, 12th edition, p. 12; Sewel's *History of the Quakers*, 5th edition, i. 10; Gough's *History of the Quakers*, i. 53.

[2] Penn's *Rise and Progress*, p. 18.

[3] Sewel's *History*, 5th edition, i. 43.

[4] Sewel's *History*, i. 86.

Formation of the Society of Friends.

George Fox was born of humble parents at Drayton in Leicestershire. In the quaint language of Sewel, "his father was Christopher Fox, a weaver by trade, an honest man, and of such a virtuous life that his neighbours used to call him righteous Christer. His mother was Mary Lago, an upright woman, and of the stock of the martyrs."[2] George was put apprentice to "a shoemaker that dealt also in wool and in cattle;" but he became most attached to the agricultural part of his master's business. His humble origin and education have often been adverted to, as implying a stigma upon Quakerism; but it is unquestionably to this circumstance that Quakerism owes its most distinguishing features, and probably the greatest amount of good that it has done, or may yet do, in the world. As Fox grew up, pursuing his solitary occupations in the fields, his strong mind soon began to employ itself on the subject of the utmost moment to a mortal creature, the grounds of his hopes of a future existence, and the true understanding of the Scriptures. That which, at a first view, seemed to be a disadvantage to Fox, his want of learning and his obscurity of station, have, through the native vigour of his intellect, become eminently advantageous. His mind was neither trammelled by creeds, nor directed by classical or other knowledge, nor misled by the glimmerings of school philosophy. He was thrown, by his absolute want of a higher education, on his Bible. The whole strength and earnestness of his understanding were concentrated on the inquiry into the doctrines it contained; and he seems, with a wonderful clearness and singleness of eye, to have at once comprehended the pure and simple system of the Christian faith. He embraced it heartily and for ever. No bias of selfishness, no hopes of honour or of gain, ever appeared to weigh with him for a moment; it was to Christianity for itself alone that he attached himself, and he set out to proclaim it in the face of the world, with that boldness which always distinguished him. At first his travels were principally through the midland counties, where he convinced great numbers of his principles. For four years he appears, as already stated, to have been the only preacher of those principles; and, what is singular, the second preacher of Quakerism was a woman named Elizabeth Horton. In the fifth year of Quakerism there were, however, according to Sewel, no less than twenty-five preachers, and in the seventh year upwards of sixty. These, traversing the kingdom in all directions, excited an extraordinary commotion. But in order fully to understand the uproar which the preaching of Quakerism created, it is necessary to call to mind the features of that age, and to see what the doctrines of Fox really were.

The age of George Fox.

George Fox made his appearance just as the struggle between the crown and the people was drawing to a close. Charles I. was already in the hands of the Parliament. The monarchy had been destroyed, and the public mind was full of new schemes of liberty and legislation. Then came the struggle between the Parliament and the military power. Not only the monarchy and the Parliament, but the church establishment itself, fell. Men soon began to grow weary of alternate tyranny and lawlessness both in ecclesiastical and in political matters. They were disgusted, too, with the greediness of priests of different denominations, struggling shamelessly for power and wealth. The diffusion of the Scriptures during the respective reigns of Henry VIII., Edward VI., and Elizabeth had now made them pretty common in the hands of the people. Thousands and tens of thousands were scattered throughout the country, who were become dissatisfied with the old institutions, and anxious to ally themselves with some body, the doctrines and practice of which were more consonant to their newly-awakened ideas. But they were not merely on the watch; they were in a state of high excitement. The novelty and animating nature of the doctrines of the gospel, and perhaps still more the splendour of eastern metaphor exhibited in the prophetical writings, had thrown them everywhere into a sort of spiritual intoxication. When, therefore, George Fox made his progress through the country, his voice was like a trumpet to collect around him hosts of inquirers. Priests, notwithstanding the opposition of their order, left their pulpits; officers in the army, judges, gentlemen, mechanics, and husbandmen; all classes, indeed, flocked round him, and found in his system of a free gospel, and renouncement of the vanities of the times, that which they had hitherto sought for in vain.

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[1] Penn's *Rise and Progress*, pp. 53-56.

[2] Sewel's *History*, i. 11.

Doctrines of the Friends.

The doctrines which Fox taught, and which have been received and are still held as the true faith by the Society of Friends, are principally the following:—

1*st.* The great foundation and corner-stone of Quakerism, as William Penn justly terms it, is the doctrine of the Inward Light, founded on various passages of Scripture, but especially on the words of the gospel according to St. John, that "Christ is the true Light which lighteth every man that cometh into the world." They believe in the words of a document, issued by themselves, that "every man coming into the world is endued with a measure of this light, grace, and spirit of Christ, by which, as it is attended to, he is enabled to distinguish good from evil, and to correct the disorderly passions and corrupt propensities of his nature; and that without the spirit inwardly revealed, man can do nothing to the glory of God, or to effect his own salvation."

2*d.* The spirituality of Christianity is a doctrine which flows directly from this root, and hence they believe in the non-essentiality of religious ceremonies. "We think," say they, "this influence (the influence of the Spirit of Christ) especially necessary to the performance of the highest act of which the human soul is capable, even the worship of the Father of lights and spirits, in spirit and in truth; therefore we consider as obstructions to pure worship all forms which divert the attention of the mind from the secret influence of this unction from the Holy One. (1 John ii. 20–27.) They cannot, therefore, admit of any fixed liturgy, any stated forms of prayer, or any regular preaching. "Yet, although true worship is not confined to time and place, we think it incumbent on Christians to meet often together (Heb. x. 25), in testimony of their dependence on the heavenly Father, and for a renewal of their spiritual strength; nevertheless, in the performance of worship, we dare not depend for our acceptance with him on a formal repetition of the words and experiences of others; but we believe it to be our duty to cease from the activity of the imagination, and to wait in silence to have a true sight of our condition bestowed upon us." On this ground the sole outward act of worship amongst the Friends consists in meeting together and sitting down in silence, without any singing, or stated prayers or sermon.

3*d.* From the same great fundamental tenet of the society it directly flows, that as this influence is absolutely necessary to the performance of individual worship, it is more especially so in the exercise of the ministry. There can be no preaching unless the preacher immediately feel himself moved to speak; therefore there can be no electing of particular individuals by the church, or education of them for the office of the ministry. It implies a ministry entirely of divine ordination, and without the participation of any human authority. According to this faith, there is and can be no paid priesthood. The gospel is a free gift to be freely exercised.

4*th.* The Friends do not hold the doctrine of the Trinity according to the common acceptation of the word. They think it safest on this mysterious subject to confine themselves to the terms of Scripture; and these are the words of their confession on this subject:—"We agree with other professors of the Christian name in the belief in One Eternal God, the Creator and Preserver of the universe; and in Jesus Christ his Son, the Messiah and Mediator of the New Covenant (Heb. xii. 24)."

5*th.* The belief in the entire spirituality of the gospel system has led the Friends to consider some rites received and practised by other bodies of Christians as non-essential. "There are two ceremonies in use amongst most professors of the Christian name,—water baptism, and what is termed the Lord's Supper. The first of these is generally considered as the essential means of initiation into the church of Christ, and the latter of maintaining communion with him. But as we have been convinced that nothing short of his redeeming power, inwardly revealed, can set the soul free from the thraldom of sin, by this power alone we believe salvation to be effected. We hold, that as there is one Lord and one faith (Eph. iv. 5), so his baptism is one in nature and operation; that nothing short of it can make us living members of his mystical body; and that the baptism of water, administered by his forerunner John, belonged, as the latter confessed, to an inferior and decreasing dispensation (John iii. 30). With respect to the other rite, we believe that communion between Christ and his church is not maintained by that nor by any other external performance, but only by a real participation in his divine nature (2 Pet. i. 4) through faith; that is the supper alluded to in the Revelations (Rev. iii. 20), 'Behold I stand at the door and knock; if any man hear my voice, and open the door, I will come in to him, and sup with him, and he with me;' and that where the substance is attained, it is unnecessary to attend to the shadow, which doth not confer grace, and concerning which opinions so different, and animosities so violent, have arisen."

6*th.* Their great doctrine of the inward light necessarily implies the doctrine of repentance and a new life; in the words of Penn, "Repentance from dead works to serve the living God, which comprehends three operations:—*First*, a sight of sin; *secondly*, a sense and godly sorrow for sin; *thirdly*, an amendment for the time to come. This was the repentance they (the first Quakers) preached and pressed, and a natural result of the principle they turned all people unto."[1]

7*th.* "From hence sprung another doctrine which they were led to declare. Perfection from sin, according to the Scriptures of truth, which testify it to be the end of Christ's coming, and the nature of his kingdom, and for which his Spirit was and is given,—viz., to be perfect as our heavenly Father is perfect, and holy because God is holy. . . . . But they never held a perfection of wisdom and glory in this life, or from natural infirmities, or death, as some have, with a weak and ill mind imagined and insinuated against them."[2]

Such are the great and strictly religious doctrines of the Society of Friends. There are others which they hold in common with other Christians, and which need not be enumerated here; but there are others, again, constituting a great system of philosophy, of morals, and manners, which distinguished the faith of George Fox from that of his predecessors and contemporaries, and which, if permitted to operate freely throughout society, would unquestionably produce the most amazing and beneficent changes. In the gospel declarations, that "God made of one blood all the nations of the earth," and that "he is no respecter of persons," he perceived nothing less than a charter of the most perfect freedom and equality of right to the whole human race. He carried out this idea so liberally, that he extended it to the female part of the community. He declared the equality of the sexes; that there is no sex in souls, but all are one in Christ Jesus; and on this ground he gave the female Friends a participation in the civil economy of the society. He extended this doctrine to all nations and colours; one right and one law for all men, whether white or black. In the declaration of Christ the heathen lorded it over one another, but it should not be so amongst his disciples, where he saw the law of brotherhood, and not of subjection. This law once recognised, he could no longer recognise the contrary law of bloodshed and revenge; he was bound to pronounce the anti-Christianity of war. He pronounced the anti-Christianity of all oaths, on the clear and unequivocal command of Christ, "Swear not at all."

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[1] Penn's *Rise and Progress*, p. 19.

[2] Ibid., p. 19.

Peculiar customs and practices.

He regarded Christianity as a heavenly dispensation, sent down to draw us from the follies and vanities of the world, and the very essence of which consisted in a renewed vitality of mind. This led him to resist, despise, and expose those assumptions of absurd titles, those demands of servile obeisance and empty flatteries by mere wealth and factitious rank, which degrade both givers and receivers, and fill the world with so much misery and heart-burnings, so much meanness and pride. On this principle, he adopted the utmost simplicity of dress and manners. He resumed the original use of *thee* and *thou* to a single person, the more so as *you* was then used to a rich person, and *thou* to a poor one. He abandoned the practice of what he called "hat-homage," taking off the hat, and bowing, as marks of obeisance to superiors. He refused to address persons of rank by the titles of your Majesty, your Excellency, your Grace, &c., looking upon it as the basest flattery, where there happened to be neither majesty, excellency, nor grace. Believing in the authenticity of no ministry but such as depended alone upon the teaching of the Holy Ghost, he denied the right to tithes, church-rates, or any compulsory payments to the support of a priesthood. As he regarded the ceremony of marriage as requiring for its celebration no interference of a minister of the gospel, he refused the mode adopted at the altars of the Established Church, and introduced a simple form of marriage in the meetings of his own society. He rejected the common customs of mourning and burial, as not being in accordance with the simplicity of the gospel. Regarding the names of the months and days of the week as originating in mythological idolatry, he substituted a mere numerical nomenclature. Various practices and social indulgences, as singing, dancing, music, the frequenting of theatres and other places of public amusement, playing at games of chance for money, drinking of healths, horse-racing, and field-sports, were renounced and discouraged by him, as incurring waste of time, or as inconsistent with the serious hopes and duties of Christians. These innovations were all adopted by the Society of Friends, and became fixed rules of practice.

The first preachers among the Friends.

It is obvious that a system like this could not be promulgated without setting in array against it an innumerable host of enemies. There was scarcely a custom of society, or a profession in it, at which it did not aim a severe blow. The church, the army, the law, each felt that it was menaced with decay or change. Royalty saw that if this doctrine succeeded, it would lop off the right arm of arbitrary power, for it could not flatter the divine right of kings. The clergy saw that it did not object to this or that dogma, this or that ceremony, like the Puritans, but it assailed, root and branch, state religion itself. If Quakerism succeeded, where would be the soldier and the marine; where the gainful trade of litigation? It was a system which aimed a death-blow at the flatteries of the world, and the self-gratulation and self-indulgent spirit of human nature; and it was accordingly speedily saluted with one general and furious tempest of hatred and vengeance. But, before turning to the persecutions of the Quakers, we must first notice the singular zeal, and as singular enterprises, of their first ministers. It has been stated that in the seventh year of Quakerism these ministers amounted to upwards of sixty. These numbers continued for some years to increase rapidly; and they were animated with a surprising spirit of proselytism. Of these, Francis Howgill, John Audland, Samuel Fisher, had been clergymen; George Bishop, Richard Hubberthorn, William Ames, officers in the army; Anthony Pearson, John Crook, justices of peace. Of the rest, Edward Burrough, Robert Farnsworth, James Nayler, William Dewsbury, John Camm, Thomas Lowe, William Caton, and James Parnel, were amongst the most eminent. William Penn and Robert Barclay, two of their most celebrated members, did not join the society till about twenty years after its formation. There was also a considerable number of women-preachers, who displayed a spirit as bold and zealous as the men.

Firmly persuaded that they were actuated by the immediate influence and revelation of the Divine Spirit, and ordained to restore the primitive form and simplicity of the Christian faith, the Quaker preachers traversed every quarter of the United Kingdom, entering the churches of the establishment, denouncing their ceremonies and doctrines, telling the people that they were come to call them off from such things, from "the beggarly elements" of outward observances and outward teachers, to the great Inward Teacher; that the ground on which these churches stood was no more holy than any other ground;[1] and that sprinkling with water, putting on of surplices, and repeating ready-made prayers, were but relics of Popery. As these clergy and churches were maintained by the nation, they conceived that they had the clearest right to call upon the nation to look into them. They did not stop here; they believed it their duty to address solemn warnings to magistrates, to Parliament, to the protector or the king as it might be, and what they regarded as their duty to the public. George Fox, Edward Burrough, Samuel Fisher, George Whitehead, and others of the Friends, had repeated interviews with Cromwell, Charles II., and other monarchs; and William Penn was a regular visitor at court during the short reign of James II.[2] Many of the preachers extended their travels to France, Germany, Holland, and America. George Fox himself visited Holland, America, and the West Indies. Penn and Barclay visited Holland and Germany, and were received with the most cordial sympathy by Elizabeth, the princess of the palatinate, who entered into a religious correspondence with them.

Their zeal and singular actions.

Their success, and perhaps the very heat and opposition of the times, so stimulated their zeal and confirmed their opinions, that they now declared that they moved in the same spirit and power as the apostles. George Fox declared them little better than imposters who did not possess and act in that power and spirit. He believed that by the Inward Light, not only the Scriptures, but both the intellectual and physical world, were opened to him. "He knew not only a renewing of the heart, and a restoration of the mind, but the *virtues of the creatures were also opened to him;* so that he began to deliberate whether he should practise physic for the good of mankind. . . . . The three great professions in the world, physic, divinity and law, were opened to him," &c.[3] He worked miracles, according to his own testimony and that of his friends. He cured a woman of a distracted mind, by merely telling her, in the name of the Lord, to be quiet.[4] He commanded a man at Arn-side to stretch out his withered arm, and it was restored.[5] But he believed himself not only endowed with the apostolic, but with the prophetic power. He foretold to Judge Fell, a fortnight before anybody else dreamed of such a thing, the dissolution of the Parliament by force.[1] He had a vision of an angel with a fiery sword, prophetic of the great fire in London.[2] Meeting Cromwell riding in Hampton Court Park, as he drew near, "he perceived a waft of death go forth from him." Cromwell invited him to come to the palace, but on going the next day he found him already on his death-bed.[3] He exercised the same gift on many other occasions, foretelling judgments on his persecutors. His coadjutors laid claim to the same revelations. They were zealous to the last to address warnings to magistrates and to governments; as Francis Howgill to Cromwell;[4] Samuel Fisher to the Parliament;[5] Edward Burrough to Cromwell and his council, &c.[6] They foretold events. Thomas Aldam foretold the fall of Cromwell;[7] George Bishop, the great plague in London;[8] Thomas Ibbitt, Humphry Smith, George Fox the younger, and Thomas Briggs, the great fire of London;[9] Edward Burrough, the death of Cromwell, his own death, and various other events.[10] They exhibited signs, like the ancient prophets. A woman went into the Parliament in 1658, with a pitcher in her hand, and breaking it, told them, so should they be broken to pieces.[11] Thomas Aldam took off his cap before the Protector, and tearing it to pieces, said, "so shall the government be rent from thee and thy house."[12] In 1660 Robert Huntingdon went into the church at Brough, near Carlisle, wrapped in a white sheet, and with a halter about his neck, to show the Independents and Presbyterians that the surplice would be introduced again, and that some of them would be hanged.[13] A woman appeared in a Protestant church at Dieppe, in sackcloth and ashes.[14] Thomas Ibbitt, two days before the fire of London, dismounted from his horse with his clothes hanging loosely about him, as though he had come in great haste, and went about the city denouncing judgment.[15] Solomon Eccles went into a Catholic chapel at Galway in Ireland, and when the people were on their knees, appeared naked above his waist, with a chafing-dish of coals and burning brimstone on his head, and, crying "Woe to these idolatrous worshippers," declared that God had sent him to show them their portion, unless they repented. The same man went into a church in Aldermanbury in 1659, and seating himself on the pulpit-cushion, in the face of the audience, began to sew.[16] In 1662 Daniel Baker, being in a ship becalmed opposite to Gibraltar, went ashore on Maunday Thursday, proceeded to the mass-house, and amid the people at high mass he rent his clothes, discovering sackcloth on his body; then taking his hat from his head, he threw it on the ground and stamped on it, and calling on them to repent, so passed away.[17]

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[1] Sewel's *History*, i. 79.

[2] Ibid., i. 273, 315–316; ii. 548, 559, 594, 613, 617.

[3] George Fox's *Journal*, 6th edition, i. 106; Sewel, i. 29.

[4] Ibid., i. 120; Ibid., i. 37.

[5] Ibid., i. 219.

Zeal of the first Quakers.

But the zeal of the first Quakers could not expend itself even in these extraordinary demonstrations; many of them set out to the very ends of the earth, with what they believed to be commissions from on high. One young woman, Mary Fisher, proceeded to Adrianople (although once stopped at Venice, and sent back by the British consul) to convert the Grand Turk, who received her in the most courteous manner.[18] Two others, Catharine Evans and Sarah Cheevers, went to Malta to reclaim the Catholic inhabitants, but did not meet with so handsome a reception as their sister had done from the Sultan. They were clapped into the prison of the Inquisition, and only liberated after a four years' imprisonment, through the interference of Lord D'Aubigny.[19] John Love, John Perrot, Samuel Fisher, and John Stubbs went to Rome, to testify, in the presence of the Pope and cardinals, against their superstitions. Love died in the Inquisition, but the others escaped.[20] George Robinson travelled to Jerusalem to denounce the trade which the friars made of the holy sepulchre, and to convert the Mohammedans, and also returned safe.[21] Others crossed to New England, where we shall have occasion to speak of them immediately.[22]

Persecutions suffered by the Friends

The persecutions which the Friends suffered forms another remarkable chapter in their history, and one in which they appear to great advantage. We have seen what were their doctrines, and that their promulgation was sure to plunge them into a sea of suffering. This was soon verified. Wherever they appeared, the clergy, who justly looked upon them as the most daring and determined enemies that ever appeared against them (for they everywhere declared to the people that their system was anti-Christian, and rotten to the very core), on all hands roused the civil and military powers against them. Wherever they preached they were hauled before the magistrates, fined or imprisoned; but though the persecution waxed hotter and fiercer every day, they never for a moment flinched, or remitted their activity in travelling and preaching all over the country. No persecution in modern times fell more heavily or savagely upon any people; and it must be said, to the honour of the society, that no people ever stood up more firmly for the rights of conscience and the liberty of the subject. The trials of the Friends, and especially that of John Crook in 1662,[23] and that of William Penn and William Mead in 1670,[24] at the Old Bailey, will for ever remain as noble monuments of their resistance to the arbitrary proceedings of the courts of judicature at that time, and their violent infringement of the privilege of jury. In the latter case there happened to be a noble jury, who, insensible to the most atrocious attempts made by the court to force a verdict, were shut up without "meat, drink, fire, or tobacco," for two nights and a day, and, still remaining immoveable, were conveyed with the prisoners to Newgate.

The enemies of the Quakers were furnished with abundant means of oppression, in the various acts which had been passed since the days of Henry VIII. till then, against the Popish recusants, and otherwise, to compel conformity to the Established Church. There was the 27th of Henry VIII.; the 1st of Elizabeth, for twelvepence a day; the 5th of Eliz. *De Excommunicato capiendo;* the 35th of Elizabeth, for abjuring the realm, on pain of death; the 3d of James I. for præmunire, imprisonment for life, and confiscation of estate; the 13th and 14th of Charles II. for transporting Quakers; the 17th of Charles II. against Nonconformists; the 22d of Charles II. against seditious conventicles. They were so surrounded with snares that there existed not a chance of escape if there were the slightest desire to punish them. If all charges against them failed on any occasion, there was the oath of allegiance and supremacy always ready to present to them; and the Quakers could not take any oath whatever. But by the last act against conventicles, passed in 1670, they were completely given up as a prey to the informers. Any five persons convicted of being present in one house, over and above the ordinary family, were to be fined five shillings for the first offence, ten for a second, twenty pounds for preaching, forty for a second offence, and twenty pounds for the building in which the meeting was held, the whole to be levied by distress; and if any one person could not pay his fine, it was to be levied on any one or more who could, the informer receiving one-third of the amount. Under such temptations to low cupidity, loss of their property and imprisonment of their persons spread throughout the whole country. Cromwell and Charles II. both professed a desire to stay this persecution, but they took few measures to effect this object; on the contrary, during the whole reign of Charles persecution raged more and more vehemently. Their sufferings lasted thirty years, and the simple matter-of-fact relation of them fills two large folio volumes of more than one thousand four hundred closely-printed pages. The prisons were full of them, and these prisons were pestilential dungeons, of which we can now hardly credit the description. In them there were at one time 4200 Quakers. The prisons of London had suffocating crowds in them, and the celebrated HOLE in Newgate was the death of numbers. Ellwood, the friend of Milton, and who had the honour to suggest the composition of *Paradise Regained*, was in Newgate amongst these numbers, and has left us, in his Life, some curious sketches of those scenes. The majority of the first preachers of Quakerism died in prison. In 1662 twenty Friends died in the London jails; in 1664 twenty-five more; in 1665 fifty-two others, besides seven who died after liberation, in consequence of their treatment during confinement. According to Besse, the historian of their sufferings, the total number of Friends who perished in prison during this period was 369. In Bristol at one time every adult was in prison. In London in 1670 Charles issued an order, signed by the Archbishop of Canterbury and thirteen others, commanding Mr Christopher Wren to pull down their meeting-houses at Ratcliffe and Horsleydown, which was done, and the materials sold. Peel meeting-house was ransacked, and stripped of doors and windows. Their other meeting-houses were nailed up; and the Friends, who met on the ruins, or in the street, were driven away by soldiers, mercilessly beaten with the butt-ends of their muskets, and some of them killed. Throughout the severe winter of 1683, these steadfast people collected in the streets to worship, in spite of all pains and penalties, and suffered incredible hardships and insults. The dead were disinterred from their graves; women and children were dragged by the hair along the streets; some were pricked with needles and bodkins, and others were sold to the sugar plantations. Meantime their property was at the mercy of constables and informers, who wrenched open their doors with sledge-hammers and screws, and carried off everything, to the very children's food, often leaving not a tool to work with, or a horse to plough the land. In many instances these fellows, where the men were in prison, carried the keys of their houses in their pockets, went in and out as they pleased, declaring that they would "eat of the best and drink of the sweetest, and these rogues of Quakers should pay for all." There was levied at one time on the Friends at Bristol, for fines, L.16,400; and, from a careful examination of the records of the society, it clearly appears that property was taken or destroyed at that period to the amount of upwards of one million sterling.

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[1] Sewel's *History*, i. 112, 113.

[2] Sewel's *History*, ii. 101.

[3] Sewel's *History*, i. 315, 316.

[4] Ibid., i. 139.

[5] Ibid., i. 226.

[6] Ibid., i. 210, 276.

[7] Ibid., i. 325.

[8] Ibid., i. 260.

[9] Ibid., ii. 175, 199, 388.

[10] Ibid., i. 315; ii. 50.

[11] Ibid., i. 312.

[12] Ibid., i. 313.

[13] Ibid., i. 436.

[14] Ibid., i. 191.

[15] Ibid., ii. 199.

[16] Ibid., ii. 241; *State Trials*, vi. 998.

[17] Ibid., i. 541.

[18] Ibid., i. 433.

[19] Ibid., i. 493.

[20] Ibid., i. 433.

[21] Ibid., i. 292.

[22] Nothing is here said of the actions of James Nayler, because they were condemned by the Friends at the time, and, after his punishment, thoroughly condemned by himself.

[23] Sewel, ii. 23; Gough, i. 518; Howell's *State Trials*, vi. 201.

[24] *State Trials*, vi. 951; Sewel, ii. 259; Gough, ii. 328.

This sketch of their persecutions would not be perfect if we omitted their treatment in New England. There, the colony of Independents, whose history is so well known from the circumstance of their having fled from persecution at home, and immediately become persecutors themselves, and whose cruelties to the Indians and to one another form so gloomy a passage in history, no sooner heard that two Quaker women were arrived in the harbour, than they seized on them before they could land, put them in prison, stripped them naked, and barbarously treated them. They ordered three other Quaker women to be stripped to the waist, and flogged through eleven towns, a distance of eighty miles, in all the severity of frost and snow. They then hanged three men and one woman, before a mandate from the king could arrest their bloody course.

The extent of persecution was much diminished by William Penn opening an asylum for his friends in his new state of Pennsylvania, whither great numbers emigrated; and a final stop was put to them by James II. He permitted the Friends to substitute an affirmation instead of an oath; then came the Toleration Act of William II., recognising more fully the rights of conscience; and subsequent acts legalized their marriages, and placed them at ease amongst their fellow-citizens. They still continued their conscientious refusal to pay tithes and church-rates, and these are taken by distraint, to the average annual amount of about L.11,000.

It would give an unfair view of the Society of Friends, if, after exhibiting the vehemence of their early zeal, we did not remind the reader of the peculiar spirit and circumstances of that age. Then all the elements of political and religious unrest were in a state of chaotic turbulence, and the whole style of language and of action amongst all denominations was such as would now be pronounced violent and fanatical. The Quakers, in this respect, only partook of the spirit of the age; and to understand them more truly, we must see them in their patient steadfastness under their dreadful misusage, in which they gave the highest evidence of the influence and support of the Divine Spirit. It is to their everlasting honour that they never showed the least symptom of retaliation. Though often urged, when circumstances were in their favour, to denounce their enemies, they had on all such occasions but one answer, "We leave them to the Lord." They not only went on steadily, preaching and convincing thousands, but they set about and organized a system of discipline or church-government, distinguished in a remarkable degree for its order and decorum. In the first place, they established a standing committee in London, called "The Meeting for Sufferings," for receiving the earliest accounts of the persecutions of their friends from all parts of the kingdom, and for taking the promptest measures for their mitigation. It was in this committee that George Fox was to be constantly found to the latest day of his life, whenever in London, anxiously engaged in endeavouring to alleviate the sufferings of the society. The system of discipline then organized, and which continues, in the main, as it was left by the first Quakers, we have now to describe.

Discipline of the society.

Wherever the Friends have a meeting-house, they hold, once a month, after the meeting for worship is over, a meeting for discipline; or, in other words, for all the civil and ecclesiastical affairs of the body. Though they do not pay their ministers, they deem it right to defray their expenses when they travel in the ministry. They hold it a Christian duty to support their own poor, and to educate their children. For these purposes they raise the necessary funds by voluntary contribution at these meetings, which are called Preparative Meetings; that is, meetings preparatory to the monthly meetings, which include several preparative meetings. Each preparative meeting appoints representatives to attend the monthly meeting.

The monthly meeting receives the funds for the poor, and appropriates to each meeting what is necessary. It also receives the funds for the public schools, and for what is called "the National Stock;" that is, a fund placed at the disposal of the society at large for general charges; and hands them in by its representatives to the quarterly meeting. In these monthly meetings is chiefly vested the real property of the society, as its meeting-houses, lands, &c. They judge of the fitness of persons applying for membership, excite to due attention to religious and moral duties; and deal with disorderly members. They grant certificates of membership and conduct to those removing into other monthly meetings, without which they could not be received as members. They appoint two or more persons in each particular meeting, called overseers, to watch over the general conduct of the members, maintain the decorum of the meeting, and see the discipline enforced. They appoint also two or more persons, of high religious standing, as elders, to watch over the ministry, to judge of the fitness of such as offer themselves as preachers, and to sympathize with those already acknowledged. It is contrary to the rules of the society for any of its members to go to law with each other; all differences are to be settled by arbitration; and it is the duty of the monthly meetings to deal with such as violate this rule. Parties wishing to marry appear at these meetings and declare their intention; persons are appointed to inquire whether the parties are free from other engagements, and whether they have the consent of parents or guardians. These inquiries being answered in the affirmative, and the parties signifying to the following monthly meeting their continuance in the same mind, are permitted by it to proceed.

Several of these monthly meetings compose a quarterly meeting. A quarterly meeting, indeed, generally embraces one or two counties. At the quarterly meetings are produced, from the monthly meetings, written answers to certain standing queries respecting the conduct of the members, and the meetings' care over them. These accounts are digested into one, and sent on by representatives to the yearly meeting. The money contributions for the national stock, &c., are not forwarded by the representatives from the quarterly meetings to the yearly meeting directly, but by appointed correspondents in each quarterly meeting to the Meeting for Sufferings, which is the fiscal and executive organ of the yearly meeting. Ministers wishing to travel in the ministry in Great Britain must obtain a certificate from their own monthly meeting; and if they extend their views to Ireland, they must take one from the quarterly meeting. The quarterly meetings assist their monthly meetings in difficult cases, and hear any appeals from their judgment.

From the quarterly meetings in spring, representatives are sent to the yearly meeting in London; thus the affairs of the society coming into operation in every meeting in the kingdom, gradually concentrating themselves into one focus, concerns of a local nature being dropped in their own proper sphere, and the monthly or quarterly meetings, and those of a more general interest being carried on to the great annual assembly. To understand, however, the mechanism of the society, it must be explained that these meetings of discipline, monthly, quarterly, and yearly, are not restricted to the representatives only. All members may, and great numbers do, attend them; for not only has every member a right to give an opinion on all public questions, but these meetings offer points of pleasant reunion and acquaintanceship. It must, too, be understood that the women, simultaneously with the men, but in a separate apartment, hold their own monthly, quarterly, and yearly meetings of discipline, in which they watch over the interests, the moral conduct, and the religious consistency of the female portion of the community. There is also, previous to any meeting of discipline, a meeting of ministers and elders, to strengthen each others' hands. To their meeting in London, more commonly called "the Morning Meeting," is intrusted the revision of manuscripts which concern the principles of the society, and the granting of certificates to ministers wishing to travel abroad during the intervals of the yearly meeting. These ministers and elders afterwards take their places in the general meetings of discipline. The ministers are also members of the Meeting for Sufferings, which, as already stated, is the standing committee of the society.

These subordinate and preliminary meetings, then, having been held, the yearly meeting comes on in London in the month of May. There is but one yearly meeting for these united kingdoms, to which come representatives from Scotland and Ireland. But in America, where the great body of the Quakers is now to be found, there are eight yearly meetings, which correspond with the English yearly meeting, and with one another; besides five yearly meetings of what are called Liberal or Hicksite Quakers, with whom neither the English nor the other American Quakers hold any communication. The discipline in all is pretty much the same, and therefore the description of that in London may represent the rest. It elects a clerk, who officiates at once as chairman and secretary, and an assistant-clerk, to relieve him by reading long documents, &c. The meeting is held by adjournment from day to day, and generally continues about ten days. It receives epistles from Friends in Ireland, and the orthodox yearly meetings in America, and appoints committees to draw up answers. It receives and considers the answers to the standing queries on the moral and religious condition of the society, from all the quarterly meetings. Accounts are laid before it by the Meeting for Sufferings of all the seizures for tithes, church-rates, &c. It has committees sitting on the state of the public schools, on the subject of slavery, and on other questions, in which the Friends take great interest, and on which they frequently feel bound to address the crown, petition Parliament, or call upon the public for its attention. It has a committee to receive all appeals against the decision of the quarterly meetings. It alone has power to alter any of the established rules of the society, or to make new ones. It sometimes appoints committees to visit such quarterly meetings as appear in need of help; and it always addresses a general epistle to the society, which is read in every meeting in the kingdom; the women Friends issuing an epistle from their meeting, addressed to the female community exclusively.[1]

Peculiar mode of worship.

In their mode of worship the Friends differ from all other Christians. Believing all worship to depend upon the immediate operation of the Holy Spirit, and having therefore no paid ministers, no stated prayers, no singing even, they walk into their meeting-house, the men with their hats on, and sit down in silence. They keep on their hats because they do not believe that place to be holier than any other, or that worship is more acceptable at one time than another, but that it is enjoined on us and is good for us, to assemble ourselves together before God. They have no separate pews, but all the men sit together on one row of benches, and all the women on another. They have no pulpit, because they have no fixed preacher; but as they may have several voluntary ones, they have a long raised gallery in front of the congregation, where the ministers sit, the men facing the men, and the women facing the women of the audience. The elders sit with them or with the overseers, in a lower gallery, still facing the meeting. As the ministry is independent of human appointment, so is it of human choice in its distribution. There may be, and often are, half a dozen ministers or more resident, as in large towns, and there may be a succession of sermons and prayers, whilst in great numbers of other meetings there is no minister, nor a word spoken for years together, except it be by travelling ministers, who occasionally visit, not only their meetings, but each family belonging to them.

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[1] For all that relates to the civil and religious economy of the society, see its statute-book, *The Book of the Rules of Discipline*, &c.

Great change in the character of the society.

Such were the early Quakers, and such are the forms of polity and worship which they have left behind them. Those who now see the Friends as they are would scarcely believe them to be descended from so fiery and innovating a race. The old Quakers were vehement in the promulgation of their principles, and aggressive in their attacks on the principles of others. The present Friends neither assail the religious doctrines of others, nor seem anxious to diffuse their own. The virtue of the first Quakers was active, that of the present is passive to a miracle. They cling tenaciously to the outward forms of their system, and to their peculiarities of dress, speech, and renunciation of popular amusements; but the ancient fire which once lit up their body seems to have gone out. They profess to hold their great principles as sacred as their ancestors did, but they show little anxiety to make them known. Much of this remarkable change is plainly attributable to natural causes. The violence of a religious paroxysm determines the length of its duration. When persecution ceased, the Friends found themselves thrown, by their abandonment of the ordinary amusements and tastes of the world, on trade for occupation, and led home for relaxation. They became busy, domestic, and of consequence wealthy. These causes will explain much, but there is another cause which will explain more of the present circumstances of the society; their great tenet, and corner-stone of their faith, the Inward Light. Carrying this doctrine to the extent which they do, that it is the all-sufficient guide; that its guidance is to be sought and waited for; that we must put down before it our own imaginations and reason, and without its impulse we must make no religious movement, it has had this effect; it has acted as a blight upon the ministry. Those who might feel disposed to address their meetings from a simple feeling of love, and desire for the salvation of their fellows, and from a belief that every good motive must come from the source of all good, and would be blessed by Him; these, perhaps the most able members of the body, have yet shrunk from the task, because they felt that they should be restrained by the elders, as persons running in their own strength, and in their own natural reason. Those who have not been so sensitive, and have been adopted as ministers, have entered upon a process of putting down every motion and faculty of their own minds, and of waiting for a direct and palpable revelation from heaven. The consequence need not be stated. It is a fact, that since the first days of Quakerism they have had few preachers of extraordinary eloquence or originality of mind. The ministry is now confessedly low, and the sermons heard in their meetings are most frequently commonplace and rambling. The experiment of an unpaid ministry in their hands has been by no means a splendid one. No spread or prevalence of their doctrines has followed, at all answerable to the ground of inspiration assumed. With the exception of two preachers who have lately paid a visit to Australia and the South Sea Islands, they have sent out no missionaries, nor contributed to the funds of those societies which did, because they were not moved to it; as if the evidence of success were not sufficient warrant. In their meetings of discipline the same principle has produced the same effects. Though all profess to live under the influence of the spiritual guide, some are supposed to live under it more habitually. These have acquired the name of Weighty Friends, that is, Friends of weight of character and consequent influence. Instead, therefore, of deciding all questions in these meetings by the ordinary mode of voting, or by a show of hands, a mode, one would have imagined, particularly consonant to their views of natural right, they have adopted the singular one of deciding by weight; that is, by the dicta of the Weighty Friends, who for the most part are men of weighty purses too. These Friends have only to say, "I am of this or that opinion," without assigning any reason, and this is taken as the sense of the meeting, and decides the question. Thus is the government of the society thrown into the hands of an oligarchy of the most dangerous kind; for none can be more dangerous than that of an assumed sanctity; and thus are the advantages of their otherwise popular system curiously neutralized.

The same principle has operated still further. It has damped religious inquiry and discussion. In the common affairs of life and trade, where the Friends have used their understandings, they have shown themselves shrewd and successful; in matters of religion they thought it right to renounce their natural faculties, and wait. When the young have expressed to ministers, or any of their elder Friends, their doubts or uneasiness on any religious point, they have replied, "they did not feel free to discuss such matters;" they advised them to "centre down into their own minds, to turn inward to the infallible guide." The consequence became apparent in a dearth of religious intelligence. There was not the same inquiry into and clear recognition of religious doctrines amongst them as amongst other communities of Christians; and when the spirit of research burst upon them from without they were startled. Many felt themselves like mere children in theology, and were scattered different ways.

Modern schisms among the Friends.

These divisions first showed themselves in America in 1827. They originated in objections to the doctrines of a very popular and aged minister, Elias Hicks; but at the yearly meeting in Philadelphia that year, it was found that great numbers were of his opinions, and the parties came to an open rupture. The schism soon spread to New York, and the feud raged for some years with great violence, ending eventually in the total disruption of the society in America. It is difficult to state the numbers of the society, because there has always been a reluctance to take a regular census of the body. In the year 1659, from the number of females who signed petitions to Parliament, it was calculated that the number altogether in England was about 30,000. At present, from calculations made by private individuals, there does not appear to be quite 20,000; but in America they have been variously estimated at from 100,000 to 160,000, and may be very safely rated at more than 100,000. The section of the American Quakers calling themselves orthodox state the numbers who avowed the opinions of Elias Hicks at 30,000; the Hicksites themselves claim 60,000. It may therefore be fairly taken for granted that the body there is pretty equally rent in two. The English Quakers renounced the Hicksite Quakers, though these people protested that they held, and had always held, the doctrines of the first Friends in their integrity. Scarcely was this schism effected when the Quakers in England found themselves assailed on the opposite side by a party which had been most urgent with them to disown the Hicksites. This attack appeared in the shape of a publication called *A Beacon to the Society of Friends*, warning them against the errors of Hicks, and advocating water-baptism, the taking of the Lord's Supper, and other opinions which the Quakers from the first had abandoned. The heats and contentions incident to religious disputes have, on this ground, distracted the society here; some few have withdrawn from the body, and several individuals have been dismissed for adopting ceremonies which Quakerism rejects; but the body itself has hitherto remained entire. It is not necessary here to enter into the points in dispute. It may suffice to say, that the Hicksites are charged with setting the Inward Light above the Scriptures, and the Beaconites with setting the Scriptures above the Inward Light; the Hicksites with running too far into mysticism, and the Beaconites into the "beggarly elements" of outward form. Both parties appeal to Scripture against each other, and the English Friends appeal to it against them both. The circumstance to be regretted is, that this society, which has boasted that it "has no creed," and which says, "We require no formal subscription to any articles, either as to the condition of membership, or to qualify for the services of the church; we prefer judging of men by their fruits;" should thus rend itself to pieces about "articles of faith," and the very stuff of which "creeds" are made.

Their high philanthropic character.

If, however, the Society of Friends, having an "infallible guide," has not avoided wandering different ways; if, being "a Society of Friends," they have not avoided bickerings and divisions; they have the honour of being amongst the noblest and most unwearied philanthropists which the world has ever seen. In this character they have proudly maintained their testimonies. If George Fox was not untouched with the extravagances of his age, he outstripped that age two hundred years in his clear perception of the highest requirements of Christianity. He was amongst the first, if not the first, to call public attention to the dreadful state of our prisons, to the injustice of capital punishments for mere stealing, and to the atrocious system of confining fresh prisoners with the most thoroughly debased.[1] He declared the anti-christianity of war, oaths, and slavery. In the maintenance of all these great truths, to the recognition of which the world is now but tardily coming, his followers have nobly emulated him. William Penn, by his just treatment of the Indians, and the full liberty of conscience granted in his new state of Pennsylvania, showed the noble lessons he had learned in this school. It was amongst the Friends that the great crusade against Negro slavery commenced in the person of John Woolman, an American minister.[2] From that time to the present the Quakers have never ceased their efforts in that cause. They were the first in England to form an association for the abolition of the slave-trade. Thomas Clarkson, on setting out on his career, found them everywhere ready to co-operate with him, and to the last day of the struggle their purses and personal exertions were never spared. They have not been less zealous in spreading their opinions of the crime and impolicy of war; and in prison discipline Elizabeth Pryor, a name not enough known or honoured, and her more known but not more deserving coadjutor Elizabeth Fry, have merited largely of the public. It is in this point of view, in thus early and steadily, theoretically and practically, exhibiting Christianity in its highest and most beneficent form, "peace on earth and good-will towards men," that the Friends have conferred on society the greatest good of which men can be made the instruments, and deserve from it the most grateful esteem.

Since the first publication of this article, a great change has been going on in the Society of Friends in regard to some of the things to which George Fox and the early Friends objected, and also as regarded certain "testimonies," as they were called, which had originated with the first Friends, or had gradually developed themselves in supposed accordance with the principles of the society. There are certain arts and practices which have nothing evil in themselves, but, on the contrary, are highly esteemed by mankind in general, as having a refining and elevating tendency, which George Fox discouraged the practice of, on the plea that they led to gross abuses, to undesirable associations, or were consumptive of time which might be better employed. Under the host of things to be avoided on such grounds were the fine arts, painting, sculpture, music, singing, and dancing. The fine arts were objected to both because they were, in Fox's time, too frequently employed on meretricious subjects, and to flatter the worst tastes and habits of society. They were made to flatter grossly the mere worldly great, and to perpetuate characters which were better buried in oblivion. Fox thought the only mode of protecting his followers against the pernicious influence of arts so employed was to forbid them altogether. Friends were neither allowed to practise these abused and degraded arts, nor to embellish their houses with specimens even of their better kind, as leading only to a love of the merely ornamental, and to a costly display which fostered ostentation. To adorn their houses with paintings and sculpture was inconsistent with that simplicity of life, and that religious tone of mind, which the Friends were called upon to cultivate in opposition to the spirit of the world.

The objection to painting and sculpture, on account of their abuse, applied still more strongly to music, singing, and dancing. These at that time were too redolent of the sensuous, the frivolous, the false, and the dissipated, to be admitted into the houses of Friends. They led, moreover, directly to worldly acquaintanceships, worldly pleasures, and a worldly tone; to assemblies, theatres, operas, concerts, and parties where mere amusement, at the cost of seriousness and propriety, was the prevalent feature. The Friends regarded, moreover, the years of youth which are requisite to acquire proficiency in painting, music, and the merely elegant accomplishments, as a serious absorption of a period when more solid acquirements demanded almost the whole attention; besides, it was not a singing and piping age to the Friends, but an age of contempt, persecutions, prisons, and tribulations.

Such, then, were the principles and circumstances which shaped and coloured the life of Quakerism, and left their results fixed till a recent period; but during this recent period the members of the society have gradually emerged more familiarly into the intercourse of life at large. They were become wealthy, well-educated, and esteemed for their high moral character. They were come in contact with, in the prosecution of great aims, Bible societies, anti-slavery societies, societies for promoting education and other similar objects; and when, by the acceptance of their affirmation instead of on oath, they were admissible to the magistracy and to Parliament, their intercourse with the best society became more extended.

Under these influences, and under the influence of a very marked and progressive improvement in the public taste as it regarded the fine arts, and consequently from the high moral qualities required as works of art, Friends began to see that the rejection of a good thing on account of its popular abuse was by no means a sound practice; that it became good, intelligent, and independent people to support the moral and religious progress of the arts by adding their own moral momentum, the purifying force of the countenance of the virtuous, to the patronage of what was eminently good in itself. They came, therefore, more and more to recognise what was ameliorating and beneficial to human life in the fine arts; and of late years every one must have remarked the numbers of Friends, especially at the time of the yearly meetings, who have crowded our galleries of painting and sculpture. A considerable number of them became purchasers of good pictures having a high moral purpose. You find such works beginning to embellish their walls, and their children have been carefully educated in drawing, and a taste for it. Though we are not aware of any distinguished painter who is a member of the society, they have distinguished engravers and photographers; and their admiration of fine works of art is now become general. Music is cultivated in a great number of Friends' families: they have an amateur singing society, and it is by no means an uncommon sight to see in the houses of grave Friends young people engaged in the dance.

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[1] Sewel, i. 67; Fox's *Journal*, i. 143.

[2] *Journal of John Woolman*; also Woolman's *Considerations on the Keeping of Negroes*, Philadelphia, 1754; Dublin, 1776.

Coincident with these social phenomena have appeared, from the same cause, the growth of more liberal ideas in the society, amalgamating with the more moral sentiment of the age in general, other relaxations of the ancient rigour of Quakerism. This rigour had been especially maintained in regard to marriage. They regarded the marriage of one of their members to a person belonging to the world at large, or to another religious body, as leading to many and serious evils,—those of a divided household, divided on the most momentous question, that of religious faith. This unequal yoking they beheld with peculiar repugnance, from its necessary effect on the minds of the children of such marriages, who must grow up under the distracting effects of a diversity of faith in the parents, and in being pulled two ways in attendance on different forms of worship. To discourage such marriages, they did not allow any one to be married at their meetings to one of their members who was not himself or herself a member, although this person might attend their meetings and hold their religious opinions; nor could such a couple be married by a priest, because the Friends had a decided testimony against a "hireling ministry;" and for a Friend to be married by such a minister would constitute a breach of the fundamental principles of the society. All such offenders, unless they took the precaution previously to resign their membership, were disowned,—that is, expelled from membership,—by the society. By this rigour the Friends actually branded a law of nature as an unchristian offence; nor did they relax this rigour when the parties, instead of going to a "hireling minister," could go to a magistrate.

But the quarterly meeting of Yorkshire, taking the start in a more rational view of things, brought a proposition to the yearly meeting in May 1856, suggesting that these rules respecting marriage should be abolished, and marriages allowed betwixt a member of the society, and one not in the society, but professing with it; or even betwixt two persons neither of whom should be a member, but both of whom should attend the meetings of the society and profess its principles; and that these marriages should be solemnized in the manner and in the meetings of Friends.

This bold proposition naturally took the more advanced in age and orthodoxy by surprise. The proposition was warmly debated at that and the succeeding yearly meetings of 1857 and 1858, and by the last was referred for decision to a conference of three hundred members, which met in London on the 2d of November 1858, and by which the proposition was fully acceded to.

But before this conference was brought another question, also marking a great change in the opinion of the society, not in any religious tenet, but in its view of certain social practices. Though neither George Fox nor the early Friends established any particular costume, as is commonly imagined they did, but merely adhered to the fashion of their own day, discarding all sorts of finery from it, the practice of the society in adhering to the fashion of their day, in spite of the perpetual changes of fashion, had, in fact, established a costume of Quakerism in marked contrast to the costume of the present age. The world had gone on changing; the Quakers had endeavoured to stand still. They had not, indeed, been able to stand perfectly still. Spite of themselves, changes and modifications of dress, both in men and women, had gradually stolen in; so that the costume of modern Friends was neither that of the age of Fox and Penn nor of any other age. In the main, it was singularly formal, stiff, bald, and ungraceful.

But in other particulars the first Friends had introduced remarkable changes into their language and customs, in direct opposition to the spirit and practice of the world. As it was the invidious practice of their time to address rich men as "you," and poor men as "thou," they condemned the custom as unchristian and corrupt, and determined to address every one alike in the singular number, as most consonant with the rules of grammar. As the days of the week and the months were for the most part named in honour of heathen gods and heroes, they discarded these names, and designated them only by numerals, as First Day, Second Day; First Month, Second Month, &c. All these reforms, which appear to us now trivial and far-fetched, were, however, founded in the practice of the early Quakers in that noble resistance to everything corrupt, adulatory, invidious, and unjust, which ran through their whole spirit and system.

But the Friends of late saw that the odious practice of saying "thou" to a poor man, and "you" to a rich, had ceased; that the practice of saying "Mr," "Mrs," "Sir," or "Madam" in address was no longer a piece of flattery, but of simple courtesy, and of much greater truth than calling any one friend who really was no friend at all. To this conference meeting in November 1858 was referred the question, whether there ought not to be a modification of the fourth of a set of queries which had to be answered once a quarter from every district of the society, the latter part of which query demanded whether Friends were faithful in maintaining "plainness of speech, behaviour, and apparel." It was contended that these words had, through time, acquired a false value; that they must bind Friends to a particular costume which the first Friends never intended, and to a language which only testified against an obsolete custom; that the words in the minds of the first Friends applied only to the practice of simplicity in dress, address, and language, but that they had now obtained another meaning, and went to perpetuate forms which were only sectarian, were not necessarily Christian, and had therefore better be omitted; and the conference also adopted this conclusion. The fiat of the conference has yet to receive the sanction of the yearly meeting; but as it is not likely to stultify its own reference, Friends feel themselves practically released from everything sectarian in regard to speech, behaviour, and apparel; to abandon all that in the world's eye stood as the visible form of Quakerism, and to adopt every one for himself what he deems consonant with the great principles of simplicity and Christian propriety.

Many of the public journals have professed to see in this great change the dissolution of the principles of Quakerism itself; but this arises from an ignorance of what Quakerism really is. Quakerism consists of a body of great Christian principles, which are already detailed in this article. The outward forms, as they became sectarian, only disguised and hid from public view these great principles. Quakerism does not depend, has never depended in the slightest degree, on the forms of caps or coats, or on any forms of speech, but on the high and independent assertion of the great doctrines of Christianity. As is the nature of all artificial props, "the peculiarities" of Quakerism have only tended to cause the Friends to lean on them instead of on their great and real principles, and to deceive the world by an idea of Quakerism as a religion of forms and oddities, whereas it is one of the noblest truths and the most solemn protests against whatever is unjust, oppressive, hollow, degrading, or demoralizing in the principles and practices of the world; and we may feel assured that all these false props being thrown down, and Quakerism left to depend for distinction only on its genuine and undisguised principles, will make those principles more prominent than ever.

For a full account of the schism amongst the American Friends, we must refer to *The Friend*, and *The Herald of Truth*, journals published by the opposite parties; *The Beacon*, and *Christian Enquirer;* all published in America.

In *The Christian Reformer*, a London journal, a narrative may also be found, vols. xiii. xiv. xv. xvii. and xviii., old series. The English discussion has occasioned a host of pamphlets, but the chief facts regarding it are contained in *The Beacon*, by Isaac Crewdson; *Truth Vindicated; The Crisis of the Quaker Controversy; Quakerism Examined*, by John Wilkinson; *An Examination of the Principles and Practices of the Quakers*, by Elisha Bates; Luke Howard's *Yorkshireman;* Reports of the proceedings in the Yearly Meetings of 1835 and 1836, in the *Christian Advocate* and *Patriot* newspapers; and defensive pamphlets by S. Tuke, Dr Hancocke, and others.

The history and doctrines of the early Friends will be found in George Fox's *Journal;* Barclay's *Apology for the True Christian Divinity; The Histories of the Society*, by Sewel and Gough; *The History of the Sufferings of the Quakers*, by Besse; *The History of the Friends in Ireland*, by Rutty; Ellwood's *Life*, written by himself; and the works of William Penn, Richard Claridge, and others. (W. H—T.)

QUANG-SI, or KUANG-SI, an inland province of China, lying between N. Lat. 22. and 26., E. Long. 105. and 112. 30.; bounded on the W. by the province of Yunnan, N. by those of Kwi-choo and Hoonan, E. by that of Quantong, and S. by Quan-tong and the country of Tonquin; area, 78,377 square miles. A great part of the surface is mountainous and densely wooded; cultivation is carried on only along the banks of the Choo-kiang, which traverses the province from W. to E. Wheat, rice, wild cinnamon, &c., grow here; and among the minerals of the province are gold, silver, lead, and cinnabar. The capital is Kwelin-foo, a fortified town on the Hei-kiang, but Wu-chau-foo is the principal commercial town in the province. Pop. (1812) 7,313,895; (1843) 7,500,000.

QUANG-TONG, or KUANG-TUNG, a province of China, lying between N. Lat. 20. and 25. 30., E. Long. 108. and 117., bounded on the N.W., N., and N.E. by the provinces of Quang-si, Hoonan, Kiang-si, and Fokien; S.E. and S. by the China Sea and Gulf of Tonquin; area 70,018 square miles. The surface is of various characters in different parts, being mountainous towards the N. of the province; and the soil is in general fertile. The Choo-kiang, or Canton River, and other streams of smaller size, water the country. Gold, quicksilver, and marble are among the mineral productions. Rice, sugar, indigo, tobacco, cotton, and silk, are also raised; and the forests produce oak, rosewood, and other kinds of timber. Many manufactures are carried on here, and the trade is extensive. The capital of the province is Canton. Pop. (1812) 19,174,030; (1843) 20,000,000.

QUANTITY, in prosody, is the distribution of long, short, and doubtful syllables, and constitutes what is called *number*.

QUARANTINE (It. *quaranto*, forty), is a trial which ships must undergo when suspected of pestilential infection. It may be ordered by her Majesty, with advice of the Privy Council, at such times and under such regulations as she judges proper. Ships ordered on quarantine must repair to the place appointed, and continue there during the time prescribed; and they must carry a yellow flag at the main, and have no intercourse with the shore except for necessary provisions, which are conveyed with every possible precaution. When the time is expired, and the goods have been opened and exposed to the air as directed, if there be no appearance of infection, they are admitted to port. This check to infection was first used by the Venetians. (See PLAGUE; also M'Culloch's *Comm. Dictionary.*)

QUARLES, FRANCIS, a poet and miscellaneous writer of some note, was born in the spring of 1592 at Stewards, in Romford Town Ward, in the county of Essex. He received his early education at a country school, where he is said to have surpassed all his equals." He subsequently entered Christ's College, Cambridge, and was a resident member of that university in 1608. Passing from the university, he entered Lincoln's Inn, where he spent some time in the study of law, and was afterwards promoted to the office of cup-bearer to the Queen of Bohemia. In the spring of 1621 he seems to have left her majesty's service, for we find him in Dublin at that period, from which place he dates his *History of Argalus and Parthenia.* This was not his first effort, however. He had before written *The Feast of Worms, or the History of Jonah*, a somewhat singular poem, in which strength, coarseness, and breadth of colouring are all equally visible. On visiting Ireland, he became secretary to the learned Usher, recently elevated to the see of Meath. Quarles wrote, about this period, his *Quintessence of Meditation* and his *History of Queen Esther*. His next work consisted of a paraphrase upon Job, interspersed with original meditations. In 1625 Quarles lost one of his most esteemed friends by the plague, in Dr Aylmer, archdeacon of London, and son of Bishop Aylmer. The poet wrote an *Alphabet of Elegies* in honour of his memory, in which there are some of the most precious tributes of sincere affection to be found in our language. He printed during the same year *Zion's Elegies*, a paraphrase upon the songs of mourning "wept by Jeremie the prophet." In 1631 was published his *History of Sampson*, and in 1635 the first issue of his *Emblems*, suggested by the *Pia Desideria* of Herman Hugo. He occasionally strikes out in these *Emblems*, as indeed in all his poetry, images of very great sublimity. In one of these he represents the sword of justice swinging through the universe with ever-increasing power. His next eccentricity was his *Hieroglyphics*, "an Egyptian dish, drest in the English fashion." Prefixed to one of these he represents a lighted taper, with the winds of eternity fanning the flame.

On Quarles' return to England, which must have been before February 4, 1639, he was appointed "Chronologer" to the city of London, with a salary of L.33, 6s. 8d. The *Enchiridion*, a collection of brief essays and aphorisms, appeared in 1641; a piece, according to Mr Headly, which had it "been written at Athens or Rome, its author would have been classed with the wise men of his country." But the vigour, eloquence, and piety of the sentiments do not atone for the frequent use of antithesis, often of the most perverse and self-willed description. They possess a novelty at first, which leads the reader forward, but he will infallibly break down long before reaching the end. The calamities which befell his "king and country" involved Quarles, whose love to both, says his widow, caused him many "prayers and tears." His *Thoughts upon Peace and War*, full of mild wisdom as they were, did not prevent him from being plundered of his "books and some rare manuscripts." A petition "full of unjust aspersions," says his widow, was preferred against him, from which he did not recover. He died on the 8th of September 1644.

After his death were published *Solomon's Recantation; A Paraphrase on Ecclesiastes;* the *Virgin Widow*, a comedy, "an innocent production;" and the *Shepherd's Oracles*. Quarles's *School of the Heart* and *Hieroglyphics* were published in London in 1858, and his *Emblems* in 1859, with illustrations. A copy of the *Enchiridion* of Francis Quarles has recently been published by Russell Smith in the "Library of Old Authors." The most complete biography of the poet is that by Robert Aris Willmott, in his *Lives of Sacred Poets*, London, 1835.

Of Quarles' very numerous family, John is alone remembered, whose compositions seem to have been very numerous. He was by some "esteemed a good poet," though falling considerably short of his father, both in power and originality. He was carried off by the plague in 1665.

QUARRY, an excavation, from which are extracted marble, freestone, slate, limestone, or other building materials.

Quarry, amongst hunters, is sometimes used for a part of the entrails of the beast taken, which is given by way of reward to the hounds.

Quarry, in falconry, is the game which the hawk is in pursuit of, or has killed.

QUART, a measure of capacity, being the fourth part of some other measure. The English quart is the fourth part of the gallon, and contains two pints.

QUARTATION, in metallurgy, is an operation by which the quantity of one metal is made equal to a fourth part of the quantity of another. Thus when gold alloyed with silver is to be parted, we are obliged to facilitate the action of the aquafortis by reducing the quantity of the former of these metals to one-fourth part of the whole mass, which is done by increasing the quantity of the silver as far as necessary.

QUARTER, the fourth part of anything, the fractional expression for which is $\frac{1}{4}$.

Quarter is generally used to signify the fourth part of an hundredweight avoirdupois, or twenty-eight pounds. Quarter, used as the name of a dry measure, is the fourth part of a ton in weight, or eight bushels.

Quarters of a horse is employed in various senses. Thus the shoulders and fore-legs are called the *fore-quarters*, and the hips and hinder-legs the *hind-quarters*. The quarters of a horse's foot are the sides of the coffin, comprehended between the toe and the heel; the *inner* quarters are those opposite to one another, facing from one foot to the other, and these are always weaker than the *outside* quarters, which lie on the external sides of the coffin. *False-quarters* are a cleft in the horn of a horse's hoof, extending from the coronet to the shoe. A horse is said to be a *quarter-cast* when, for any disorder in the coffin, we are obliged to cut one of the quarters of the hoof.

Quarter, in astronomy, the fourth part of the moon's period. Thus from the new moon to the quadrature is the first quarter; from this to full moon, the second quarter; and so on.

Quarter. See Heraldry.

Quarter of a Ship, that part of a ship's side which lies towards the stern, or which is comprehended between the aftmost end of the main chains and the sides of the stern, where it is terminated by the quarter-pieces.

Quarter-Master, an officer whose principal business it is to look after the quarters of the soldiers, their clothing, bread, ammunition, firing, and the like.

Quarter-Master-General is an important officer in the army, whose duty it is to mark out to the quarter-masters the marches and encampments of the soldiers. (See Army.)

QUARTERING. See Heraldry.

QUARTETTO, *Quartet*, in music, a composition for four voices, or four instruments, in which the parts are all *obbligati*; that is, in which no one of the parts can be omitted without injuring the proper effect of the composition. To understand the structure of instrumental quartettos of this kind, those of Haydn, Mozart, Beethoven, Spohr, Onslow, and a very few others, must be examined. Vocal quartettos are generally accompanied by instruments, to sustain the voices. A mere interchange of melody between one part and another, where the parts alternately become principal and subordinate, without any interweaving of them by means of imitations, double counterpoint, &c., does not constitute a regular quartetto. Neither is a regular quartetto found in a composition that consists of one principal part, accompanied from beginning to end by three other parts, which are merely harmonic supports to the principal part. (See Music, and Principal.) (G. F. G.)

QUATRE-BRAS, a village of Belgium, in the province of South Brabant, 26 miles S.S.E. of Brussels. It is only notable on account of the indecisive battle that was fought here, June 16, 1815, two days before that of Waterloo. The British troops then occupied this position, while the Prussians under Blucher were at the village of St Arnaud and Ligny. Napoleon attacked the latter in person; and after meeting with a desperate resistance, forced them to retire to Wavre. Meanwhile Ney, with 40,000 men, advanced against the British, but they stood firm, and thus foiled the attempt of Ney to turn Blucher's right, and place himself between the Prussians and the British. The loss of the British at Quatre-Bras was 350 killed and 2380 wounded; that of the French above 4000.

QUATREMÈRE-DE-QUINCY, Antoine Chrysostome, a distinguished French archæologist, was born at Paris in 1758. He was just beginning to be known as a writer on art, when he became involved in the political broils of the French revolution. Entering the Legislative Assembly in 1791, he took his stand for constitutional monarchy. His unswerving adherence to that cause brought him into trouble and danger at several of the momentous stages of the struggle. During the Reign of Terror he lay for thirteen months in prison. After the insurrection of the 13th Vendémiaire he was sentenced to death, and was obliged to skulk in concealment for nearly a year. In 1797 also, the year in which he sat in the council of the Five Hundred, he would have been banished to Cayenne, had he not consulted his safety by a temporary absence from the capital. The rest of Quatremère-de-Quincy's long life was spent in peaceful activity. There were several offices in connection with learning to which he was called at different times. In 1814 Louis XVIII. made him censor-royal, and intendant of arts and public monuments. In 1815 he was named member of the Council of Public Instruction. In the following year the Institute elected him a member, and the Academy of the Fine Arts appointed him their perpetual honorary secretary. Nor were his literary faculties meanwhile unemployed. He wrote numerous works on the history and theory of art. He composed funeral orations on many of his fellow-academicians. It was not until a few years before his death, in 1849, that his pen was laid aside. The following are some of Quatremère-de-Quincy's principal works:—

Le Jupiter Olympien, 1814; *Lettres Addressées à M. Canova sur les Marbres d'Elgin*, 8vo, Rome, 1818; *De la Nature, du But, et des Moyens de l'Imitation dans les Beaux Arts*, 8vo, 1823; *Histoire de la Vie et des Ouvrages de Raphael*, 1824; *Monumens et Ouvrages d'Art Antiques restitués*, 4to, Paris, 1826–1829; and *Essai sur l'Idéal*, 1837.

QUATUORVIR, formerly written IIII. Vir, a Roman magistrate, who had three colleagues joined with him in the same administration, and had the care of conducting and settling the colonies sent into the provinces. There were also quatuorviri appointed to inspect and take care of repairs.

QUAVER, in music, a measure of time equal to half a crotchet, or an eighth part of a semibreve.

QUEBEC, a town of East Canada, the chief seaport and strongest military position in British North America, on a rocky promontory at the confluence of the rivers St Lawrence and St Charles, 170 miles below Montreal, and 556 N. by E. of New York. The country in which it stands is much admired for the boldness and sublimity of its scenery; the left bank of the St Lawrence is lined for some distance above the town with an elevated strip of table land, on the extremity of which the town is built. The citadel, which occupies the highest point, has an elevation of 350 feet above the river,—the declivity being steep on the S.E. side, but more gradual towards the N. and W., where the ground slopes towards the St Charles. It is on the latter side that Quebec is built,—the upper town on an elevated slope, about 100 feet below the citadel, and terminating in steep cliffs 200 feet high; while the lower town occupies the narrow strip of land between these cliffs and the river. To the west there are two large suburbs,—that of St Roche occupying the lower plain, which here expands to a greater width; and that of St John, on the same level as the upper town. To the S.W. of the latter are the plains of Abraham. The citadel, which covers an area of 40 acres, is considered almost impregnable, being defended for the most of its circuit by steep precipices; and in other places by strong and skilfully-constructed fortifications, consisting of a moat, covered way, and glacis. There are in the citadel barracks, magazines, and a large armoury. The upper town is encircled by a wall, which is mounted with heavy ordnance, and entered by five gates. The approach to the upper from the lower town is commanded by well-placed cannons in the citadel. On the plains of Abraham, outside of the suburb of St John, there are four Martello towers, extending across the ridge, which defend the city from attack in this direction. The houses in Quebec are in general two or three storeys in height, built of stone or brick, and roofed with shingles or tin plates, so as to present a singular and antique appearance. The lower town, owing to the confined and uneven ground on which it is built, is very irregular, with short, narrow, and crooked streets; but in the upper town, and especially in the suburbs, there is more regularity,—the streets are broad, straight, well paved, and clean. There are many public buildings, some of which are large and handsome. The Parliament buildings, formerly the episcopal palace, is a large edifice in the Ionic style, surmounted by a dome. The Roman Catholic cathedral of Notre Dame is an irregular building of great size, with a tower and spire, and it contains many fine old paintings. There is also a Protestant cathedral, a plain edifice in the Roman style. The Roman Catholic Church has six other places of worship; the Church of England, five; the Established and the Free Church of Scotland, the French Protestants, the Congregationalists, Wesleyans, and Baptists, one each. The public buildings in general are more remarkable for their substantial character than for any great elegance. Among the ornaments of the town, the most interesting are those which commemorate the celebrated victory by which Quebec came into the possession of the British. A monument to General Wolfe, consisting of a column 40 feet high, stands on the plains of Abraham; a smaller pillar marks the place where he fell; and inside the town there is an obelisk, 65 feet in height, in honour of Wolfe and his adversary Montcalm, who both died in the battle, and lie buried on the field. Laval university derives its name from the first Roman Catholic bishop of Canada, who founded in 1663 an institution, called the Quebec Seminary, for the education of priests. When the British gained possession of Canada this was made a general college; and having risen considerably in importance, was in 1852 erected by royal charter into a university. The buildings are only partially finished, and none but the faculties of law and medicine are yet in operation. The university has 12 professors, 36 students, and a library of 3200 volumes. The collegiate department comprises the institution as it was before being made a university, and includes the grand seminary for the study of theology, and the minor seminary for literature and philosophy. Quebec has also a normal school, and several literary and scientific institutions. The benevolent institutions include the Hotel Dieu, a nunnery and hospital; a lunatic asylum; military, marine, general, and orphan hospitals, &c. Though not very remarkable as a manufacturing town, various branches of industry are carried on at Quebec: soap, candles, tobacco, beer, and brandy are made here; but ship-building is the employment that occupies the greater number of operatives in the town. The number of vessels annually built and equipped is from 30 to 40, and the tonnage 1000 or 2000. The harbour of Quebec is very good. It is protected towards the N.E. by the island of Orleans, on either side of which there is an approach. Vessels of the largest size can lie in the middle of the stream, where there is excellent anchorage; and smaller ones come alongside the wharves which line the water's edge. The water here is fresh, but yet the tide has 18 feet at springs. The chief article of export from Quebec is timber, which is floated down the river from the basin of the Ottawa and the north shore of Lake Ontario, and is laid up in coves extending along the river for 6 miles above the town. From these coves the timber is floated out to the ships in the harbour. Quebec is the principal emporium of the export trade between Canada and Great Britain; while the imports, on the other hand, are generally conveyed directly up to Montreal, which in that respect is much superior. The number, tonnage, and crews of the vessels entered and cleared at Quebec for several years is as follows:—

Year.	Entered.			Cleared.		
	No.	Tons.	Crews.	No.	Tons.	Crews.
1845......	1489	576,541	20,912	1499	484,540	...
1848......	1188	452,436	16,423	1194	457,430	...
1851......	1305	533,821	17,753	1394	586,093	...
1854......	1416	618,926	20,301	1558	693,588	22,166
1856......	990	462,083	14,783	1068	495,867	15,651

The quantity of timber conveyed to the town and exported in 1854, was as follows:—

	Supply.	*Export.*
	Feet.	Feet.
Oak	2,176,071	1,335,920
Elm	1,927,865	1,463,600
Ash	221,446	106,160
Birch	45,052	51,160
Temarac	2,649,759	78,560
White pine..........................	19,648,006	19,612,320
Red pine	3,756,848	2,699,080
Total	30,425,047	25,346,800

The total value of exports in 1856 was L.2,048,299, of imports L.071,598, and of import duty received L.92,477.

Quebec has been several times devastated by terrible fires, the last of which occurred in 1845; but it is now guarded against this danger by a copious supply of water from Lake St Charles, which can be thrown by its own pressure over the highest edifices. The city is governed by a mayor and twenty-four councillors, and returns three members to the legislative assembly. It was founded by the French in 1608, and fortified in 1690. It remained in their hands till 1759, when, in consequence of the victory of Wolfe, it was surrendered to the British, and finally confirmed to them by the treaty of Paris in 1763. It was attacked by the American republicans in 1775, but the siege was raised in the following year. Since then its capture has not been again attempted. Pop. (1851) of the city, 42,052; of the county, 61,566; (1857) of the city, about 60,000, chiefly of French origin.

QUEDAH, or KEDAH, a native state in the Malay peninsula, dependent on the empire of Siam, lying between N. Lat. 5. and 7., E. Long. (of the capital) 100. 30, bounded on the N. by Siam proper; E. by the dependent states of Patani, Kalantan, and Tringanu; S. by the independent state of Perak; and W. by the British province

Wellesley and the ocean. It is about 140 miles in length by 50 in average breadth. The coast is skirted with many small islands, and is difficult of access on account of the shallowness of the water. The country consists for the most part of a plain, but slightly elevated above the level of the sea, and traversed by a chain of hills from N. to S. about 20 miles inland. The soil is fertile, though little cultivated, and covered in many places with vast forests. Rice, cocoa-nuts, plantains, and betel-nuts, are among the vegetable productions of Quedah; and gold, iron, and tin are its chief mineral riches. The subjection of Quedah to Siam is little more than nominal. The rajah of Quedah receives a pension from the British government in return for the cession of Prince of Wales Island and Province Wellesley. The capital of the state is Quedah, at the mouth of the river of the same name; and an active trade is carried on with Prince of Wales Island in the produce of the country, especially in tin. Pop. of the state, 65,000; of the town, 8000.

QUEDLINBURG, a town of Prussia, in the province of Saxony and circle of Magdeburg, on the Bode, 35 miles S.W. of Magdeburg. It is well built, and encircled by walls flanked with towers, and entered by ten gates. Its most conspicuous edifice is the castle, which rises on a sandstone rock above the rest of the town. It was the residence of the abbesses of Quedlinburg, who, as princesses of the empire, had a vote in the Diet, and a Seat in the bench of bishops. The church, which was partly built in the eleventh, and partly in the fourteenth century, contains the graves of the Emperor Henry I. and his wife Matilda; of Aurora Maria, Countess of Konigsmark, and mother of Marshal Saxe; and of several abbesses of Quedlinburg. The castle is now used as a seminary for young ladies of rank. The town-hall of Quedlinburg contains numerous specimens of ancient armour, plate, and portraits, as well as a manuscript of the ancient code of law called the *Sachsenspiegel.* Here is also shown a large and strong chest in which Albert Count of Reinstein was confined for 20 months by the citizens of Quedlinburg. The town contains a gymnasium and several hospitals, including one for orphans and another for the deaf-and-dumb. Woollen cloth, beet-root sugar, and brandy are manufactured here; and a trade in corn is carried on. The poet Klopstock was born here in 1724. Pop. (1852) 14,258.

QUEEN (Saxon *cwaen*), was employed to denote *femina, mulier, conjux*, as well as the most noted of women and wives, to whom now it is only appropriated. The use of *queen* as a sovereign princess who reigns in her own right, and possesses all the powers which are the prerogative of a male who is endowed with kingly authority, is an application of the word which was not originally contemplated. The king's consort has been regarded in all countries as a person of eminent dignity, and who has possessed privileges granted to no other woman, whether married or single. A queen-consort, in England, is regarded in all legal proceedings as a single and not as a married woman. She is competent to purchase and convey lands, to grant leases, and to do other acts of ownership, without the king's intervention. She may have a separate property in goods, and may dispose of them by will. She pays no toll, and is free from amercement by any court. She is, however, to all intents the king's subject, and is generally upon the same footing with other subjects. Her majesty has separate courts and officers distinct from the king's, not only in matters of ceremony, but by ancient usage of law; and her attorney and solicitor-general are entitled to a place within the bar in the king's courts. Her personal expenses are defrayed from the king's privy purse. A queen-dowager enjoys most of the privileges which belonged to her as Queen-Consort.

A queen regnant differs in no respect from a king as to the political rights vested in the dignity.

The Hungarians have an aversion to the name of *queen*, and when a female ascends the throne, she reigns with the title of *king*. (See MARIA THERESA.)

QUEEN ANNE'S BOUNTY, the name applied to a perpetual fund of first-fruits and tenths which was granted and confirmed by Queen Anne (statute 2 and 3 Anne, c. 11) in 1704 for the augmentation of the livings of the poorer clergy. These first-fruits and tenths formed originally part of the papal exactions from the clergy. The former consist of the first whole year's profit of all spiritual preferments, and the latter of one-tenth of their annual profits. The poorer livings are now exempted from the tax. On the abolition of the papal authority, the income thus derived was annexed to the revenues of the crown (26 Henry VIII.), and so continued till the reign of Queen Anne. The governors consist of the archbishops and bishops, some of the principal officers of the government, and the chief legal authorities. They hold four courts yearly. About 4700 livings are charged with the payment of first-fruits, and about 5000 charged with the payment of yearly tenths. The average income from these sources is L.14,000 yearly. To the end of the year 1852, the capital appropriated to small livings, including L.1,000,000 from parliamentary grants, and L.1,530,400 from benefactions, was L.5,027,200. The governors have received from Parliament, to whom they present an annual account, between 1809 and 1820, the sum of L.1,100,000, being the product of eleven sums distributed during that time for augmenting the incomes of the clergy. By 1 and 2 Vict., c. 20, the offices are consolidated in the treasurer of the Queen Anne's Bounty. The treasurer and secretary, offices now held jointly with a salary of L.1000 a year, are appointed by the Queen during her pleasure by patent under the great seal. (See *The Official Handbook.*)

QUEEN CHARLOTTE ISLANDS, a group of islands in Australasia, lying between S. Lat. 10. and 12., E. Long. 165. and 168., consisting of five or six islands of considerable size, and a great number of smaller ones. The largest is Santa Cruz, or, in the native language, *Nitandi*, about 20 miles in length by half a mile in breadth. They are all of volcanic origin; and in one, called Volcano, this agency is not yet extinct. The larger islands, and some of the others, are lofty; and they are all well wooded, producing the cocoa-nut tree, the bread-fruit tree, and other vegetables similar to those of the Friendly Islands. The inhabitants are numerous in proportion to the area, and they belong to the race of Australian Negroes. Queen Charlotte Islands were discovered by Mandana in 1595, and it is at Mallicollo, or Recherche, one of this group, that the unfortunate La Pèrouse is believed to have been lost with his crew.

QUEEN'S COLLEGES. (See UNIVERSITIES.)

QUEEN'S COUNTY, an inland county in the province of Leinster, in Ireland, bounded on the north by the King's County, east by Kildare and Carlow, south by Carlow and Kilkenny, and west by Tipperary and the King's County. It extends over a surface of 664 square miles, or 424,854 acres, of which 342,422 are arable, 69,289 uncultivated, 11,630 in plantations, 1117 in towns, and 396 under water. Of the uncultivated ground about 18,000 acres, consisting partly of pasture land on the eastern declivity of the Slieve-Bloom Mountains, but chiefly of bog and boggy pasture, are capable of being drained and cultivated advantageously; 26,000 acres may be improved by draining for pasture; and the remaining 25,000 acres are unimproveable.

No notice of the inhabitants of this part of Ireland is to be found in Ptolemy's account of the island; but Whitaker supposes it to have been peopled, together with all the other interior parts, by the Scots. It was afterwards known by the names of *Ossory* and *Leix;* the former consisting of the north-western districts, the latter of the remainder of the county, and the Barrow constituting the boundary between them. Ossory, of which the Macgillypatricks or Fitzpatricks were the toparchs, ranked as a subordinate kingdom at the landing of the English, and for some time afterwards. Leix was made a county palatine, which fell into the possession of Roger Mortimer through the female line, and afterwards was seized on by the O'Mores, who retained possession of it, and proved persevering and troublesome enemies to the English government, until the reign of Philip and Mary, when the territory was made shire-ground, under the name of the Queen's County, in honour of the sovereign; and the place chosen for the county town was named Maryborough, for the same reason. This county, when brought under British law, was gradually peopled by English settlers. During the subsequent reigns several of these families became extinct in the male line; many were expelled or extinguished by the confiscations arising out of the civil wars in 1641 and 1689; whilst the descendants of others, the principal of whom are the Veseys, Cootes, Parnells, Dawsons, and Burrowes, still retain the whole or some portion of their ancestral possessions. The Queen's County is now divided into the baronies of Ballyadams, Clandonagh, Clarmallagh, Cullinagh, Maryborough East, Maryborough West, Partnahinch, Slievemarigue, Stradbally, Tinnehinch, and Upperwoods. These are subdivided into thirty-eight parishes, and six parts of parishes, the remaining parts of which are in the adjoining counties. According to the ecclesiastical arrangements of the country, the county contains fifty-three parishes, of which thirty-five are in the dioceses of Leighlin and Kildare, and fifteen in Ossary, the remainder forming part of the dioceses of Killaloe and Dublin.

The general face of the country is level, but it rises into heights of considerable elevation in the Slieve-Bloom Mountains, which, taking a direction nearly north and south along the western verge of the county, rise to a considerable height, their most elevated point being 1689 feet above the level of the sea, and with an acclivity so abrupt that the only practicable road across them is through the pass of Glandine. In the southern extremity the Slievemarigue Hills, of considerably inferior elevation, separate the county from that of Kilkenny. The monotony of a generally level surface is somewhat relieved by a range of low hills, which traverse it in a direction from north to south, the most remarkable of which are the Rock of Dunamaise and the Dun of Clopoke; as also by eskars, a singular species of low hills, or rather slight elevations of the surface, formed of rounded pebbles, apparently forced together by the operation of contending currents of water. The most remarkable of these is the Ridge of Maryborough, which, entering from the King's County, proceeds for a considerable distance by Maryborough, and, after having been deranged and broken, resumes again the form of a continuous ridge, branching out in the southern part of the county in two divisions. The Slieve-Bloom Mountains give rise to some of the great rivers of Ireland. The Barrow rises at their northern extremity, and, after passing through the north of the county, forms its north-eastern boundary; then, turning southwards, it forms its boundary to the east, separating it from Kildare and Carlow, and falls into the Suir some miles below New Ross, forming with that river the estuary called Waterford Harbour. The source of the Nore is southward of that of the Barrow, in the same mountains. It passes through the south-western part of the county by Abbeyleix and Ballynakill, enters the county of Kilkenny near Ballyragget, and, after flowing by the city of Kilkenny, joins the Barrow about two miles above New Ross. The portion of the Barrow between its junction with the Nore and Suir is generally called the Ross River. The Suir, which also rises in the Slieve-Bloom Mountains at their southern extremity, does not belong to this county. These three rivers, the Barrow, Nore, and Suir, are, next to the Shannon, the chief means of transmitting the waters of the great central limestone district of Ireland to the sea. The smaller rivers are the Ownas, Trihogue, and Blackwater, tributaries of the Barrow; and the Tonnet, Dolore, Old Forge River, Cloncoose, Cromoge, Corbally, Trumry, Colt, and Erkin, tributaries of the Nore. Under the name of the Barrow Navigation, the River Barrow is navigable for barges from Athy, where it joins the Grand Canal to the Scars below St Mullins, a distance of 43 miles; from thence there is an open navigation for large craft, passing by New Ross and Waterford to the sea. The Nore is not navigable until after it has quitted the county. There is no lake except Lough Annagh on its northern boundary, which partly belongs to the King's County, and does not exceed one mile in length.

The population of this county in 1812 was 113,857; 1821, 134,275; 1831, 145,851; 1841, 153,930; 1851, 111,623. The return of 1841 gives an average of 232 inhabitants to each square mile, that of 1851 exhibits only 168, being a reduction of 64; the decrease in the population of all Ireland for the same period having been 49 persons to each square mile.

The county returned eight members to the Irish Parliament; two for the county at large, and two each for the boroughs of Portarlington, Maryborough, and Ballynakill. This number was reduced to three by the Act of Union, by which the boroughs were disfranchised, with the exception of the first-named. The number of registered electors for the county, according to the latest return, was 2993; that of the borough of Portarlington, 96. The local government consists of a lieutenant, eighteen deputy-lieutenants,—all appointed by the crown during pleasure; and county magistrates, appointed by the lord chancellor. The constabulary force consists of a county inspector, eight sub-inspectors, eight head constables, fifty-one constables, and one hundred and eighty-five sub-constables; in all, 253.

The state of education, according to the parliamentary returns in 1821 and 1824–26, was as follows:—

Year.	Boys.	Girls.	Sex not ascertained.	Total.
1821	4825	1998	...	6,823
1824–6	6624	4908	231	11,763

Of the numbers stated in the latter of these returns, 2074 were Episcopalian Protestants, 104 Protestant dissenters, and 9426 Roman Catholics; the religious persuasion of the remaining 305 not having been ascertained. The number of schools, and of pupils attending them during the week ended 12th April 1851, was ascertained to be as follows:—

Description of Schools.	No. of Schools.	No. of Children.		
		Males.	Females.	Total.
National	58	1658	1746	3404
Church Education	24	461	376	837
Endowed	2	33	20	53
Boarding	11	218	151	369
Private	35	356	265	621
Parochial	17	314	268	582
Free	7	243	123	366
Mission	1	22	...	22
Workhouse	3	795	436	1231
Gaol	1	155	61	216
Total	159	4255	3446	7701

At the same period it was found that 37 per cent. of the population could neither read nor write; a proportion of ignorance below all the counties of Connaught and Munster, and several in the other provinces.

The level part of the county forms the southern portion of the great limestone field which traverses Ireland across its centre. The peculiar flatness of the interior appears to have caused those accumulations of alluvial matter, composed of clay and limestone gravel, which, in the form of low but steep ridges of hills, occur so frequently throughout the midland districts, and are known by the name of *eskars*. Some very striking specimens of this formation in the county have already been noticed. That the surface of the country was exposed to the action of rapid currents of water, is evidenced by the deep parallel indentations or furrows frequently observable on the surface of rocks from which the alluvial soil has been removed. It is also probable that the gravel hills were rapidly deposited from water in violent action; an inference which is confirmed by the fact, that they mostly consist of large masses of rock partially rounded, intermixed with small gravel, and even with clay and sand. The old red sandstone shows itself in the Slieve-Bloom Mountains, which are almost wholly of that formation. The south-eastern extremity forms a small part of the Leinster coal-field, the mineral in it being, like that of Kilkenny, which adjoins it, of the carbonaceous or stone-coal formation, the slaty glantz-coal of Werner, burning dully with little flame, emitting an offensive and unwholesome vapour, and therefore disagreeable for domestic use, but excellent for malting or for the forge. Iron was raised here, and two hundred years ago was an article of export, through the port of Waterford, to London. The works were carried on as long as the forests afforded materials for fuel. Potters' earth is also raised, and applied, in the neighbourhood of Mountmellick, to the manufacture of the coarser kinds of earthenwares.

The soil varies greatly in different parts, but is in general fertile. Where it rests on the limestone substratum, it consists mostly of a stiff clay loam, well adapted for the growth of wheat; in other parts it is light and sandy, and produces good crops of oats and barley. The mountain district is wet and boggy, even in the higher parts, the clayey subsoil not admitting free passage for the water, which therefore accumulates on the surface: it is also much encumbered with rock. The low hills that traverse the middle of the county from north to south are capable of culture to their summits, and, where not deemed suitable for the plough, afford rich pasturage for sheep. The tracts on the sides of the rivers, being annually flooded by the overflowings of the stream during winter, form rich meadowland. Bogs are frequent in most parts, supplying ample fuel for domestic purposes. The county was once so thickly wooded as to be almost impenetrable for the passage of large bodies of men; and thence, as well as from the bogs, which, from a different cause, were also difficult to be crossed by those not well acquainted with their peculiarities, the natives were enabled to hold out long against the attempts of the English settlers. But the old woods have long since been cleared away, the only proof of their former existence being discoverable in the numerous remains of timber-trees lying in the bottom of Lough Annagh. A new growth, however, the offspring not of the unaided efforts of nature, but of the hand of modern improvement, has in a great measure restored one of its most beautiful and useful features. Large plantations, chiefly around the demesnes of the gentry, vary the prospect, and tend much to relieve the monotony of the level surface. Most parts present the mansions and seats of resident proprietors; comfortable farm-houses are numerous, and much attention has been paid by many landlords to excite amongst their tenantry a laudable emulation in the neatness of their cottages, and in the judicious cultivation of their little farms. The coal-district, and some few other localities, must, however, form exceptions to this general description,—the appearance of the peasantry, both in their persons and dwellings, exhibiting too frequent instances of the destitution consequent on extreme poverty or confirmed habits of improvidence. With the exception of the lands held by wealthy proprietors in their own hands, and those in the mountainous parts, where grazing is the chief object, the farms are not large, seldom more than from ten to fifteen acres. Wheat is extensively grown, its culture being attended to even on those soils which, during the more confined state of agricultural knowledge, were thought to be unfit for it. The lighter soils answer well for barley and oats. Potatoes are everywhere raised, both for family use and for feeding cattle,—forming also an essential part of the improved rotation system, which is generally practised. Green crops, particularly turnips, are not unusual; and the value of every kind of clover seems to be duly appreciated. The description of crops, and the extent of land under cultivation of late years, have been as follows:—

	1853.	1855.	1858.
Wheat	18,873	21,500	22,218
Oats	35,397	32,587	27,575
Barley, bere, rye, beans and pease	11.219	9,683	10,405
Potatoes	19,617	20,875	23,758
Turnips	14,606	14,231	14,225
Other green crops	2,260	1,958	2,605
Flax	14	7	29
Meadow and clover	49,665	51,931	55,734
Total	151,651	152,772	156,549

Much attention is given to the introduction of implements and machines of the best description,—the clumsy and inartificial vehicles, ploughs, and harrows formerly in use being scarcely to be met with except in districts little capable of being brought into profitable agricultural production. The breed of every kind of cattle has been improved during the last forty or fifty years, to a degree that scarcely could have been anticipated at the commencement of the period. Dairies are numerous and highly productive. Butter is the produce chiefly attended to, and large quantities are prepared for export. In 1858 the stock of the country included 14,197 horses, 69,370 cattle, 80,012 sheep, and 32,921 pigs; and the total value of live stock was L.689,000.

From the preceding statement it may easily be inferred that the character of the population is almost exclusively agricultural. The only place in which manufactures have been introduced is Mountmellick. Several branches of the woollen, linen, and cotton trade have been undertaken there, but without much success; coarse woollens and cotton for the supply of the surrounding districts being the only kinds fabricated. Tanning is carried on to some extent; flour-mills are large and numerous; and there are some extensive distilleries and breweries. In 1852 an extensive establishment was formed here for the manufacture of sugar from beet-root, but subsequently the experiment proved unprofitable, and is not likely to be repeated, it being evident that the article cannot be successfully manufactured in competition with colonial and foreign sugar. The Grand Canal, a branch of which runs from Monasterevan to Mountmellick, conveys much of the produce of the county to Dublin, either for sale there or for export. The Barrow serves the same purpose with respect to Waterford. The Great Southern and Western Railway crosses the county from N.E. to S.W., having stations at Portarlington, Maryborough, Mountrath, &c., and connecting it with Dublin, Limerick, and Cork.

There are many remains of ancient edifices, both ecclesiastical and military. Amongst the most remarkable of the former are the extensive ruins of the abbey of Aghaboe, once the seat of the bishopric of Ossory; the ruins of Aghmacart, and of several others of lesser note. The site of the abbey of Timahoe can be ascertained only by the pillar-tower there, which is supposed to have stood in its immediate vicinity. Of the military antiquities, the most ancient is a fortress placed on the summit of a hill in the south-west of the county, and called Bawnachra; it consists of a circular inclosure surrounded by a rampart and fosse. The ancient fortress of Dunamase, situated about four miles south-east of Maryborough, on the summit of a precipitous hill rising abruptly from the middle of a large plain, and once the chief residence of the O'Mores, presents a very picturesque appearance. Lea Castle, the fine ruins of which stand on the right bank of the Barrow, about 2 miles below Portarlington, was formerly a place of considerable strength, erected by the Fitzgeralds in 1260, burnt by Edward Bruce in 1315, afterwards rebuilt, and finally reduced to ruins by Cromwell's army in 1650. Borris-in-Ossory on the Nore, and Castlecuffe in Tinnehinch, built by the celebrated republican leader Sir Charles Coote, were also places of considerable strength. Amongst the modern mansions are those of the Earl of Portarlington at Emo, and of Sir Charles Coote, at Ballyfin, near Mountrath, two of the finest modern structures in the Italian style to be found in the kingdom.

Maryborough, the county town, situated nearly in the centre of the county, presents few features to arrest attention. It was a borough entitled to send representatives to Parliament; but this, the only important privilege to a small town, was abolished at the Union, the other corporate functions decayed, and were extinguished by the Municipal Corporations Act. The town is now under the superintendence of town commissioners. The chief buildings are the county court-house, the jail, the infirmary, and the district lunatic asylum. The population in 1851 was 2635. That of the other towns having upwards of 1000 inhabitants each was in the same year respectively as follows: Mountellick, 3657; Portarlington, originally a settlement of French refugees, and formerly of some note as a place of elementary education, 2728; Mountrath, 2101; Graigue, which is, strictly speaking, a suburb of Carlow, though in a different county, 1527; Ballynakill, 1109; Stradbally, near which is the Dun of Clopoke, an isolated rock perforated by subterraneous cavities, 1326; and Abbeyleix, which, though amongst the smallest, is the neatest in external appearance, 1341.

QUEENSFERRY, South, a parliamentary and royal burgh of Scotland, in the county of Linlithgow, on the right bank of the Forth, 9 miles N.W. of Edinburgh. It is an irregularly-built place, containing a curious ancient chapel, a new church, and a meanly-built town-hall. The town has very much declined in importance, having been dependent chiefly on the ferry, which was once the principal means of communication between Edinburgh and the north, but which has been in a great measure superseded by that from Granton to Burntisland. Queensferry is said to derive its name from Margaret, Queen of Malcolm III., who used to embark here. Pop. (1851) of the parish, 1165; of the parliamentary burgh, 720.

QUEENSTOWN, or, as it was formerly called *Cove of Cork*, a seaport and market town of Ireland, in the county of Cork, on the south side of Great Island, in Cork harbour, 14 miles E.S.E. of Cork, and 167 S.W. by S. of Dublin. Built upon the steep side of a hill rising from the water, it has a very fine appearance, its streets running parallel to the shore, and rising one above another. Most of the houses are well built, and some, as a defence against storms, are faced with slates. Besides the parish church, a fine edifice erected in 1812, there are Roman Catholic and Wesleyan places of worship, a market-house, jail, national schools, public library, reading-rooms, hospital, dispensary, &c. In the harbour, opposite to Queenstown, stands Spike Island, which contains artillery barracks and a convict establishment; and there are also smaller islands, with powder magazines, and an ordnance depôt. The pier of Queenstown, which was built in 1805, is used as a public walk, and commands a fine view of the harbour. There are no manufactures or commerce here; and the town has risen to its present size since the last French war, when it was an admiral's station. Before that time it was nothing but a small fishing village. It is now much resorted to as a bathing-place, especially by invalids. The name of Queenstown was given to it in 1849, in honour of the visit of Queen Victoria. Communication is kept up by steam between Queenstown and Cork. Pop. (1841) 5142; (1851) 11,428.

QUELPAERT, an island in the Pacific, about 60 miles off the south coast of Corea, N. Lat. (of Beaufort Island) 33. 9. 7., E. Long. 126. 56. 5.: length, 45 miles; greatest breadth, 12. The surface is mountainous; and there is a peak in the centre as high as 6544 feet above the sea. Volcanic in its origin, the island is covered with dense forests in the higher regions; but the soil is in general light, and produces corn but scantily. The houses of the inhabitants resemble those of the Loo-Choo islanders; and there is a town called Moggan on the N. coast. Quelpaert is supposed to be used as a penal settlement of Corea.

QUENTIN, St, a town of France, capital of an arrondissement in the department of Aisne, on the Somme, 87 miles N.E. of Paris. It is built on the sides and top of a hill, and surrounded by public walks, which occupy the place of the ancient fortifications. In a spacious square near the centre stands the town-hall, a handsome and richly-ornamented edifice. The cathedral, a large structure, 416 feet long in the interior, and 212 feet high, is a fine specimen of pure Gothic architecture, and has some fine painted glass in several of the windows. The town contains also a court-house, theatre, public library of 14,000 volumes, infirmary, and several hospitals. St Quentin is the centre of the manufacture of linen cloth, which is carried on extensively in the surrounding country. Cotton fabrics are also made; and there are many bleach-fields in the vicinity. The trade of St Quentin, besides the manufactures of the place, includes corn, fruits, liquorice, flax, and colonial produce. It is much facilitated by the canal of St Quentin, which unites the waters of the Oise, Somme, and Scheldt. A battle was fought under the walls of the town in 1557, between the French and the Spaniards, in which the latter gained a complete victory. Pop. (1856) 26,887.

QUERETARO. See Mexico.

QUERINI, or Quirini, Angelo Maria, a learned cardinal, was born at Venice in 1680, and was educated at the college of the Jesuits in Brescia. The early part of his career was devoted to the enthusiastic study of letters. Settling down in Florence at the age of seventeen, as a Benedictine monk, he availed himself of every means to satisfy his craving for knowledge. His quiet hours within the walls of the abbey were engrossed with the cultivation of the liberal sciences. His intervals of recreation in the city were passed in the society of some of the most learned men of the day. The progress of time only increased his literary ardour. Bent upon seeing the world, and upon holding personal converse with the great spirits of the age, he set out in 1710 on a tour through Europe. He passed through Germany, the Netherlands, England, and France, visiting the chief literary men of each country; and returned home in 1714, greatly advanced both in acquirements and in reputation. With a mind so thoroughly cultivated, Querini could scarcely fail to attract the interest of the Holy See. Accordingly, in no long time there was opened up before him a way of promotion to some of the highest offices in the church. In 1723 he was appointed archbishop of Corfu. In 1728 he was translated to the see of Brescia, and created a cardinal. Not long afterwards the office of librarian of the Vatican was conferred upon him. He would also have been promoted to the lucrative bishopric of Padua, had he not preferred to spend his remaining days among his attached Brescian diocesans. Cardinal Querini, in his high position, now proved himself a beneficent patron of learning. He founded and endowed a public library at Brescia. He presented one large collection of books, and another of medals, to the library of the Vatican. Nor was his liberality at all influenced by party feelings. Authors of every class found him ready to supply them with books, manuscripts, and notes, for the composition of their works. In fact he had come to be recognised throughout Europe as a benefactor in the world of letters, when he was suddenly cut off by apoplexy in 1755.

The following is a list of Querini's most important works:—*Primordia Corcyrae*, 4to, Brescia, 1738; *Specimen Litteraturæ Brixianæ*, 4to, Brescia, 1739; *Pauli II. Vita*, 4to, Rome, 1740; and a selection of his own letters, in ten books, 4to, Brescia, 1742–49.

QUESADA, a town of Spain, Andalucia, in the province, and 38 miles E. of Jaen. It is an ill-built place, with a church, hospital, school, court-house, and the remains of an old fort, now used as a prison. Flour, oil, and soap are manufactured here; and there is some trade in corn, fruit, &c. Pop. 4503.

QUESALTENANGO, a town of Guatemala, capital of a department of the same name, on the small river Samala, 88 miles W.N.W. of Guatemala. It is large and well built, being second only to the capital in point of size. In the centre is a large market-place, with a fountain in the middle. The streets are straight, and the houses large and handsome. Among the churches in the town, there is one of large size and imposing appearance; and there is also a good town-hall. Some trade is carried on in wheat, sugar, woollen and cotton fabrics, &c. Pop. 20,000, many of whom are Indians.

QUESNAY, François, a physician of considerable eminence, but who is chiefly known as an ingenious inquirer into the constitution of society, and as the founder of the sect of political philosophers known by the name of Economists.

The accounts of the life of this distinguished person, which, unlike that of most literary men, abounded in incident and adventure, are exceedingly meagre and contradictory. Neither the place of his birth nor the condition of his parents has been well ascertained; but the accounts apparently most entitled to credit state that he was born at the village of Ecquivilly in the Isle de France in 1694; and that his father was either a common labourer, or a small proprietor who cultivated his own little property.[1] His humble origin is indeed evident from the fact mentioned by all his biographers, of his early education having been almost entirely neglected, and of his being constantly occupied, until his fourteenth or sixteenth year, in the sports or labours of the fields, without being either sent to school or taught to read. But although placed in such unfavourable circumstances, young Quesnay was imbued with an ardent love of knowledge, and with a strong desire to emerge from the obscure station in which he had been brought up. The *Maison Rustique* of Liebaut was the first book that came into his hands; and he is said to have learned to read it by the assistance of lessons given him by a gardener of the village. The perusal of this book, which seems to have had a material influence over his future studies, awakened his latent powers, and stimulated him to make further efforts to extend his information. Having acquired a competent knowledge of his vernacular tongue by the eager reading of such French books as came into his hands, he next applied himself to the study of the dead languages; and speedily attained, partly by the slender assistance of a self-dubbed surgeon of the village, but chiefly by his own industry, to a tolerable proficiency in Latin and Greek.

Quesnay now resolved, in opposition to the wishes of his parents, and especially of his mother, to devote himself to the profession of surgery, and received the rudiments of his instruction in that art from the village doctor who had assisted him in his philological studies. But the pupil very soon surpassed the master; and when the latter applied to be admitted into the *Maitrise*, or Corporation of Surgeons, he presented, as testimonials of his skill in his profession, and of his capacity to practise it with advantage, some Essays written by Quesnay, and which were received with much applause. Quesnay was not aware of this trick; but soon after its occurrence he left his paternal village, and set out to prosecute his studies at Paris. We are not informed by what means he supported himself in that city, nor how long he remained there; but his indefatigable industry and zeal enabled him to make great progress in his studies, whilst his merit and modesty procured him several friends. Besides attending prelections on the various branches of surgery, and the different hospitals, he found leisure to devote some portion of his time to metaphysical researches, and the study of philosophy, for which the perusal of the *Recherche de la Vérité* of Malebranche had given him a taste. Nay, such was the activity and vigour of his mind, that having accidentally met, during his stay in Paris, with the celebrated M. Cochin, of the Royal Academy of Painting, he put himself under his tuition; and we are told that he profited so well by the few lessons he received, as to be able not only to take remarkably good likenesses, but to design and engrave, with his own hand, the various bones of the human skeleton, in a manner which would not have disgraced the most skilful artists.

On finishing his studies at Paris, Quesnay formed the design of establishing himself as a surgeon in Mantes, a considerable town of his native province, and presented himself to the surgeons of its *Maitrise* for examination. But they refused, from jealousy, as is alleged, of his talents, to admit him to trial. He was thus laid under the necessity of returning to Paris, where he passed his examinations with éclat; and in 1718 received letters ordering him to be admitted into the Corporation of Mantes.

Having established himself at Mantes, his reputation soon extended itself. He was employed by some of the first families of the neighbourhood, and, amongst others, by that of the Marshal de Noailles, Duc de Villeroi, who persuaded him to leave his residence in the country, and to accompany him to Paris as his surgeon, as nearly as we can collect in 1729 or 1730. An incident not long afterwards occurred which had the most material influence over his future prospects and life. Having accompanied the Duc de Villeroi to the house of the Comtesse d'Estrades, Quesnay remained behind in the carriage whilst the duke went in to visit that lady, who, during the interview, was suddenly seized with an epileptic fit. Quesnay being called in, and perceiving the nature of the attack, with singular presence of mind ordered the duke and the other attendants out of the room, and managed so well as to succeed in concealing the nature of the malady. The comtesse was so much pleased with this dexterity and address, that she lost no time in recommending Quesnay to her all-powerful friend, Madame d'Etioles, afterwards Marchioness de Pompadour. The latter made him her physician; and, besides obtaining for him apartments at Versailles, procured him, in 1737, the place of surgeon in ordinary to the king.[1]

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[1] It is stated in the "Eloge Historique" of Quesnay, in the *Mémoires de l'Académie des Sciences* for 1774, that he was the son of an *advocat en Parlement* at Montfort, and that he was born at Merey. But it is difficult to suppose, had his father been in such a station, that his education should have been so entirely neglected. In the brief but interesting notice of Quesnay given by Mr Crawford in a note to the *Journal* of Madame du Hausset, femme-de-chambre of Madame de Pompadour, et *l'amie* de Quesnay, in the *Mélanges d'Histoire et de Littérature* (p. 276), he is stated to have been the son of a labourer. This also is the statement of the *Encyclopédie Méthodique*. According to the notice prefixed by Dupont to the "Eloge" of M. Gournay in the third volume of the *Œuvres de Turgot*, Quesnay was the son of a peasant-proprietor.

Quesnay was shortly afterwards appointed secretary to the Royal Academy of Surgery, established in 1731; and, besides several articles on particular branches of surgery, he contributed the Preface to the first volume of its *Mémoires*, which has always been reckoned peculiarly valuable for its profound and discriminating observations on the respective uses of theory and observation in the physical sciences, and on the assistance they reciprocally lend to each other.

Having from an early period been much subject to the gout, and becoming in consequence less able to discharge his duties as surgeon, Quesnay took the degree of Doctor of Medicine in 1744; and was soon afterwards appointed, through the influence of his powerful patroness, to the important place of consulting physician to the king. In this capacity he attended Louis XV. in the campaigns of 1744 and 1745, and, amid the distractions of a camp, collected and prepared the greater part of the materials for his *Traité de Fièvres*, published in 1753.

His appointment as physician to the king was preceded by the grant of letters of nobility, issued on the recovery of the Dauphin from an attack of small-pox. Louis, who was much struck with the justice and solidity of Quesnay's remarks, familiarly called him *son penseur*, and gave him, in allusion to this title, three pansey flowers (in French *pensées*) for his arms, with the motto "*Propter cogitationem mentis.*"

The leisure Quesnay now enjoyed enabled him to prosecute his studies with greater assiduity. In 1747 he republished an enlarged edition, in 3 tomes 12mo, of his *Essai Physique sur l'Economie Animale*, originally published in 1736; in 1748 he published an *Examen Impartiel des Contestations des Médécins et des Chirurgiens de Paris;* in 1749 he published a *Mémoir sur la Sagesse de l'Ancienne Législation de la Chirurgie en France*, and two separate treatises in 12mo, the one on *Suppuration*, and the other *De la Gangrène;* in 1750 he republished his *Traité des Effets et de l'Usage de la Saigné*, written during his residence at Mantes, and originally published in 1730; and in 1753 he published his *Traité des Fièvres Continués*, 2 tomes 12mo.

These works have all been held in high estimation; and an excellent judge has given it as his opinion that "The *Traité de la Gangrène* is by far the most valuable publication which we yet possess upon this subject." Every page of this work, he adds, "is distinguished by the same talent for accurate observation and perspicuous arrangement which are so remarkable in all the other writings of this celebrated author." (Thomson's *Lectures on Inflammation*, p. 502.)

The *Traité des Fièvres* was the last of Quesnay's professional works. He appears to have thenceforth comparatively abandoned his medical studies. At no period, indeed, had he allowed them to occupy exclusively his attention; and he now devoted himself in preference to other, and, if possible, still more interesting inquiries. He had always entertained a strong predilection for agricultural pursuits, the effect, perhaps, of his situation in early life; and this, combined with the speculative and metaphysical cast of his mind, seems to have led him to those peculiar notions respecting the paramount importance of agriculture as a source of wealth, and the constitution of society, which have rendered his name so celebrated in the history of economical science. The articles "Fermier" and "Grains" in the *Encyclopédie*, published in 1756 and 1757, contain the earliest development of his views on this subject. They are both written with great ability, and display an intimate acquaintance with the subject, considerable reading, and great powers of analysis. In the article "Grains" the distinction between the gross and nett produce (*produit total* and the *produit net*,)—between the productiveness of agriculture and the supposed unproductiveness of other employments, with the doctrine of the unrestricted freedom of commerce, and most of the other leading principles in the theory of the Economists, are distinctly stated, and illustrated with much ingenuity. The *Tableau Economique* and the *Maximes Générales du Gouvernement Economique*, annexed to it under the title of *Extraits des Economies Royales de M. de Sully*, were printed by command of the king at Versailles, in the year 1758, with the following very remarkable epigraph for a work brought forth under such auspices,—"Pauvres paysans, pauvre royaume; pauvre royaume, pauvre souverain." The Maxims, which contain a short but comprehensive abstract of Quesnay's system, were reprinted, together with an analysis of the Table, and a selection from various articles contributed by Quesnay, in explanation and defence of his peculiar doctrines, to the *Journal d'Agriculture*, and the *Ephémérides du Citoyen*,[2] in the collection of Quesnay's economical works, entitled *Physiocratie, ou Constitution Naturelle du Gouvernement le plus Avantageux au Genre Humain*, edited by his friend and scholar Dupont in 1767.

We have elsewhere entered at considerable length into an examination of the speculations of Quesnay and his followers, with respect to the constitution of political societies and the sources of public wealth. (See ECONOMISTS, and POLITICAL ECONOMY.) That there is a good deal of error in them must be allowed; but this is far more than countervailed by the many just, discriminating, and original views and important discoveries which they contain. Perhaps, however, the principal merit of Quesnay and his followers does not consist so much in the discoveries they made, as in their having been the first philosophers who distinctly perceived that the institutions of society should always harmonize with the natural principles on which it is founded, or, as they termed it, with the *ordre naturel et essentiel des sociétés politiques.* According to them, economical science is "*L'étude et la démonstration des loix de la nature rélatives à la subsistence et la multiplication du genre humain.* L'observation universelle de ces loix est l'intérêt commun et général de tous les hommes. La connaissance universelle de ces loix est donc le préliminaire indispensable et le moyen nécessaire du bonheur de tous." (*Ephémérides du Citoyen*, 1769, No. ii., p. 13.) It is to be regretted that, in investigating these laws, they proceeded too much upon abstract and speculative principles, without sufficiently attending to the effects of particular institutions, and to the various phenomena manifested in the progress of society. But notwithstanding the defective mode in which they conducted their researches, they succeeded in establishing and elucidating many important principles; and there is certainly much more reason to wonder at the general correctness of their conclusions, than to feel surprised at the errors into which they fell. Quesnay and his disciples established, that society either is or should be formed to secure the greatest possible advantage to its members; that the security of property and the freedom of industry are its essential bases; and that, instead of interfering to regulate the pursuits of individuals, the proper business of the politician is to protect the equal rights and liberties of all, and to secure the utmost freedom of competition in every department of industry. And though it be undoubtedly true that most of these principles had been pointed out by previous writers, Quesnay and his school have the merit of being the first who showed their dependence on each other, and who, by presenting them in a systematic and consecutive form, were enabled to give a scientific demonstration of the injustice and impolicy of such institutions as ignorance or mistaken views of national interest had established in opposition to them.

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[1] This incident is related by Crawford, *Mélanges*, p. 276, and is referred to by Marmontel.

[2] The *Ephémérides du Citoyen*, begun in 1767, was for a few months conducted by the Abbé Baudeau, and then by Dupont. It appeared monthly, and two numbers make a considerable 12mo volume. The authors were disciples of Quesnay, and zealous Economists. Their discussions embraced the moral and political sciences, many branches of which they have treated with much ability and acuteness. There is a valuable Eloge of Quesnay in one of the numbers for 1775, written by Count d'Albon. The following extract from the *approbation* given by the *Censeur* to the third number for 1770 is curious:—"J'exhorte de nouveau les auteurs de ce *Journal*, à résister à la tentation de critiquer. Le bonheur du citoyen tient à sa confiance. On peut et l'on doit quelquefois avertir en secret ceux qui sont préposés à l'administration. Mais ou ne doit prêcher aux particuliers que leur propre réforme, et non celle de l'état."

In the article POLITICAL ECONOMY an attempt has been made to show the fallacy of Quesnay's opinion with respect to agriculture being the only source of wealth; and the experience of all ages sufficiently proves that the *despotisme légal*, in the hands of an hereditary monarch, without *contreforces* of any kind, which he strangely supposed was the best of all possible governments, is about the very worst.[1]

Notwithstanding his great age, and the sufferings he experienced from almost incessant attacks of the gout, the activity of Quesnay's mind continued unimpaired. "*Il a*," said one of his friends, "*une tête de trente ans sur un corps de quatre-vingts*." He contributed, subsequently to the publication of the *Physiocratie*, many acute and able articles to the *Ephémérides du Citoyen*, and continued wholly occupied with these studies, and with mathematics, to which he latterly began to pay considerable attention, until his death, which took place at Versailles in December 1774, in the eightieth year of his age.

Quesnay possessed inflexible integrity, a nice sense of honour, and great prudence and discretion. Though highly esteemed by the king, and long resident at court, he never intermixed in the intrigues of which it was the constant theatre. No one ever scrupled to express himself freely in his presence; nor was this confidence ever betrayed. "Il récevoit chez lui des personnes de tous les partis, mais en petit nombre, et qui toutes avoient une grande confiance en lui. *On y parloit très hardiment de tout; et ce qui fait leur éloge et le sien, jamais on n'a rien repété*."[2] To the utmost frankness and sincerity he added the easy address and polish of a courtier and the intelligence of a philosopher. No man could be less solicitous of distinguishing himself, or more careful not to offend the self-esteem of others. His conversation was animated, without the least effort at brilliancy. So much, indeed, was he averse from every appearance of pretension, that he was in the habit of veiling the most profound remarks and observations under the form of apologues, which generally referred to some subject connected with rural affairs, to which he was always particularly attached. He was most indulgent to the faults and errors of others, provided they were unalloyed by any taint of artifice or baseness, for which he never hesitated, whatever might be the rank of the party, to express the utmost contempt. Quesnay was truly a patriot and a philosopher; and it would be difficult to produce another instance of one who, having lived long in a profligate and luxurious court, unsullied by its vices and aloof from its contentions, preserved to an extreme old age all those generous and kindly feelings, with that unobtrusive but ardent zeal in the cause of humanity, and that love of speculation and profound inquiry, which distinguished his earlier years.

"Quesnay," says Madame du Hausset, "étoit un grand génie, suivant l'opinion de tous ceux qui l'avoit connu, et de plus un homme fort gai. Il aimoit causer avec moi de la campagne; j'y avois été élevée, et il me faisoit parler des herbages de Normandie et du Poitou, de la richesse des fermiers, et de la manière de cultiver. C'étoit le meilleur homme du monde, et la plus éloigné de la plus petit intrigue. Il étoit bien plus occupé à la cour de la meilleure manière de cultiver la terre que de tout ce que s'y passoit." (*Mélanges*, p. 343.)

"Tandis," says Marmontel, "que les orages se formoient et se dissipoient au-dessus de l'entresol de Quesnay, il griffonnoit ses axiomes et ses calculs d'économie rustique, aussi tranquille, aussi indifférent à ces mouvemens de la cour, que s'il en eût été à cent lieues de distance. Là bas, on déliberait de la paix, de la guerre, du choix des généraux, du renvoi des ministres; et nous, dans l'entresol, nous raisonnions d'agriculture; nous calculions le produit net, ou quelquefois nous dînions gaiement avec Diderot, d'Alembert, Duclos, Helvétius, Turgot, Buffon; et Madame de Pompadour, ne pouvant pas engager cette troupe de philosophes à descendre dans son salon, venoit elle-même les voir à table, et causer avec eux." (*Memoirs d'un Pere.*, i. 286.)

Dr Smith was well acquainted with Quesnay. He frequently met him during his residence at Paris in 1766; and whilst he bears the most honourable testimony to the "modesty and simplicity" of his character, he has pronounced his system to be, "with all its imperfections, the nearest approximation to the truth that has yet been published on the subject of political economy." (*Wealth of Nations*, p. 307.) So highly, indeed, was Smith impressed with a sense of his merits as a man and a philosopher, that it was his intention, had he not been prevented by Quesnay's death, to have inscribed to him the *Wealth of Nations*. (Dugald Stewart's *Account of the Life and Writings of Dr Smith.*)

Quesnay had a son by his wife, to whom he was united when at Mantes. He gave him an excellent education; and exhibited a striking proof of his disinterestedness by constantly refusing to solicit for him any place or situation under government. This son ultimately settled in the country, on an estate near Beauvoir. Turgot gave one of Quesnay's grandsons a place in the administration; and another entered the army, and acted as captain of infantry at the battle of Jemappes.

Few men have been more esteemed by their friends than Quesnay, or more ready to do all in their power to advance their interests. Mercier de la Rivière, the author of the work *Sur l'Ordre Naturel et Essentiel des Sociétés Politiques*, seems to have occupied the chief place in his esteem, and was looked upon by him as the only person in France qualified to conduct the administration of the finances. He was also much attached to the Marquis de Mirabeau, Turgot, Dupont, the Abbé Baudeau, St Péravy, and other leading Economists, who willingly acknowledged him for their master, and enthusiastically exerted themselves to defend and to propagate his docrines. "The Economists were in reality, and not merely in appearance, a sect of philosophers:

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[1] We are at a loss to conjecture the grounds on which Chalmers has affirmed (*Biographical Dictionary*, vol. xxv., art. "Quesnay"), that the "Economists abused their influence by circulating democratical principles." It would be quite as correct to say that Locke and his followers abused their influence by circulating despotical principles.

[2] "Journal de Madame du Hausset," in the *Mélanges*, &c., p. 277. A striking instance of the confidence placed by the most opposite parties in Quesnay is given in the second volume of Marmontel's *Memoirs*.

Secta fuit, servare modum, finemque tenere
Naturamque sequi, patriæque impendere vitam,
Nec sibi, sed toti genitum se credere mundo.

They acted from an honest zeal for the truth, and not from fashion, eccentric tastes, or the love of singularity; their sole object was to enlighten and improve mankind; and to them, amongst political inquirers, belongs the rare praise of having first pointed out the natural order of things, or the observed course of nature in the conduct of the world, as the example and guide of human policy." (J. R. M.)

QUESNE, Abraham, *Marquis de*, admiral of the naval forces of France, and one of the greatest men of the seventeenth century, was born in Normandy in the year 1610. He contributed to the defeat of the naval power of Spain at Gattari; he was dangerously wounded before Barcelona in 1642; and having entered into the service of the Swedes, he became vice-admiral, and entirely defeated the Danes, killing their admiral, and taking his ship. He was recalled to France in 1647, and commanded the squadron sent to Naples. The naval affairs of France being much decayed, he fitted out divers ships for the relief of the royal army that blockaded Bordeaux, which was the principal cause of the surrender of the town. He was very fortunate in the wars of Sicily, where he defeated the Dutch thrice, and killed their admiral De Ruyter. He also obliged the Algerines to sue in a very humble manner for peace from France. In short, Asia, Africa, and Europe felt the effects of his valour. He was a Protestant; yet the king bestowed on him the land of Bouchet, and, to immortalize his memory, gave it the name of that great man. He died in 1688.

QUEUE. See Heraldry.

QUEVEDO Y VILLEGAS, Francisco Gomez de, a Spanish writer of considerable celebrity, was the contemporary of Lope de Vega and Cervantes, and was born at Madrid in 1580. His father, though descended from a family in that mountainous region to the north-west of Spain, occupied at the time of his birth some office of dignity at the court of Philip II. At the age of fifteen young Quevedo graduated in theology at the university of Alcalá, where he laid a foundation broad enough for universal scholarship. He must have been possessed of extraordinary natural endowments, as well as of extreme industry. On his return to Madrid he mixed with the distinguished scholars and fashionable cavaliers of his time. In "an affair of honour" in which he had the ill-luck to be engaged, he killed a person of rank, fled to Sicily, was invited to the splendid court of the Duke of Ossuna, viceroy to Philip III., and was subsequently employed in important affairs of state, which demanded on numerous occasions personal courage and involved personal risk. On the conclusion of his master's administration in Sicily, Quevedo was despatched to Madrid in 1615 as a sort of plenipotentiary, where he was very graciously received. He returned to the duke, who was now in Sicily, with a pension of 400 ducats, and was raised to the dignity of minister of finance. He discharged this duty with eminent skill and honesty; and in 1617 he was made a knight of the Order of Santiago. In 1620 the duke fell from power, and Quevedo endured a detention of three years and a half in his patrimonial estate of Torre de Juan Abad. He refused various offices of state, and was content with the merely titular rank of Secretary to the King. He had long had a desire to betake himself to letters, and he did so for the rest of his life. In 1634 he married; but was soon left alone by the death of his wife. In 1639, in consequence of some satirical verses which were placed under the king's napkin at dinner, and which were hastily attributed to Quevedo, he was seized with great suddenness and secrecy, and was rigorously confined for upwards of four years in the royal convent of San Márcos de Leon. Here, in a damp and unwholesome cell, his health was wasted beyond all recovery: his personal property likewise melted away, until he was obliged to depend on charity for his support. In a haughty yet heart-rending letter written to Olivarez, he tells him despairingly, "No clemency can add many years to my life; no rigour can take many away." The hour of the favourite's disgrace came at last, and Quevedo was free. It was already admitted that another had written the verses; but it was too late. Quevedo failed in his endeavour to recover his lost property; and, unable to subsist in the capital, he retired to the mountains from which his race was sprung, where, worn out by suffering and exhausted by trial, he died in 1645.

The works of Quevedo which have come down to us show him to have been a fruitful and an industrious writer. He tried his hand in all manner of departments, from theology and metaphysics down to stories of vulgar life and wild gypsy ballads. Many of his writings are still in manuscript, in the national library of Madrid and in other collections, public and private. He seems to have published nothing with his name except his meagre translations of Epictetus and Phocylides. His first appearance as an author was probably in *The Flowers of Illustrious Poets* of his friend Pedro de Espinosa. After his death, Gonzalez de Salas published, in 1648, the first part of such of his poetry as could conveniently be reached; and his nephew, Pedro Alderete, issued the rest in 1670, in a very careless manner, under the conceited title of *The Spanish Parnassus, divided into its Two Summits, with the Nine Castilian Muses.* Sonnets and ballads are the most numerous, but there are likewise abundance of odes, satires, and idyls. Many of his lighter ballads, such as those of the Gypsies, have attained an unbounded popularity among the peasants, and are still to be heard sung to the guitars thoroughout the whole of Spain. His burlesque sonnets, in imitation of the Italian, are considered the best in the language. But besides the indecency of much of his poetry, he made use of words and phrases that are low and essentially unpoetical. In 1631 he published a small volume entitled *Poems by the Bachiller Francisco de la Torre*, which are now generally ascribed to his own pen. The works, however, on which Quevedo's fame mainly rests, both at home and abroad, are in prose. Passing by those on theology and metaphysics, we come to *The History and Life of the Great Sharper, Paul of Segovia*, first printed in 1627. It is written in the *picaresco* style of Mendoza's *Lazarillo de Tormes*, and is overrun with conceits, puns, and a reckless, fierce humour. It teems with wit, and most cruel sarcasm against all orders of society. As a satire it is perhaps too hard and unrelenting to be considered at all amusing. This, indeed, is the charactar of most of his other prose satires, and especially his *Visions*, published in 1635. As an instance of that mixture of the solemn and ludicrous in which he so much delighted, the reader will obtain as good a specimen as can be given in his *Dream of Skulls* or *Dream of Judgment.* Everywhere he exhibits a bold, original, and independent spirit; and his personal sufferings may have had much to do with his satirical bitterness and the severity of his sarcasm.

A somewhat diffuse Life of Quevedo was printed at Madrid in 1663 by Don Pablo Antonio de Tarsia, a Neapolitan, and is inserted in the tenth volume of the best edition of Quevedo's works, that of Sancha, Madrid, 11 vols. 8vo, 1791–94. A much more satisfactory Life is to be found in Baena's *Hijos de Madrid*, tom. ii., pp. 137–154.

Quevedo's *Visions* were freely rendered into English in 1668 by Sir Roger l'Estrange; a number of his tales were translated into English by Stevens in 1707, and by Pineda in 1734. The latter is the basis of the Edinburgh translation of the *Visions*, &c., 3 vols., 1798. (See Ticknor's *History of Spanish Literature*, vol. ii., c. xix.)

QUID PRO QUO, in law, denotes the giving one thing of value for another; or the mutual consideration and performance of both parties to a contract.

Quid pro Quo, *Qui pro Quo*, is also used in physic to express a mistake in the physician's bill, where *quid* is written for *quo*, that is one thing for another; or of the apothecary, in reading *quid* for *quo*, and giving the patient the wrong medicine. Hence the term is in general extended to all blunders or mistakes committed in medicine, either in the prescription, the preparation, or the application of remedies.

QUIETISM. See Mysticism.

QUILIMANE. See Mozambique.

QUILLET, Claude, an eminent Latin poet, was born at Chinon in Touraine in 1602, and practised physic there with reputation; but having declared against the pretended possession of the nuns of Loudun, in a manuscript treatise, the original of which was deposited in the library of the Sorbonne, he was obliged to retire into Italy, where he became secretary to the Marshal d'Estrées, the French ambassador at Rome. In 1655, Quillet having published in Holland a Latin poem entitled *Callipædia*, under the name of "Calvidius Lætus," he there inserted some verses against Cardinal Mazarin and his family; but that churchman making him some gentle reproaches, he retrenched what related to the cardinal in another edition, and dedicated it to him, Mazarin having, before it was printed, given him an abbey. He died in 1661, aged fifty-nine, after having given Ménage all his writings, and 500 crowns to pay the expense of printing them; but the Abbé took the money and papers, and published none of them. A third edition of his poems, with a number of other pieces, was published in London in 1708, 8vo. The *Callipædia* was translated into English verse by Nicolas Rowe, London, 1710.

QUILLOTA, a town of Chile in the province of Aconcagua, in a fertile valley 23 miles N.E. of Valparaiso. It is chiefly important on account of the copper mines in the vicinity, which are considered the richest in the country. The town suffered much from an earthquake in 1823; and also on other occasions. Pop. 8000.

QUILOA, or Keelwa, a seaport-town of Zanguebar, on the E. coast of Africa, on an island about 10 miles long and 6 broad, 225 miles N. of Mozambique; S. Lat. 8. 57., E. Long. 39. 47. From the middle of a grove of palms rise the whitewashed flat-roofed houses of the town, and the domes and minarets of its mosques. The streets are narrow, and the buildings generally substantial. Some remains of former fortifications are still in pretty good preservation; and there is a fort capable of containing a strong garrison, though mounted with no guns. The harbour is large and deep, accessible to vessels of any size. Quiloa was once a place of much importance; and its monarchs held sway over the country as far south as Sofala. It was taken and burned by the Portuguese in 1505, but abandoned by them soon after, on account of its unhealthiness. It was subsequently rebuilt, and has recovered some degree of its former prosperity, being subject now to the Imam of Muscat. Pop. from 6000 to 8000.

QUILON, a seaport-town of India, in the native state of Travancore, presidency of Madras, 385 miles S.W. of Madras, and 740 S.E. of Bombay. There is here a British cantonment, containing a barrack and an hospital. The town has also a jail under the native authorities; and an Episcopal church has been erected some years ago. Communication is carried on with Trivandrum, the capital of Travancore, by means of canals running parallel to the shore; and similar means of transit extend in the opposite direction northwards. The chief productions of Quilon are timber, cocoa-nuts, pepper, ginger, and coffee. There is good anchorage in a bight about 3 miles from the fort. Pop. estimated at 20,000.

QUIMPER, a town of France, capital of the department of Finistère, on the slope of a hill at the confluence of the Eir and the Odet, 134 miles N.W. of Nantes, and 330 W. of Paris. It has an antique appearance; and there are still some remains of its ancient walls and towers. The older part of the town is ill built; but the more modern quarter contains many fine houses, especially along the quay which lines the right bank of the Odet. The cathedral is a large and stately edifice, with a finely-sculptured portal and two massive towers. There are more than one other church, a large college, a military hospital, public baths, and a prefect's house, behind which there is a fine promenade leading to the top of a wooded hill. Quimper contains potteries, tanneries, breweries, &c. Fishing and ship-building are also carried on; and there is a considerable trade in corn, wine, brandy, fish, cattle, wool, hemp, flax, &c. Pop. (1856) 9896.

QUIMPERLÉ, a town of France, in the department of Finistère, at the confluence of the Isole and Ellé, 57 miles S.E. of Brest. It has a picturesque situation among high hills; and contains a curious old round church, a large Benedictine convent (now the residence of the mayor), Capuchin and Ursuline convents, a college, and a court of justice. Leather, paper, and wooden shoes are made here; and there is some trade in these articles, corn, and cattle. Vessels of considerable size can come up to the town, and discharge their cargoes at a spacious quay lined with good warehouses and other buildings. Pop. (1856) 5902.

QUIN, James, a celebrated performer on the English stage, was born in King Street, Covent Garden, London, on the 24th of February 1693. He was intended for the bar; but preferring Shakspeare to the statutes at large, he, on the death of his father, when it became necessary for him to do something for himself, appeared on the stage at Drury Lane. For this profession he had many important qualifications. He had an expressive countenance, a majestic figure, a piercing eye, and a clear, full, melodious voice. In 1720 he first displayed his comic powers in the character of Falstaff, and soon afterwards appeared to as great advantage in Sir John Brute; but it was upon Booth's quitting the stage that Quin showed to most advantage, in the part of *Cato*. He was the first man on the boards till Garrick made his appearance, of whom Quin at first spoke rather contemptuously. He continued a favourite performer until the year 1748, when, on some dispute between him and Rich the manager, he retired to Bath, and only came up annually to act for the benefit of his friend Ryan, until the loss of two front teeth spoiled his utterance for the stage. Whilst Quin continued upon the stage, he constantly kept company with the greatest geniuses of the age. He was well known to Pope and Swift; and the Earl of Chesterfield frequently invited him to his table; but there was none for whom he entertained a higher esteem than for the poet Thomson, the author of the *Seasons*, to whom he made himself known by an act of generosity that does the greatest honour to his character. Quin's splendid elocution recommended him to Frederick, Prince of Wales, who appointed him to instruct his children in speaking and reading with a graceful propriety; and Quin being informed of the elegant manner in which his majesty delivered his first speech from the throne, he cried out in a kind of ecstasy, "Ay, I taught the boy to speak." Nor did his majesty forget his old tutor; for, soon after his accession to the throne, he gave orders, without any application being made to him, that a pension should be paid to Mr Quin during his life. Quin, indeed, was not in absolute need of this royal benefaction; for, as he was never married, and had none but distant relations, he sunk L.2000, which was half his fortune, in an annuity, for which he obtained L.200 a year, and, with about L.2000 more in the funds, lived in a decent manner during the latter part of his life at Bath, whence he carried on a regular correspondence with Garrick, and generally paid a visit to his friends in the metropolis once a year, when he constantly passed a week or two at the great actor's villa at Hampton. He died of a fever in 1766.

QUINARIUS was a small Roman coin, equal to half the denarius, and consequently worth about threepence three farthings of our money. It was called *quinarius*, because equal in value to five asses, just as the denarius was named from its containing ten.

QUINAULT, Philippe, a French lyric poet of some note, was born at Paris in 1635. He pursued the study of law for some time, but preferring the poetry of the stage, he afterwards renounced his legal profession in favour of the drama. His tragedies and comedies, written for the Théâtre Français, are now forgotten. In 1673 he commenced writing for the Grand Opera, and his lyrical talent gained for him entire success. He is regarded as the best operatic writer which France has yet produced; and A. W. Schlegel even prefers his light, animated, fantastic style to that of the great Italian Metastasio. *Armide* is considered his masterpiece. He received the order of St Michael at the hands of Louis XIV., with a pension of 2000 livres (L.100); and was a member of the French Academy, and of the Academy of Inscriptions and Belles-Lettres. Quinault ceased to write when Lulli, who set his pieces to music, died. The poet outlived the musician only a year; and leaving his daughters a considerable fortune, he died in 1688. His dramas have been collected and published, under the title of *Le Théâtre de M. Quinault, contenant ses Tragédies, Comédies, et Opéra, Edition augmentée de sa Vie, et d'une dissertation sur ses Ouvrages et sur l'Origine de l'Opéra*, 5 vols. 12mo, Paris, 1715.

QUINCUNX, in gardening, is a plantation of trees, disposed originally in a square consisting of five trees, one at each corner, and a fifth in the middle; or it is applied to trees planted in oblique lines of three and two.

QUINCY, a town of Massachusetts, in the United States of North America, near the shore of a bay of the same name in Boston harbour, 8 miles S. by E. of Boston. It is well built on level ground, and has a stone church, a handsome granite town-house, a newspaper office, and two banks. It is chiefly remarkable for its granite quarries, in which about 1000 workmen are employed, and from which granite is sent to various parts of the country. Pop. (1850) 5017.

Quincy, a town of the United States of North America, capital of Adams county, in the state of Illinois, stands on a limestone cliff on the left bank of the Mississippi, in the midst of a rich undulating prairie-land, 170 miles above St Louis, and 104 W. of Springfield. It has a large public square, numerous churches, a handsome court-house, several newspaper offices, and three banks. There are numerous manufactories, including distilleries, machine shops, foundries, flour and saw mills worked by steam, &c. An active trade is carried on by steamers on the Mississippi. Pop. (1850) 6901; (1853) 11,000.

QUINDECAGON, a plain figure with fifteen sides and fifteen angles.

QUINDECIMVIRI. See Decemviri.

QUININE, or Quinia, a vegetable alkaloid discovered by modern chemistry in the yellow Peruvian bark (*Cinchona cordifolia*). It is a white powdery substance, sparingly soluble in water, but dissolved by warm alcohol, from which it is not deposited in crystals. Quinine unites with acids, and forms salts, the most important of which is the sulphate. It is soluble in water, and crystallizes. In the dose of one grain twice or thrice a day it is the most valuable of all the vegetable tonics, and in larger doses it is the best of all the antiperiodics. Quinine should not be administered where there is a tendency of blood to the head.

QUINQUATRUS, or Quinquatria, was a festival celebrated at Rome in honour of Minerva, and which was celebrated on the 19th of March, and lasted five days. On the first day they offered sacrifices and oblations without the effusion of blood, and was considered the festival proper; the second, third, and fourth were spent in shows of gladiators; and on the fifth day they went in procession through the city. Scholars had a vacation during the solemnity, and at this time presented their masters with a gift or fee, called *Minerval*. Boys and girls used to pray to the goddess Minerva for wisdom and learning, of which she had the patronage. Plays were acted and disputations held at this feast on subjects of polite literature. The quinquatrus was so called because, according to Varro, it was held the fifth day after the Ides.

QUINQUEREMIS, in the naval architecture of the ancients, is a name given to a galley which had five benches of oars. The invention of them is ascribed to the reign of Dionysius. They in general divided their vessels into *monocrota* and *polycrota*. The former had only one tier of rowers; the latter had several tiers of them, from two or three up to twenty, thirty, or even forty; for in the time of Philopater we have an account of such a vessel, which required no less than four thousand men to row it.

QUINQUIVIRI, in Roman antiquity, were five extraordinary magistrates frequently appointed to carry any measure into execution.

QUINTANA, Manuel Josef, an eminent Spanish poet and patriot, frequently called "the Spanish Tyrtæus," was born at Madrid in 1772. He was educated at Salamanca, and adopted the profession of the law under the patronage of Jovellanos. But he secretly indulged a preference for letters; and in 1801 he wrote his tragedy of *The Duke of Viseo*, and in 1805 he produced his *Pelayo*. The former had but little success; but the latter, which had been designed to rouse his countrymen to a resistance of foreign oppression, struck a chord in their hearts which it took a number of years to allay. Meanwhile, in 1802, he had published a thin volume of poems almost entirely lyrical, which rang through the hearts of the half of Spain. He wrote in the same spirit, in 1807, a volume containing the lives of five distinguished Spaniards who had successfully fought the enemies of their country. He at the same time prepared three volumes of selections from the best Spanish poets, accompanying them with critical notices, which were not without occasional Gallicisms, but yet were thoroughly national in spirit, and were unquestionably superior to anything of the kind in the Spanish language. Many years afterwards Quintana added both to the lives and selections. At the outbreak of the revolution of 1808 Quintana devoted all his talents and all his fortune to the service of his country. He wrote *Odes to Emancipated Spain;* he harangued his countrymen through the journals; he penned the proclamations, manifestoes, and addresses which so honourably distinguish his career as secretary to the Cortes and to the regency; and he had his reward. Ferdinand VII. no sooner gained his freedom from France than, in 1816, on his return to Madrid, a persecution was instituted against the very men who had contributed to his liberation. Quintana was imprisoned in the fortress of Pamplona for six miserable years, without even the use of writing materials. But a change came at last. In 1820 he was raised to greater distinction than he had known before, which he was allowed to enjoy for three years, when another political revolution took from him both place and power. He retired to Estremadura till the king's death, when he was again restored to his old public offices, was created a peer of the realm, and received a crown of laurel from the hands of the present Queen of Spain, whose education he had superintended. He died at Madrid on the 11th March 1857, aged eighty-four. His funeral was attended by the leading nobility and all the noted men of letters in the Spanish capital.

Quintana's complete works will be found occupying a volume of the *Biblioteca de Autores Españoles* of Rivadeneyra, by Ferrer del Rio, published in 1852. His *Lives of Celebrated Spaniards* has been translated into English by Preston.

QUINTANAR DE LA ORDEN, a town of Spain, in the province of Toledo, 63 miles S.E. of Madrid. It has two large squares, a good town-hall, church, prison, schools, hermitages, &c. Oil, flour, chocolate, soap, bricks, tiles, blankets, ropes, and other articles, are made here; and large markets are held. Pop. 5656.

QUINTETTO (English, *Quintet*), in music, a composition for five voices, or for five instruments, each of which is *obligato*. The remarks that have been made upon the construction of the quartetto apply generally to that of the quintetto. Amongst the finest instrumental quintettos are those of Boccherini, Mozart, Beethoven, and Onslow. The best that have been composed for wind instruments only are A. Reicha's, for flute, oboe, clarinet, horn, and bassoon. (G. F. G.)

QUINTILIANUS, M. FABIUS, a celebrated Roman rhetorician, chiefly eminent for his treatise on oratory. The main facts of his life, as far as they are known to us, are derived from his own allusions in this celebrated work. His father seems to have been a man of some note (ix. 3, § 73), and from a passage in Seneca, it has been inferred that he was a declaimer. If so, Seneca speaks of him very slightingly (*Controv.* v., pref., p. 318), as a man whose oratorical reputation had not survived him. Others suppose that the Quintilian noticed by Seneca was the grandfather of M. Fabius; but the name was so common that any assumption about it is highly precarious.

Quintilian is said to have been born at Calagurris in Spain (Auson. *Profess.* i. 7; Euseb. *Chron.* ad. Ol. ccxi.), and we hear of other Quintilians in that country at a much later period (Prudent. *Hymn.* vii. 152). Doubt has been thrown on this fact from the silence of Martial, who being himself a Spaniard, would naturally have been glad to have included a man whom he so profoundly admired (*Ep.* ii. 90) in the list of his distinguished fellow-countrymen. Some weight must undoubtedly be attached to this argument, and his birthplace be regarded as uncertain. He was certainly educated at Rome, and repeatedly alludes to the instruction he received from Domitius Afer, whose waning powers were the more conspicuous from his unwillingness to abandon an arena in which he had excelled all his contemporaries, although they were men of such high reputation as Julianus Africanus and Servilius Nonianus (v. 7, 7; x. 1, 24, 118, &c.) Quintilian was then a mere youth (*adolescentulus*) during the old age of this distinguished orator; and he must therefore have been born A.D. 40–42, for Domitius Afer died in the reign of Nero, A.D. 60. When his education was completed, and after the death of his friend and instructor, he went to Spain with Galba, and stayed with him during his eight years' administration of Hispania Tarraconensis. At the end of this period he returned to Rome with his patron, and began to practise at the bar with such distinction that his name became with his contemporaries a proverbial term for a consummate orator. (Juv. vii. 280.) He won still greater distinction in the office of a teacher (*moderator summe juventæ*, Mart. ii. 90), and had the good fortune to number Pliny among his pupils. (Plin. *Ep.* ii. 14, § 9; vi. 6, §§ 3, 32.) We cannot wonder at his brilliant success, if his practice in any way came up to the noble requirements of his theory. His general remarks on education, distinguished as they are by the calmest good sense, may still be read with advantage; and the arguments by which he maintains the superiority of a public to a private education, give an irresistible answer to the objections which eighteen centuries have not sufficed to clear away. Probably few men came nearer to his marvellous ideal of a tutor than he did himself, as we may conjecture from the affectionate respect which he received from his pupils, and from the use of his name by Juvenal as a general expression for a pure and honourable man. (*Sat.* vi. 75.) When we add to this the certainty that he fully gained *during his lifetime* the reputation which he had justly earned, his biography presents a picture of rare good fortune. Two emperors singled him out for their most conspicuous marks of approbation. Domitian entrusted to him the education of his sister's grandsons (*Inst. Orat.* iv. preæm.); and Clemens, the father of these youths, obtained for him, in gratitude for his instruction, the honours and empty title of consul (Anson. *Grat. Act.* ante med.) Although this office had long been shorn of all its political power, it may well have seemed a guerdon sufficiently splendid to excite the envy of contemporaries as a freak of fortune. (Juv. vii. 194.) From Vespasian he received the still more substantial recognition of a regular salary of 100,000 sesterces (between L.800 and L.900) a year out of the privy purse, with the additional honour of being the first recipient of a bounty which was afterwards continued in imitation of this excellent precedent. (Suet. *Vesp.* 18.) These distinctions were showered upon him at the close of his public duties, when, after twenty years of professional labour, he was employing his retirement in the composition of his great work, the *Institutiones Oratoriæ*.

But in spite of his brilliant success, the life of Quintilian was embittered by the severest domestic misfortunes. He had married, probably late in life, a very young girl, who, after bearing him two sons, died before her twentieth year. He speaks of her with almost parental tenderness, and says that his sons were his only consolation. Of these, the younger, a child of the utmost promise, died a few months after his mother, while the father was diverting his thoughts with the composition of his treatise *De Causis Corruptæ Eloquentiæ*. All his hopes were then centred in the young Quintilianus, whose unusual abilities formed a strong stimulus to his father's diligence, and heightened his desire to complete, before his own death, his larger and more celebrated work. But these hopes were destined to be blighted; the boy died, after eight months' illness, in the tenth year of his age, and Quintilian bitterly complains that the fruit of his labours was destined to be reaped by any one rather than those for whose sake he had so fondly written. Besides showing him in a very amiable domestic character, the autobiographical digression, in which he informs us about these circumstances, is valuable, as illustrating Quintilian's high position; for the son whose loss he so pathetically laments had been adopted by a man of consular dignity, and already betrothed to the daughter of a prætor. (*Inst. Or.* vi. Proæm.)

Pliny wrote one of his extant letters to a Quintilian, whom he addresses in affectionate terms, and to whom he sends a present of 50,000 sesterces (between L.400 and L.500), as a present for his daughter on her marriage to Nonius Celer, a Roman knight. He apologises for so trifling a present (*munusculum*) by saying that he would not have succeeded in persuading him to accept a larger sum, and adds that his friend's means were disproportionate to the wealth of his intellect. (*Ep.* vi. 32.) If the Quintilian here addressed be the author of the *Institutiones* (as appears most probable), he must have married the daughter of Tutilius when he was at least fifty, and have lived to a considerable age. We see no improbability in this, since the death of his children, and the very short duration of his previous married life, would naturally induce him to a second marriage. The date of his death is entirely uncertain.

Doubt has been thrown on the identity of the great Quintilian with the one mentioned by Pliny, because in this epistle he is said to have been "modicum facultatibus," whereas we have seen that he enjoyed a handsome pension; and Juvenal quotes him as an instance of a literary man who possessed the amplest means. We may add to this that he himself alludes to his circumstances ("facultates patrimonii nostri") in terms which show that he had a considerable competence. There is, however, no real difficulty here. The general tone of Pliny's letter shows that he was addressing a rich man, though one poorer than himself; and there is an obviously sarcastic exaggeration in the jealous language of Juvenal, who, although he felt for Quintilian a sincere respect, probably disliked him as a court favourite under a detestable tyrant. It has been well remarked that Quintilian was "a rich man among the poor, and a poor man among the rich."

He lived in times which were perilous to the honesty of prominent and able men. Comparatively few of his contemporaries escaped without a stain from the all but universal corruption of that dark period, when, as Niebuhr expresses it, "the world was effete with the drunkenness of crime." Many of the eminent men with whom Quintilian lived on terms of intimacy, and among them Domitius Afer, were "prosperiore eloquentiæ quam morum famâ." (Tacit. *Ann.* iv. 5.) It is even strange that in close proximity to men so distinguished for genius, yet so degraded by moral weakness, Quintilian should still have maintained his celebrated theory, that a splendid eloquence is incompatible with an immoral life. (*Inst. Or.* i. 2.) And yet there is not a single reproach against Quintilian's own character, unless it be the adulation with which he addresses the Emperor Domitian on being requested to undertake the education of his grand-nephews. Considering the high compliment which was involved in his selection for this office, and the general prevalence of flattery far grosser and more extravagant (Vell. Paterc. ii. 94, 104; Stat. *Sylv.* i. 1, 62; Mart. v. 81), we cannot but consider this a venial offence. Quintilian was no politician, and even if he had been, such insane compliment is too preposterous to do any harm. We might call it a vice rather of the period than of the individual, did we not know historically how seductive are the blandishments of royalty. Even Lord Chatham, a far greater man than Quintilian, burst into tears on receiving from George III. a few words of ordinary civility.

Quintilian's chief claim to the respect of posterity rests on his famous work, *Institutiones Oratoriæ*, written mainly with a view to the education of his own son and the son of the courtly orator Marcellus Victorius, to whom he dedicated it. The publication of it was hastened by the generally expressed wish, that he would embody in writing the results of his long experience, and by the fact, that no less than two unauthorized editions of his rhetorical notes, full of imperfections, had already been brought before the world by the ill-judged zeal and admiration of his youthful auditors. He tells us that he composed the present work in rather more than two years, amid the interruption of numerous other engagements; but it gives the result of many years' study of the subject, and contains all that he considered most valuable in numerous earlier treatises, both Greek and Latin. It forms a complete compendium of every topic likely to be technically useful in the education of a young aspirant to the honours of eloquence. It is the clearest and most practical of rhetorical manuals; and though inferior to Cicero's *De Oratore* in a literary point of view, is much more adapted to be practically useful. Quintilian's style is graceful, lucid, and flowing; and although he was not so pedantic as to avoid every expression which wanted the classic stamp of the Augustan period, yet he may be regarded as the restorer of good taste, and "can in no way be classed among the writers of the *Argentea ætas.*" (Niebuhr.) The first MS. of Quintilian was discovered by the Florentine Poggio in the tower of the monastery of St Gall, when he was attending the council of Constance. The first printed edition was that of Campanus at Rome in 1470. The best commentary is that of Spalding (completed by Zumpt and Bonnelli), who gives in his Preface an imperfect and desultory sketch of Quintilian's life.

It is now generally agreed that the work *De Causis Corruptæ Eloquentiæ* is lost. It was long identified with the *Dialogus de Oratoribus*, which is more rightly assigned to Tacitus, and usually printed by modern editors among his works. The arguments about the authorship are well and briefly given by Spalding in his note on *Institutiones Oratoriæ*, vi. preæm., and need not be recapitulated here. The one hundred and sixty-four declamations which long passed under the name of *Quintilian*, are universally acknowledged not to be his. They are the feeble and tasteless productions of those rhetorical schools which, by encouraging empty rant on subjects which had the least possible affinity with real human interests, tended radically to vitiate the taste of young orators. Tacitus and Petronius Arbiter alike condemn the futile and fantastic manner of these discussions, which degraded eloquence into affectation, and made it the orator's sole object to surprise by unexpected and unusual expressions, and emasculate his sentences by a nauseous superfetation of quips and flourishes. The ridiculous and intolerable style of the later Roman writers, with the archaisms and euphuisms with which they elaborately endeavour to conceal their barrenness of thought, was the natural development of so mistaken a practice. (F. W. F.)

QUINTUS SMYRNÆUS, called QUINTUS CALABER, a Greek poet, who appears to have lived about the end of the fourth century A.D., and who wrote a supplement to Homer's *Iliad*, in fourteen books. The poem was discovered by Cardinal Bessarion, and was first published by Aldus in 1504 or 1505. The best edition is that of Tychsen, Strasburg, 1807.

QUIRITES. See ROME.

QUITO, the capital of the republic and of the department of Ecuador, stands in a ravine on the E. side of the volcano Pichincha, 9534 feet above the sea, 150 miles N.N.E. of Guayaquil; S. Lat. 0. 13., W. Long. 78. 50. A small part of the town is built on level ground, but the most of it occupies the slope of a hill, which is in some places exceedingly steep. The level part is chiefly occupied by a large square, containing the cathedral, episcopal palace, government palace, and town-hall, and having a fountain in the centre. From the corners of this square extend four broad, straight, but short streets, which are the best in the town; the others being narrow, crooked, and uneven, and many of them unpaved. The cathedral is a plain building, and is excelled in beauty by some of the other churches. The former Jesuits' college, a large and handsome building, with a Corinthian front, is now occupied by the university. There are also two ecclesiastical colleges, and several convents and hospitals. The houses are seldom more than one storey in height, and are generally built of sun-dried bricks, flat-roofed, and thatched with *maguey* leaves. Cotton, coarse woollen fabrics, hosiery, silk, lace, leather, and confectionary, are among the manufactures of the town. The markets are well supplied with provisions; grain and other rural produce are exported to central America, and hardware, cloth, &c., imported from Europe. Quito was founded by Sebastian Benalcasar in 1534. It has frequently suffered from earthquakes. Pop. 70,000.

QUORUM, so called from the words of the commission, *quorum A. B. unum esse volumus* ("of whom we will that A. B. be one"); thus rendering it necessary that certain individuals (said to be of the *quorum*) should be present at the transaction of business.

R.

R, a liquid consonant, being the eighteenth letter of the English alphabet. Its sound is formed by a guttural extrusion of breath vibrated through the mouth, with a sort of quivering motion of the tongue drawn back from the teeth, and advanced with the tip a little elevated towards the palate. It is convertible with the letters *l*, *n*, *m*, and *s*. It is apt to place itself at one time before, at another time after a vowel, and is liable to disappear from the neighbourhood of several consonants.

In the notes of the ancients, R. or RO. signifies *Roma*. R. C. *Romana civitas*; R. G. C. *rei gerendæ causa*; R. F. E. D. *recte factum et dictum*; R. G. F. *regis filius*; R. P. *res publica*, or *Romani principes*, and R. R. R. F. F. F. *res Romana ruet ferro, fame, flamma*. (See ABBREVIATIONS.) Used as a numeral, R anciently stood for 80; and with a dash over it, thus $\bar{\text{R}}$, for 80,000; but the Greek R, $\acute{\rho}$, with a small mark over it, signified 100; with the same mark under it, it denoted 1000 × 10; thus ρ͵ signifies 100,000. In the Hebrew numeration ר denoted 200; and with two horizontal points over it, thus ר̈, 1000 × 200; = 200,000. In the prescriptions of physicians, R or ℞ stands for *recipe*, that is, "take."

RAAB (Magyar *Györ*), a town of Hungary, capital of a county of the same name, in the midst of a wide marshy plain at the confluence of the Raab, with the Little or Wieselburg Danube, 34 miles S.E. of Pressburg, and 67 W.N.W. of Buda. Besides the town properly so called, which is defended by a castle, and surrounded by fortifications and a glacis, there are extensive suburbs. It is well built, chiefly of stone, and some of the streets are straight and regular. Among the chief buildings are the old and splendid cathedral; several other Roman Catholic, a Protestant, and a Greek church; Benedictine and Ursuline convents. The educational establishments include an archigymnasium, a royal academy with legal and philosophical faculties and a library, an Episcopal seminary, and other schools. There are also an orphan hospital, theatre, barracks, and arsenal. Large horse markets are held here; and there is a considerable trade in corn. The only manufacture of any importance is that of tobacco, which is carried on by the government. Raab is connected by railway with Vienna and with Buda; and steamers ply between it and Gönyö, on the Danube. A battle was fought under the walls in 1809, in which Napoleon totally defeated the disorderly force of the Hungarian nobles. Pop. (exclusive of the military) 16,000.

RAAT, a town of British India, presidency of Bengal, capital of a pergunnah of the same name in the district of Humeerpore, 46 miles S. of Calpee. It is a populous and thriving town, having a bazaar, and being well supplied with provisions and water. It is, however, very unhealthy, on account of the swamps and rank vegetation of the adjacent country. Pop. 8616.

RABATT, a seaport of Morocco, on the S.W. side of the Bu-Regreb, at its mouth in the Atlantic, in the province and 100 miles W. of Fez. From the bank of the broad, full river rise groups of palms and minarets, mosques and mausoleums, the time-worn walls of the town, the battlements of the citadel, and the lofty tower of Sma Hasann, on a cliff to the S.E., forming a conspicuous sea-mark for many miles off. There are pretty good fortifications towards the sea, consisting of a wall flanked by round batteries; and the entrance of the river is commanded by another battery with 24 guns. The citadel is also mounted with artillery. Many of the houses are large, but the streets are narrow and dirty. The mouth of the river is obstructed by a bar of shifting sand; and in winter the surf is frequently so violent as to make the entrance very dangerous. Vessels entering can moor close to the town, where there is room for about twelve; but they are sometimes compelled by stress of weather to go farther up the river. The manufactures of Rabatt are considerable, including carpets, mats, rugs, serge, woollen and cotton cloth, ropes, hemp, heather, saddles, bridles, muskets, &c. Salt is made both here and at Sallee, on the opposite side of the river, with which communication is kept up by boats. The trade of the town is considerable: calico, cotton, linen, muslin, hardware, cutlery, tinplate, sugar, tea, &c., being imported; and wool, wax, oil, hides, bark, pease, beans, gum, and other articles exported. The quantity of exports and imports would in all likelihood be much greater than it is, were it not for the high duties and government monopolies. Pop. about 35,000, of whom 28,000 are Mohammedans and 7000 Jews.

RABBI (Ῥαββί), a title of honour given to the teachers of the law in the time of Christ, and for which there is no exact equivalent in our language, though perhaps in purport and usage it comes near to "doctor" or "master:" a word combining *both* these significations would fairly represent it. The actual signification of רב (*rab*), in Hebrew is "a great one,"—*i.e.*, a chief, a master; and would as a title be probably represented by the "Excellenza" of Southern Europe, which is perhaps as common as Rabbi was among the Jews. It was there employed as a title in the Jewish schools in a threefold form, indicating as many degrees, which might without much impropriety be compared, in the stricter sense, to the progressive academical degrees of Bachelor, Master, and Doctor. The lowest of these degrees of honour was רב (*rab*). This, with the relative suffix, became רבי, Ῥαββί, *Rabbi*, "my master," which was of higher dignity; and beyond that was רבן (*Raban*), "great master;" or with the suffix רבני (*Rabboni*), "my great master," which was the highest of all. It is not certain, however, that this graduation of terms existed in the time of Christ. The teachers and professors of the law were distinguished by the title of Rabbi both by the people and by their own disciples.

RABBIT. See MAMMALIA.

RABELAIS, DR FRANÇOIS, immortalized by his romance of *Gargantua and Pantagruel*, was born at Chinon, a little town of Touraine, in 1483. His father, Thomas Rabelais, is generally understood to have been an apothecary of that town, and proprietor of the farm of La Devinière in the neighbourhood, celebrated for an excellent Burgundy which was grown upon it, and where, it is said, a great part of the romance was written. According to some biographers, however, he was a vintner in Chinon, and kept a cabaret there at the sign of the Lamprey. The probability is, that, in a certain sense, he combined both occupations, dealing in drugs and spices, "and other things of great price;" and also, like many other gentlemen of good position, disposing of the wine produced upon his own property, a traffic very different in its nature from that suggested by the modern ideas of an apothecary and keeper of a cabaret. He was unquestionably a man of substance, and able to procure for his son an education of as high a character as was then to be obtained. He sent him to be educated by the monks of Seuilly, an abbey not far from Chinon; but the boy's progress under their care was so unpromising as to occasion his removal to the university of Angers, according to some biographers, or according to others, to the convent of La Baumette, near that town. Here he studied for some time, but apparently with no more satisfactory results than before. It was at this establishment that he made the acquaintance of the brothers Du Bellay, one of them afterwards the celebrated cardinal. The friendship then formed lasted through life, and ultimately proved of the greatest service to Rabelais. It may be assumed that it was rather from submission to his father's wish than from natural inclination that he is found to have soon afterwards adopted a monastic life. In 1511, after passing through the usual preparatory studies, he was admitted into the order of Cordeliers at the convent of Fontenay-le-Compte in Poitou, where he assumed the religious habit. Here he prosecuted his studies with such zeal as to retrieve any loss of time which indifference or injudicious tutors might previously have occasioned. Striking out of the usual routine of scholastic study, which then held undivided sway in the monastic houses, he applied himself with unusual industry and research to the cultivation of the sciences. It was his aim, says Niceron, to become a grammarian, poet, philosopher, physician, jurist, and astronomer; and the encyclopædic knowledge displayed in his works bears ample testimony to his success. He possessed a peculiar aptitude for the acquisition of the languages; an aptitude which afterwards showed itself in his command of Italian, Spanish, German, English, Hebrew, and Arabic. At this period, in fact, he was a perfect master of the Latin and Greek tongues, the latter of which had for some time been engaging the attention of the most enlightened spirits of the age. Within the walls of Fontenay-le-Compte, however, a Greek book was looked upon as no better than a work of magic, and the man who commanded the key to its secrets passed for a trafficker in "the arts inhibited;" and Rabelais' attachment to the Greek writers drew upon him and his friend Pierre Ami, a brother of the same order, the hatred and persecution of his fellow-monks. His independence of spirit and generous ardour in the pursuit of learning, which could not but be felt as a reproach to their own resolute ignorance, pedantry, and sloth, were continually furnishing fresh incentives to their rancour, and they omitted no opportunity of subjecting his friend and himself to annoyance. Among other persecutions to which they were subjected, their cells were ransacked, and their precious Greek volumes confiscated. Worn out by repeated aggressions, Rabelais followed the advice of his friends, and resolved to quit a society where he found so little that was congenial to his own disposition. It has been alleged that the true cause of this step was his own profligacy; but this is only the first of the many groundless charges against him, engendered either by the malice of his enemies, or originating in a misapprehension of his character from the nature of his famous romance, as that of a man whose whole life was a noisy jest, a soulless round of sensual indulgences. Had such really been his character, as has been pertinently remarked by Père Niceron, "these were not the days when, for such a cause, he needed to have left his monastery; he might have given free rein to his propensities there, and yet have made no deviation from the ordinary course." The authority of a churchman on such a point is conclusive. But there is direct evidence, in the letters of Budæus, that Rabelais was persecuted because of his much-dreaded knowledge of the noblest language of antiquity. "Multa et atrocia passus gratia amoris Græcarum literarum," are the words of Budæus.

Rabelais had by this time made influential friends, who, seeing how uncongenial to his nature were all the habits of the severe order of Mendicant friars to which he belonged, exerted themselves to secure for him the advantages of a milder order. Accordingly, about the year 1524 a brief was obtained from Pope Clement VII., allowing him to pass from the order of St Francis into that of St Benedict; and leaving this "pack of capuchins, monks, who forbade the use of beans, that is, Pantagrueline books," to borrow a phrase from the prologue to the fifth book of his romance, he entered the monastery of Maillezais in Poitou. There he remained during several years; but he appears to have found himself little better off in his new quarters than in those which he had left. They did not present him, it is said, with such resources as he desired for extending the limits of his knowledge, more especially in medical science. He accordingly quitted the monastery abruptly. His motives for this step were doubtless of a mingled nature, of which it is but reasonable to suppose the chief was a disgust at the torpor and profitless seclusion of a monastic life, by escaping from which he could alone hope to find opportunities for exercising his stirring and strongly practical intellect in a field of action, observation, and experience, sufficiently ample for its desires. However this may be, he laid down the regular habit for that of a secular priest, and quitted Maillezais without the sanction of his superior, a breach of ecclesiastical discipline which exposed him to its severest censures. After rambling about for some time in the diligent pursuit of medical knowledge (as he says himself in his petition to Pope Paul III. for absolution from the penalties incurred by his unauthorized retirement from Maillezais), he settled at Montpelier in 1530, and, after taking his physician's degree at its university, practised the medical profession there with credit and success. It appears by the dedication to Godefroy d'Estissac, then bishop of Maillezais, who had studied along with him at La Baumette, of an edition of Hippocrates' *Aphorisms* and the *Ars Parva* of Galen, published by Rabelais in 1532 at Lyons, and highly esteemed by the medical and literary men of the time, that his lectures on physic at the university of that place had attracted considerable attention. Such, indeed, was the distinction he attained, that he was selected by the university as their deputy to procure a restitution of the privileges of which one of its colleges had been denuded by the chancellor Du Prat. The means employed by Rabelais for obtaining access to the chancellor have formed the subject of a story to be found in all his biographies; but it is too obviously a fabrication from an incident in his own romance (the introduction of Panurge to Pantagruel, book ii., c. ix.) to deserve a place here. He succeeded in the object of his mission, and his services to the university were perpetuated in a custom, still, according to the *Biographie Universelle*, in existence, by which every candidate is required to put on Rabelais' gown upon receiving his physician's degree.

In 1532 we find him established at Lyons, where he was hospital physician, and taught and practised for several years. During his residence in Lyons, Rabelais published several works. Besides those above mentioned, he published in 1532 the *Epistolæ Medicinales Manardi*, and edited numerous publications on medicine, archæology, and jurisprudence. He edited a series of almanacs from 1533 to 1550, which are chiefly interesting for their disclaimers of that power of divination to which the professors of astrological science have always pretended. "Ce sont les secrets du conseil étroit du Roi éternal," he says, in the almanac for 1533, speaking of future events, "que tout ce qui est et ce qui fait modère à son franc arbitre et bon plaisir, lesquels vault mieux taire et adorer en silence." It is probable that he acted as corrector of the press for one of the great printing establishments, from which at this period emanated many of the most celebrated editions of both the Italian and French authors. At the commencement of the year 1534 his old schoolfellow and friend, Jean du Bellay, then bishop of Paris, having occasion to pass through Lyons on his way to the papal court, regarding the divorce of Henry VIII. of England, took Rabelais along with him in the capacity of his physician; thus enabling him to realize what had long been his passionate wish, a personal acquaintance with Italy and the Eternal City. For, to use the words of his dedication to Du Bellay of an edition of Marliani's *Typographia Antiquæ Romæ*, published, under Rabelais' superintendence, by Gryphius at Lyons in 1534, "from the first moment that I was able to appreciate the worth of polite learning, it was amongst the foremost of my desires to travel throughout Italy, and to view the capital of the Roman world." The opportunity for gratifying the popular conceptions of his character afforded by this visit of the great satirist of the abuses of the Romish Church to the court of its supreme head, has not been overlooked by the anecdote-mongers; and several absurd stories of his conduct have accordingly been handed down from biographer to biographer, till they seem almost to have acquired the authority of undoubted truths. One specimen of these will be sufficient. When the Cardinal du Bellay was presented to the Pope, he, as ambassador of Francis I., went through the usual ceremony of kissing his holiness's slipper. His suite followed his example, all except Rabelais, who remained leaning against a pillar, and exclaimed, loud enough to be heard, "that if his master, who was a great lord in France, were unworthy to kiss the Pope's feet, his holiness might untruss, and possibly, after reasonable abstersion, a part might be found where an humble follower like himself might presume to apply his lips." The improbability that Rabelais should have expressed himself in these terms, filling the situation which he did, and when, too, he was on the eve of supplicating a release from this very Pope from the ecclesiastical penalties he had incurred by his unauthorized desertion of the monastery of Maillezais, speaks sufficiently for the worthlessness of this story. But its real source is obvious enough, and may be found in book iv., c. xlviii., of his romance. It needed but a poor invention to construct such a tale out of the extravagant devotion of the worthies who greeted Pantagruel and his band on their arrival at the island of Papimany. That, however, which, as told by Rabelais himself, is a stroke of the most caustic satire, makes but a sorry jest in the hands of those who first invented a theory of his character, and then fabricated anecdotes to support and illustrate it. Rabelais' judgment, it is certain, was quite as powerful as his wit; and he knew too well when to discharge his bolt with effect ever to let it fly where detriment to the archer himself could alone be the result. The veil of extravagance which he has thrown over his great satirical work, is the best possible proof how unlikely he was to be guilty of any such piece of superfluous imprudence.

Rabelais seems to have gone back to Lyons for a time, as his Epistle Dedicatory to Du Bellay of his edition of Marliani's *Antiquitates Romæ Antiquæ* is dated from that city on the 31st of August 1534. He returned shortly afterwards to Rome, and rejoined Du Bellay, who had been created cardinal on the 21st of May 1535. His letters to Godefroy d'Estissac, whose favour he had won during his residence at his abbey of Maillezais, and continued ever afterwards to retain, are dated from Rome during the two following years. Availing himself of the opportunity which his presence on the spot afforded, he petitioned Pope Paul III. to be absolved from the penalties incurred by the abandonment of his order. Rabelais' merits had secured him the esteem of Cardinals de Genutiis and Simonetta, and they combined with Du Bellay and the Bishop of Mascon in forwarding his petition. By their exertions a bull in his favour was obtained gratis, contrary to the usual practice. It was granted on the 17th of January 1536, in terms of his request, allowing him to return into any house of the Benedictine order which would receive him, and to practise physic, upon condition of his doing so without hope of fee or reward. This release from the ecclesiastical disabilities consequent upon his transgression of the church's rules, enabled the Cardinal du Bellay to assign him a place in his abbey of St Maur des Fossez, near Paris. Here he remained until the year 1542, when he was appointed by the same friend to the cure of Meudon; and he continued in the zealous discharge of the duties of this station down to the close of 1551. "Ever mindful," says Niceron, "to instruct his people, he made it part of his care to give their children a knowledge of church music, of which he was himself a thorough master. His house was always open to the poor and wretched, whom he assisted to the utmost of his means; and he was in the habit of drawing men of learning and science about him, to discourse with them upon their several pursuits. Against women, however, his gates were barred, and his reputation on this score is wholly without blemish. This," he adds, "is the uniform testimony of contemporary biographers; and Antony Le Roi, who wrote a Life of him in 1649, avers that such was then the prevailing tradition at Meudon. His knowledge of medicine rendered him doubly useful to his parishioners, who invariably found him ready to minister to their wants both corporeal and spiritual." He died in Paris in 1533, in the Rue des Jardins, parish of St Paul, and was buried in the cemetery of that church.

His death-bed has not escaped profanation by the caterers for the jest-books; and there are few stories more common than his calling for his domino when he felt his end approaching, with the words, "Beati qui in Domino moriuntur." Another anecdote, even more detrimental to his character, is in every-day circulation, by which he is reported to have replied to a page sent by Du Bellay to inquire after his health, "Tell your master the state you find me in; I am going in quest of a Great Perhaps. He is up in the jay's nest. Bid him keep where he is; and for you, you will never be anything but a fool. Draw the curtain; the farce is ended." Those who have read Rabelais' spirit aright need no confutation of this slanderous fabrication of monkish malice, the miserable patchwork from some half-dozen threadbare facetiæ. The simple fact recorded by Du Verdier is worth a thousand such tales; and it determines, if indeed such evidence were necessary, Rabelais' opinion as to the momentous doctrine which he is here represented to have viewed as no more than "a great perhaps." In a copy of Galen, annotated throughout in the handwriting of Rabelais, which had come into the Bishop of Evreux's possession, opposite a passage in which Galen argues for the mortality of the soul, Rabelais had written, "Hic vero Galenus se plumbeum ostendit." Du Verdier also states, whilst at the same time he retracts what he had formerly been led, in accordance with the popular voice, to say against Rabelais in his *Bibliothèque Française*, that "the manner of his death compels us to form a judgment of him totally at variance with that which is currently received." The particular circumstances of this event are not now known, but they were doubtless such as became a pious and eminently thoughtful man.

One cannot help regretting, with Coleridge, "that no friend of Rabelais, and surely friend he must have had, has left an account of him." Had any such account existed, it would unquestionably have conveyed an impression of his personal character very different from that which the current anecdotes of him are calculated to produce. It is the peculiar misfortune of distinguished humourists to have the paternity of such jests as are tossing unclaimed about the world laid to their charge. They become a sort of foundling hospital for wit; and Rabelais has had more than his share of this abandoned progeny thrust upon him. His reputation as a man has suffered accordingly, and this for an obvious reason; for just in the degree that a great man's mind is marked by features which puzzle the finest sagacity to discriminate and reconcile, are people disposed to pronounce an authoritative judgment regarding him. In all such cases a lively anecdote or sparkling witticism is too cheap and pleasant a method of settling a doubtful character not to be generally adopted. They commonly fall in with the conclusion which lies nearest to the surface, and being thus most easily come at, they are eagerly caught up and borne along from mouth to mouth till their mere repetition sanctifies the delusion out of which they sprung. One common character runs throughout all the anecdotes of which Rabelais is the hero. They show a mind without gravity or depth, giving the rein to its most wayward sallies, destitute of self-respect, and reckless either of present circumstances or of future results. Such is just the character which a superficial observer is likely to form of him from his own romance. The rhodomantade, the coarseness, the downright nonsense, the reckless exuberance of humour, are easily noted; whilst the vein of deep and earnest thought which ever and anon shows itself amid the surrounding extravagance, the infinite good sense, the high-toned and enlightened philanthropy, and the great moral purpose which the author had in view, escape the careless and unpenetrating eye. The vices which he has laid bare with such masterly tact have been set down as his own, and he is charged with having been a profligate, a debauchee, and a buffoon, devoid at once of self-respect and of reverence for whatsoever is sacred or noble. But everything which is authentically known of his life, not less than what may be inferred from a careful study of his works, goes to discountenance such a conclusion. He was beloved and respected by many of the most illustrious and virtuous prelates of his time, admitted into their most private councils, and charged with the most important trusts. All his works, except his romance, which, being a reflection of the time, must needs carry its grossness and licentiousness upon its front, are conceived in a uniformly grave and learned spirit; and in his letters, where certainly a light or ribald mind was most likely to have shown itself, there is nothing to be found unworthy of the scholar, the gentleman, and the churchman. These facts are utterly inconsistent with the charges of buffoonery, immorality, and irreligion which are usually coupled with his name; and assuredly, if his life had given any warrant for such charges, there were jealous enemies enough to have placed the fact beyond all doubt.

In common with the other great assailants of religious abuses, Rabelais was branded with the names of heretic and atheist, and the dedication of the fourth book of his romance makes an indignant allusion to the circumstance. Epithets like these, however, he could well afford to share with such men as Erasmus, Luther, and Melancthon. Had he escaped them, indeed, there would have been some cause for wonder; for assuredly the severest blow ever levelled against the abuses of the Roman Catholic Church was the publication of the *Chronicle of the Wondrous Deeds of Gargantua and Pantagruel.* The popularity of its form secured it attention, where a formal censure would have been disregarded; and it was read on every hand with unexampled avidity. Calvin spoke of part of it with asperity, but others of the Reformers, penetrating its real spirit, gave it their warmest approval, and Beza's well-known epigram has long graced every edition of the book.

Qui sic nugatur, tractantem ut seria vincat,
Cum seria faciet dic, rogo, quantus erit?

If he, who in his frolic mood
Outdoes the lore of toilsome sages,
Should don grave Wisdom's reverend hood,
What might be looked for from his pages?

"Beyond a doubt," says Coleridge, "he was among the deepest as well as boldest thinkers of his age. His buffoonery was not merely Brutus' rough stick, which contained a rod of gold; it was necessary as an amulet against the monks and bigots. Never was there a more plausible, and seldom, I am persuaded, a less appropriate line, than the thousand-times-quoted

'Rabelais laughing in his easy chair'

of Mr Pope. The caricature of his filth and zanyism proves how fully he both knew and felt the danger in which he stood. I could write a treatise in praise of the moral elevation of Rabelais' work which would make the church stare and the conventicle groan, and yet would be the truth, and nothing but the truth. I class Rabelais with the great creative minds of the world [Homer], Shakspeare, Dante, Cervantes, &c." The prevalent coarseness, though this even is not always without its meaning, of Rabelais' great work, makes it repulsive to the mass of readers; and this it is, probably, which has enabled modern writers to appropriate its thoughts and witticisms with impunity. But the richness of invention, the dramatic force of the characters, the originality and vigour of thought, the wit, the learning, the satire, poignant yet without cynicism, the wise philosophy, and the atmosphere of triumphant joyousness which invests the whole, justify the praises of Coleridge, and will secure its fame as long as vice remains to be lashed and folly to be ridiculed.

It is impossible not to admire the robust and healthy nature of the mind of Rabelais, which, at a time when earnestness was constantly running into extravagant excesses in the persons of the other great reformers of the period, maintained its equipoise, without losing any of its intensity in seizing and grappling with the predominant abuses. Nor is its moral culture less conspicuous, which, in an age when the face of society presented so much to impress a conviction of the farce and hollowness of the world, preserved him, in despite of his acute sense of the absurd, the false, and the contemptible, as well as of his strong satirical bias, from becoming a morbid and misanthropical reviler of mankind. "I ask not," says Coleridge, "the genius of a Machiavel, a Tacitus, or a Swift; it needs only a worldly experience and an observing mind to convince a man of forty that there is no medium between the creed of misanthropy and that of the gospel." Which of these, then, was the creed of Rabelais? Most certainly the latter. He hates cant in all its shapes, hypocrisy under all its disguises; tyranny, intolerance, villany, selfishness, and all its brood of tyrant vices, are his abhorrence; mere folly he makes his sport, and he dallies with absurdity with a very wantonness. But he never forgets that he, the satirist, is himself come of the stock of Adam, or libels the Creator by flying in the face of that nature which, good or bad, is still his gift. Rabelais takes life as it is; he would fain see it better, and lends a helping-hand to make it so. Like his great countryman Beranger,

"De l'univers observant la machine,
Il y voit du mal, et n'aime que le bien."

He detests the evil with which the world is overrun, but he never abandons his faith in the good. His satire is not the angry yelping of a currish nature, the overflow of sour secretions and accumulated bile. Where it is grave, it is the commanding voice of honest indignation; where jovial, its kindliness of tone makes you like the man, whilst you admire his genius. He is essentially kindly even in his severest moods; and this is apparent in the very form of his satire. Its most caustic strokes are given with a merry voice and laughing eye; and yet, whilst apparently revelling in the most unrestrained ebullitions of mere animal spirits and licentious fancy, he is covertly stripping sensualism of its enticements, and enforcing the strongest lessons of humility. He possessed, in short, the wisdom of love, which is "the creed of the gospel," and this his great romance testifies in a hundred places. At the same time, its defects are great and manifold, and these cannot be better summed up than in the words of La Bruyère:—"Rabelais is inexcusable in having scattered mere filth throughout his writings. His book is a chimera. It is the face of a beautiful woman with the tail of a serpent, or of some other still more unsightly monster. It is a monstrous jumble of a fine and delicately-wrought moral, and of the most offensive grossness. Where it is bad, it is as bad as can be,—the very scum of the world might batten on it; where it is good, nothing can be more choice or excellent; it *can* furnish most dainty fare."

For bibliographical details as to the works of Rabelais, see *Biographie Universelle*, tome xxxvi. The standard edition is that by E. Johanneau and Esmangart, Paris, 1823, 9 vols., which contains the *Songes Drolatiques*, a curious series of one hundred and twenty caricatures by Rabelais himself, illustrative of the characters of his romance. It also contains his letters and the *Sciomachia*, a work which had become extremely scarce. The two latter have been included in most of the editions, now very numerous, since published. Of these, that by MM. Burgand des Marats and Rathery is the best (Paris, 2 vols., Didot, 1858). A careful memoir of Rabelais will be found there, and also in Niceron's *Mémoires des Hommes Illustres*, and Chauffepié's Supplement to Bayle. Rabelais has been naturalized amongst ourselves, more successfully, perhaps, than any other foreign writer, by Sir T. Urquhart and Motteux's admirable version of his romance. (T. M.)

RABENER, GOTTLIEB WILHELM, a German satirist, born in 1714 near Leipsic, and studied law at the university of that city. While holding a civil office at Dresden he commenced to write satires upon men and manners. An observant eye and a humorous and benevolent disposition qualified him in an especial manner to be the censor of social follies and vanities. His descriptions were faithful, vigorous, and good-natured; and his style was correct, pointed, and flowing. Accordingly he attained a a high reputation as a satirist. During his lifetime his works passed through several editions, and were translated into French and Dutch. After his death in 1771 they appeared in an eleventh edition, in 6 vols. 8vo, Leipsic, 1777. They have now a historical value as a record of habits and modes of life which have passed away.

RACCONIGI, a town of the kingdom of Sardinia, province and 11 miles N.E. of Saluzzo, in a rich and beautiful plain, near the right bank of the Maira, 21 miles S. of Turin. A walled town, with broad regular streets, and substantial good houses, it is chiefly remarkable for the noble palace and extensive park belonging to the family of Carignan, now the royal family of Sardinia. There are also several churches and convents, a college, military and other schools, hospitals, &c. Silk is extensively manufactured here, and forms the staple of a considerable trade. Pop. 10,500.

RACE-HORSE. See HORSE.

RACES OF MAN. See ETHNOLOGY.

RACHEL, the name by which a celebrated French tragèdienne is ordinarily known, was the daughter of Abraham Felix and Esther Haya, both of Jewish race, and was born in a wretched little inn in Munf, in the canton of Aran in Switzerland, on the 24th of March 1821. Her father was a poor pedlar, who pursued his craft by the highways till he succeeded in housing his numerous progeny in Lyons, where her mother opened a paltry little second-hand clothes shop. Sarah, the eldest child, sang from café to café, and Rachel collected the coppers. Towards 1830 the family removed to Paris, and continued the life they had led in Lyons. Shortly afterwards, Rachel seems to have found interest to recommend her to St Aulaire, manager of an institution where pupils were taught declamation gratuitously; and in 1837 this meagre, dark, poverty-stricken little girl, with her harsh gruff voice, found an engagement with M. Poirson at 3000 francs for three years. On the 12th of June 1838 she made her first appearance on the classic boards of the Théâtre François, where she was destined to earn her greatest fame. From this date her progress was upwards and onwards. The grand old formal drama of Corneille and Racine, so long believed to be dead, revived again at the splendid declamation and singular attitudinizing of this new tragic muse. She was the organ of the great classic poets; and, accustomed to the pomp and grandeur of the sounding Alexandrine, her clear, distinct enunciation brought out every beauty in bold relief; but unfortunately it did the same with every fault. She had not the power of concealing under the warmth of delivery the meagreness of the author's style, and M. Samson could not teach her *that*. Her best characters were probably "Phedre," "Roxane," "Camille," "Lyciska," and "Lady Tartuffe." When the old drama began to pall at the Théâtre François, modern characters were created for her, in which, however, she very rarely succeeded. The managers gave her an enormous salary, yet this did not content her; she was almost constant in her quarrels with them. She dictated her own terms, and kept the authors whom she lured to write for her in a perfect fever. In her acting she was terrible rather than touching, and she was often far from being true. Her tears had the bitterness of Marah in them, and very rarely excited tears in her audience. She never melted or awakened sympathy; but she always inspired the spectator with wonder and fear. The love of gold was born with her, and swam in her Jewish blood. Her graspingness had one redeeming feature, and that was, that she permitted her family to share in her gains. She had few real friends, and those she had were new. She was a woman of real genius, but that genius, though of a very high order, was very limited in its range. During her *congês* she visited professionally London, St Petersburg, Amsterdam, Germany, Rome, and the French provinces, and finally made a tour to America, which so aggravated the disease under which she was labouring that on her return she sought the shores of the Mediterranean, and died at Cannet on January 4, 1858. Her disease was consumption. Rachel was never married, yet she left behind her two sons, who were old enough to know their loss. (*Memoirs of Rachel*, by Madame de B——, 2 vols., were published in London in 1858.)

RACINE, a town of the United States of North America, capital of a county of the same name in the state of Wisconsin, on level ground, about 40 feet above Lake Michigan, on the west shore of which it stands, 23 miles S.E. of Milwaukie, and 62 N. of Chicago. It is regularly built, with broad straight streets, and contains many good public buildings. In a grove of trees, somewhat to the south of the town, stands the Episcopal college, a fine Gothic structure of pale brick. Besides several Protestant and Roman Catholic churches, Racine contains a high school, conspicuous in the centre of the town, and three other public schools. The harbour is one of the best on the lake, and admits vessels drawing 12 feet. The chief manufactories of the town are ship-yards, furnaces, machine-shops, and flour-mills. The total value of the principal articles manufactured in 1855 was L.230,133. The trade is great and rapidly increasing, especially in timber from the west; the exports and imports in 1851 amounted together to L.522,438. Pop. (1850) 5111; (1853) about 7500; (1857) about 11,000.

RACINE, JEAN, an illustrious French poet, was born at Ferté-Milon on the 21st of December 1630. He was the son of Jean Racine, controller of the salt magazine of that city, and of Joan Sconin, daughter of the king's warden of the woods and waters of Villers-Caterets. Deprived of his father and mother at the early age of three, he passed under the guardianship of his paternal grandfather, also named Jean Racine, who, not long afterwards, bequeathed the trust to his widow. He studied first at

Beauvais; next at Paris, in the college of Fearcount; and lastly at Port-Royal-des-Champs, whither a number of eminent persons had retired to devote themselves to piety and the instruction of youth, amongst whom were the advocate Lematire, Dr Hamon, Nicole, A. Arnauld, Lacy, and Launcelot, authors of the *Logic*, the *General Grammar*, and other works, known under the title of *Methodes de Port-Royal.* Launcelot, in particular, undertook to teach Greek to the youthful Racine. But besides the taste for sound literature and serious studies, these immortal solitaries inspired their pupil with those religious principles which never abandoned him, and which were common to all the great writers and great men of that age. The docility of Racine towards his masters equalled his ardour for study. On one occasion, however, he showed himself refractory. Having accidentally met with the Greek romance of *Theagenes and Chariclea*, he commenced the perusal of this work of fiction, when his master, surprising him while thus engaged, took from him the book and consigned it to the flames. The youth procured another copy, and learned it by heart, after which he placed it in the hands of Launcelot, saying, "You may burn this also." An act of disobedience of a kind so novel, was the more readily excused because it was not likely to have many imitators.

The first poetical essay of Racine was *La Nymphe de la Seine*, an ode which he composed for the marriage of Louis XIV., and which having made him known to Chaplain, the temporary arbiter of literary reputations and court favours, produced him 100 louis, which Colbert sent him on the part of the king; and not long afterwards he received a pension of 600 livres. Four years later, towards the close of 1663, another ode, *La Renommée aux Muses*, composed on the occasion of the establishment of the three academies, procured for him a second royal gratuity, the order for which was couched in terms peculiarly flattering to the youthful poet. This ode, though inferior to the preceding, was nevertheless more fortunate. Recompensed like the other by the king, it had the good fortune to be criticised by Boileau. The poet took an early opportunity to thank the critic, and this proved the origin of that connection so intimate, so honourable, so useful to Racine, and which was not one of the least advantages which fortune gave him over Corneille. A little before this period Racine had made the acquaintance of Molière, and had communicated to him a tragedy entitled *Theagène et Chariclée*, taken from the romance which had afforded him such delight at Port-Royal. Molière, disapproving of this production, gave him the plan of the *Thébaïde, ou les Frères Ennemis*,—a subject on which it is alleged that he had himself been engaged. Racine executed the design, and the piece had some success. *Alexandre*, which was performed the following year (1665), met with a still more favourable reception, and showed great progress in the versification of the author, who was then only twenty-five years of age; but, excepting the verses, neither of these works gave any indication of what Racine afterwards proved. They were but feeble imitations of Corneille, of whom, by a misfortune common to all imitators, Racine had only adopted the defects,—that is, the cold gallantry mixed with heroism, the idle maxims, the metaphysical reasonings, and the elaborate declamation. Corneille, to whom Racine read his *Alexandre*, counselled him, it is said, to write no more tragedies. At a subsequent period the same advice was given to Voltaire by Fontenelle after the reading of *Brutus.* But it is fortunate for letters that such counsels are never followed. Voltaire replied to Fontenelle by the production of *Zaïre*, and Racine responded to Corneille by that of his *Andromaque.* Finding himself pursuing a wrong direction, he suddenly changed his route and took a different one, unknown perhaps even to Corneille himself. The latter had astonished and surprised his audience; his young rival sought to move and to soften them. Pity appeared to him a tragic resource more active, more extensive, and of an effect more penetrating and less transitory than admiration. He studied the human heart, its passions, its weaknesses, and its most secret recesses, and there he discovered a species of tragedy altogether new, of which he gave the first and probably most inimitable model in his *Andromaque*,—that one of all his tragedies which, without being the most perfect, produces the greatest effect on the stage by the vigorous and just expression of the sentiments and characters, and by the alternations of hope and fear, of terror and pity, with which the poet agitates the soul.

The representation of the *Andromaque* in 1667 was followed almost every year by a new masterpiece. But at first Racine surprised the public by an excursion into the domain of Molière. The *Plaideurs*, imitated from the *Wasps* of Aristophanes, is a comedy the plot of which is somewhat feeble and inartificial; but in nature, truth, facility, and gaiety, it is admirable, and its verses became so fixed in the general mind that they passed into proverbs. The piece was first represented at Paris in 1668, when it was indifferently received; but it succeeded pretty well at Versailles, and the players, elated with the success, came to awaken Racine in the middle of the night, to communicate the good news. The noise of vehicles at such an hour in the Rue des Marais, convinced first the neighbours, and next day all Paris, that justice had avenged itself on the author of the *Plaideurs*, by causing him to be seized and sent to the Bastille. This pleasant mistake, and the knowledge which soon became general, that the comedy had obtained the suffrage of the monarch, conciliated the favour of the loyal Parisians; and from that time the piece has continued in possession of the stage, privileged to extort a smile, perchance a laugh, even from the iron visage of Justice herself. It is not true, as has sometimes been said, that the *Plaideurs* is the work of several hands. Racine may have received from his friends hints or suggestions for some scenes, and borrowed from certain *hommes de palais*, or gentlemen of the robe, some formulas and expressions foreign to his habitual studies; but the unity of the style and the general coherence of the whole are too perfect to be the work of any but one and the same hand.

The success of *Andromaque*, which was only equalled by that of the *Cid*, had excited envy; perhaps, also, it had rendered the public fastidious. In 1669 *Britannicus* was coldly received, and with difficulty reached the eighth representation. At first no one felt the truth, the depth, and the force displayed in the magnificent historical picture of Nero and his court. Boileau alone was struck with its merit, and hurrying to embrace Racine, he exclaimed, "Voila ce que vous avez fait de mieux." This great critic was not only useful to Racine in praising his performance; his severity was of full more service in inducing him to suppress two scenes which deformed his work,—one between Burrhus and Narcissa, at the commencement of the third act, and another in the fifth, in which Junia is brought back into the presence of Nero. *Britannicus* was followed by *Berenice*, which, in some respects, is one of the most remarkable of Racine's works. At the solicitation of the celebrated Henrietta of England, Racine and Corneille both treated this subject, which is so little fitted for representation, neither being aware that the other was engaged upon it. Besides the pleasure of seeing two illustrious rivals unconsciously contending for the palm, this princess secretly promised herself another, in the treatment of the heroic separation of the two august lovers; but a premature death deprived her of the pleasure she had anticipated, in witnessing this singular competition. Three words of Suetonius represent the subject of the piece: *Invitus invitam dimisit;* too slight a foundation upon which to work, and in the case of Corneille, who was now old, an ungrateful task, far more dangerous to him than even to Racine. The two rival plays were represented towards the close of 1670; that of Corneille at the Palais-Royal, by the company of Molière, and that of Racine at the Hôtel de Bourgogne. Corneille's totally failed; that of Racine had thirty consecutive representations, during which it drew tears alike from the court and the city. The great Condé replied to some criticisms which were made in his hearing in the following verses of the piece itself:—

> Depuis cinq ans entiers chaque jour je la vois.
> Et crois toujours la voir pour la première fois.

It has been said, and even zealous admirers of Racine have confessed, that *Berenice* was not a veritable tragedy. But, tragedy or drama, what signifies the title which may be given to it, provided we be agreed that it is a miracle of art, and that never, in any piece, were greater difficulties more meritoriously overcome. The style possesses exquisite beauties in detail, and an inexpressible charm pervades the diction throughout.

Bajazet appeared in 1672, and obtained immediate success, partly, no doubt, from the novelty of the manners and costumes, but in a greater degree from admiration of the force and truth with which the poet had delineated the characters of Roxana and Acomat; two real creations, which in spite of all its faults, will make *Bajazet* immortal. At the same time, there is not a little truth in the remark of Corneille, that though the costumes be Turkish, the characters are French. *Mithridate*, which was represented for the first time in January 1678, is, according to Laharpe, the work where Racine appears to have come nearest to Corneille in bringing on the stage the great personages of antiquity as they are delineated in history. Few characters, indeed, have, upon the whole, been more vigorously traced than that of Mithridates; and were it not that Racine, sacrificing to the taste of the time, has made the hero amorous and jealous, Corneille would not have enjoyed unquestioned supremacy in reviving and re-animating history. Voltaire regards *Iphigénie*, first represented in 1674, as the masterpiece of the stage. Do we desire grandeur? We find it in Achilles. Do we wish for true policy? It is exemplified in the part of Ulysses; a policy founded solely on the love of the public good, and equally adroit, dignified, and resolute. Clytemnestra is the model of the lofty pathetic; Iphigénia, that of noble and touching simplicity. Agamemnon is as he should be; and, then as to the style, Voltaire has declared it to be the true sublime. Three years elapsed between the appearance of *Iphigénie* and that of *Phèdre*, which was first represented in 1677. The former had been the object of sundry ill-natured and depreciatory criticisms; but all these were only a feeble essay, or rather a mere foretaste, of the attacks which were now directed against the latter, chiefly at the instigation of the Duke de Nevers and the Duchess de Bouillon, nephew and niece of Cardinal Mazarin, the declared enemies of Racine, though for what reason does not appear. Every engine was put in action to ensure the condemnation of Racine's *Phèdre*, and extol to the skies that of Pradon, a person of no genius, and whose name is not worth remembering, except that he was employed by the chiefs of his odious cabal to have a drama on the same subject ready for representation against the time when Racine's was to appear. Pradon lent himself to the vengeance of these intriguers; his *Phèdre* was represented four days after that of Racine; and, for the moment, the cabal were successful. But, in about a year, each piece found its natural level, and Pradon and his *Phèdre* were alike forgotten or despised.

This tardy reparation, however, could not console Racine; and, besides, it was poisoned by new indignities, which were heaped upon him by his indefatigable enemy. Disgusted with the theatre, where he had met with such injustice, he now determined to renounce it for ever; though not more than thirty-eight years of age, and still in all the vigour and maturity of his genius. Besides, in his infancy, he had imbibed a deep sense of religion, which, suppressed for a while by his connection with the theatre, now returned in full force. He conceived that his past life had been full of errors, nay, even tainted by vices and under this impression he not only resolved to write no more plays, but had even thoughts of devoting himself to penitence and prayer in monastic solitude. His spiritual guide, however, justly distrusting a zeal springing out of wounded feelings, advised him to marry and settle in the world; and this judicious advice Racine had the good sense to comply with. In the year 1677 he married the daughter of the treasurer of Amiens, a fortunate choice, which greatly contributed to his future happiness. He next effected a reconciliation with the solitaries of Port-Royal, whose censures of dramatic composition, which had formerly offended him, he now acknowledged. He first made his peace with Nicole, who received him with open arms; and Boileau introduced him to Arnauld, who also embraced him tenderly, at the same time freely forgiving him all his satire. About the same time Louis XIV. appointed Racine and Boileau historiographers of France, upon the understanding, of course, that they were to write the history of his reign; and the public expected great things from two writers of such distinguished reputation. But both the king and his subjects were equally disappointed. Boileau and Racine, after having for some time laboured at the work, perceived that it was entirely opposite to the genius of each; and they also judged, with reason, that the history of such a king could not, and indeed ought not, to be written until long after his death, unless it were to be made up of extracts of gazettes and such like materials.

During a period of twelve years Racine had steadily adhered to his resolution not to write any more poetry, especially for the stage; but the entreaties of Madame de Maintenon so far prevailed as to induce him to resume his dramatic character, and in consequence he composed his *Esther*, which was to be represented, not on the French stage, but in the house of Saint-Cyr. On the 20th of January 1689 it was performed for the first time, and had prodigious success. "It appears to be very remarkable," says Voltaire, "that this tragedy should then have had universal success, and that two years afterwards *Athalie*, though performed by the same persons, had none. It happened quite otherwise when these pieces were acted at Paris long after the death of the author, and when prejudice and partiality had ceased. *Athalie*, represented in 1717, was received, as it deserved to be, with transport; whilst *Esther*, in 1721, inspired nothing but coldness, and never appeared again. But at that time there were no courtiers who complacently acknowledged Esther in Madame de Maintenon, and with equal malignity saw Vashti in Madame de Montespan, Haman in M. de Louvois, and, above all, the persecution of the Huguenots by this minister, in the proscription of the Hebrews." The same writer, who had no taste for scriptural subjects, thinks the story of *Esther* uninteresting and even improbable; "but, notwithstanding the badness of the subject," he adds, "thirty verses of *Esther* are of more value than many tragedies which have had great success."

Athalie, composed, like Esther, for Saint-Cyr, had, as already intimated, a very different fate. Envy masked under a false zeal prevented the representation. It was only performed twice at Versailles, in a chamber without scenes and costumes, by the ladies of Saint-Cyr. Racine having originally intended it for publication, now sent it to the press; but, to the eternal disgrace of the age and nation, this masterpiece of sublime genius, unsurpassed either in ancient or in modern times, found no readers; and, in some societies of pretended wits the perusal of it was ironically prescribed as penance. It is in truth lamentable to think that Racine should have descended to the grave suffering under this injustice, and with the bitter feeling of seeing his age dissatisfied with his immortal work. In vain did Arnauld, from the depth of his solitude, try to sustain, by his suffrage, the sinking spirits of his old pupil; in vain did Boileau repeat, "C'est notre meilleur ouvrage, le public y reviendra." Racine almost believed that he had survived his genius, and the authority of Boileau, so potential with posterity, was disregarded during the lifetime of his friend. This second injustice of the public towards Racine reopened the wound inflicted by the first, completed his disgust, and decided him to abandon definitely writing for the theatre, which, in fact, his religious impressions had for some time led him to regard as incompatible with the Christian life. He accordingly withdrew from all connection with the stage, and employed the remainder of his days in the grateful and almost filial task of composing a history of Port-Royal, the place of his education, which is drawn up with equal taste and elegance, but was not published till 1767, when it appeared in two volumes 12mo.

Racine, although he had conversed much with the court, had not learned to disguise his sentiments, the usual, perhaps the necessary, accomplishment of a courtier. In 1697, during one of those interviews which Madame de Maintenon frequently granted him, the conversation having turned upon the misery of the people exhausted by long wars, and the best means of affording them relief, this celebrated woman entreated the poet to throw his ideas on the subject into the form of a memoir, promising that the writing should not pass out of her hands. Racine consented, not from the mere complacence of a courtier, and still less from any ambitious view, which the whole tenor of his life contradicts, but solely with the design of being useful. The king surprised this memoir in the hands of his mistress, and the name of the author was disclosed. Perhaps the lesson was a little too direct, since the monarch, who had all along favoured the poet, immediately took offence. "Because he makes good verses," said Louis, "does he think he knows everything? and because he is a great poet, does he pretend to be a statesman?" Racine was greatly hurt by this observation, not from any selfish consideration, but from the idea of having unnecessarily offended his royal benefactor. But to say as some have done, that it shortened his days, is manifestly absurd. His constitution had for several years been sinking under the wasting influence of excitement, and, in consequence, the term of his earthly career was now fast approaching. During his last illness, however, the king evinced the greatest interest in the expiring poet, about whom he daily sent to make the most anxious inquiries; and his benefits followed him even beyond the tomb. Racine died on the 22d of April 1699, after much suffering, borne with truly Christian fortitude, and was interred, according to his wish, at Port-Royal, at the feet of Dr Hamon, that he might not be separated even in death, from the master whom he so loved and respected in life. After the destruction of this monastery, his remains were transported to Paris, and deposited in the church of Saint-Etienne-du-Mont, where they were placed beside those of Pascal.

Racine was naturally melancholy when alone, though gentle and pleasing when in company. His nature was tender and affectionate, inclined to indulge sorrowful or religious emotions rather than those which spring out of mirth or joy. He was generous, and knew how to preserve the means of being so by much order and economy. He afforded assistance to a number of distant relations, and had a regard almost filial for his nurse, whom he did not forget in his will. There was no better husband, no more affectionate father. The Christian education of his children formed his chief concern. He had family prayers daily, at the same time reading and explaining a portion of the gospel to his wife, his children, and his domestics. During the last ten years of his life all his pleasures and all his happiness were concentrated in his domestic circle. He no longer went to court except when called thither by the duties of his charge and the interests of his family; and yet who else could boast of the same means of pleasing and making himself beloved; his fine and noble figure, his gracious manners, all the charms of wit, all the splendour of renown, united with the happy art of causing them to be forgotten? He was indeed what the ladies of Saint-Cyr described him, a man of great genius and great simplicity; and he had in fact enchanted the world more by the amenity and grace of his instructions than by his talent for declamation, which, however, he possessed in the very highest degree. No man of his time read and recited better than Racine. One day, at Boileau's, in his house at Anteuil, reading and translating off-hand the *Œdipus* of Sophocles, he drew tears from all present. He also taught Baron and La Champmâlé a system of declamation more conformable to nature and good taste than that which they had previously practised; in short, he taught them to speak and not to declaim.

As to his works, his countrymen have reason to be proud of them. He is the poet of the heart and the affections, and yields to none in the truth, the beauty, and the force of his delineations. If Corneille surpassed him in heroic sentiments, and the grand character of his personages, he was inferior to Racine in moving the passions, and in purity and harmony of diction. Such is the perfection of Racine in this last respect, that in all his pieces there is not perhaps, we do not say a scene, but even a single verse, which could be replaced by another. All is just and true; all is full of that poetry of images and sentiments, and that continued elegance which, since the time of the Greeks, Virgil and Racine have almost alone possessed. But above all, it is in *Esther* and in *Athalie*, particularly in the choruses of these two tragedies, that, sustained by the most sublime models, he is himself almost always sublime. It is there that Racine has all the elevation of a Hebrew prophet who had come to announce divine truths in strains almost divine. But that which chiefly characterizes Racine is the complete union, perhaps unique, of two qualities which appear to be incompatible; of imagination the most brilliant and reason the most perfect, of sensibility the most exquisite with good sense the most invariable. Reason, in fact, as much, and even more perhaps, than imagination, predominates in the conception of his most touching productions, in the execution of his most dramatic scenes, in the choice of his richest expressions, and in his boldest combinations, as well as most elliptical turns. Boileau, who has been surnamed the "poet of reason," is not even in this view, superior to Racine; and, besides, the quality here mentioned is the less astonishing in him, because it is accompanied with an imagination much less lively. Racine has often been pronounced the greatest of the French poets. He should also be set down as the most rational; or rather, it is precisely because he really is the most rational, in the widest sense, that he is likewise the greatest.

There are some smaller pieces of Racine which have not been mentioned in the course of this article, particularly *Idylle sur la Paix*, 1685; *Discours prononcé à l'Académie Française*, en 1685; *Cantiques Spirituelles*, 1689; and *Epigrammes Diverses*. The most complete edition of the works of Racine is that published by Aimé Martin at Paris, in 6 vols. 8vo, in 1820, reprinted by Lefèvre in 1822.

RACING. See HORSE.

RACK, an engine of torture, furnished with pulleys, cords, and other means, for extorting confession from criminals. It was known from an early period in the south of Europe, where it was applied to the early Christians, and was in later times an instrument of the Inquisition. The trial by rack is unknown to the law of England; though, in 1423, when the dukes of Exeter and Suffolk, and other ministers of Henry VI., had formed a design to introduce the civil law into the kingdom as the rule of government, they erected a rack for torture, which was called in derision the "Duke of Exeter's Daughter," and still remains in the Tower of London, where it was occasionally used as an engine of state, not of law, in the reign of Queen Elizabeth. But when, upon the assassination of Villiers, Duke of Buckingham, by Felton, in 1628, it was proposed in the Privy Council to put the assassin to the rack in order to discover his accomplices, the judges, being consulted, declared unanimously that no such proceeding was allowable by the laws of England. The most fearful piece of torture on record is that of Ravailliac, the murderer of Henri IV. of France. (See Ravailliac.) The Marquis of Beccaria, in an exquisite piece of raillery, has proposed this problem:—"The force of the muscles and the sensibility of the nerves of an innocent person being given, it is required to find the degree of pain necessary to make him confess himself guilty of a given crime."

RACZ-KEVE, a market-town of Hungary, on an island in the Danube 28 miles long and 1 or 2 broad, in the county and 22 miles S.S.W. of Pesth. It has a fine palace, built by Prince Eugene of Savoy. Pop. 4650.

RADCLIFFE, Ann Ward, author of the *Romance of the Forest* and the *Mysteries of Udolpho*, was born in London on the 9th of July 1764. At the age of twenty-three, she acquired the name which she subsequently rendered famous, by marrying William Radcliffe, a graduate of Oxford, and then a student of law. This gentleman renounced the prosecution of his legal studies, and afterwards became proprietor and editor of the *English Chronicle*. Mrs Radcliffe having thus a strong inducement to cultivate her literary powers, first came before the public as a novelist in 1789, in the *Castles of Athlin and Dunbayne*. Her genius, however, was more advantageously displayed in the *Sicilian Romance*, which appeared in 1790, and attracted a considerable share of public attention. The *Romance of the Forest* appeared in 1791, and at once raised the authoress to that pre-eminence in her own style of composition which her works have ever since maintained. In 1798 Mrs Radcliffe visited the scenery on the Rhine, and it is supposed that the *Mysteries of Udolpho* were written, or at least corrected, after the period of this journey; the mouldering castles of the robber-chivalry of Germany, situated on the romantic banks of that celebrated stream, having, it is thought, given a bolder flight to her imagination, and a more glowing character to her colouring. Her remarks upon the countries through which she travelled were given to the public in 1793, under the title of a *Journey through Holland*, &c. This, however, was merely a sort of intercalary production. The next production by which Mrs Radcliffe attracted the attention of the public was destined to be her last. The *Italian*, which appeared in 1797, was purchased by the booksellers for L.800, and favourably received by the public. The tenor of her domestic life was peculiarly calm and sequestered. She appears to have declined the notoriety which in London society usually attaches to persons of literary distinction. During the last twelve years of her life Mrs Radcliffe suffered from a spasmodic asthma, which considerably affected both her health and spirits. This chronic disorder, however, at length took a more fatal turn on the 9th of January, and on the 7th of February 1836 it terminated her life. (For an estimate of her works, see Romance.)

Radcliffe, *Dr John*, an English physician of great eminence in his time, was born at Wakefield in Yorkshire in 1650. He was educated at Oxford, and enrolled himself as a student of physic; but it was remarked that he recommended himself much more by his ready wit and vivacity than by any extraordinary acquisitions in learning. He began to practise at Oxford in 1675, but never paid any regard to established rules, which he censured whenever he thought fit with great freedom and acrimony; and as this drew all the old practitioners upon him, he lived in a state of continual hostility. He died in 1714; and if he never attempted to write anything himself, he has perpetuated his memory by founding a fine library at Oxford, named after its founder the "Radcliffe Library," and which cost the sum of L.40,000. (See Libraries.)

RADETZKY DE RADETZ, Count Joseph, an eminent Austrian field-marshal, was born in Bohemia in 1766, and entered the Austrian army in 1784. The outbreak of the great continental war against the French soon gave him an opportunity of achieving distinction. His soldier-like qualities then came into notice. Courage and coolness appeared as inherent parts of his nature, which he could not lose. In victory or defeat he was always the same—ever steady and ever valiant. He distinguished himself in the successful battle of the Trebbia in 1799. He was one of the foremost of the victors at Novi in the same year. Even in the disastrous rout of Marengo, in 1800, he did not forego his self-possession. Nor did his ability fail to rise to the high offices of command which were at length assigned him. In 1813 he was the main instrument in gaining the victory of Kulm; in the same year he drew up the plan of the decisive battle of Leipsic; and in 1814 he rode into Paris side by side with the Emperor Alexander. But the greatest achievement of Marshal Radetzky was the part which he took as commander-in-chief in Lombardy, in suppressing the Italian insurrection of 1848. It is true that at first the suddenness of the rebellion threw him off his guard. After three days of barricade fighting, the Milanese forced him to retire from their city; the Sardinians, under King Charles Albert, followed up the advantage; and he was obliged to fall back upon Verona. Yet all this while, like a wary veteran, he was assiduously concentrating his strength for the recovery of the ground he had lost. A sudden and successful recoil was the result. The Italian forces were driven back and dispersed; one post after another was re-captured; on the 6th of August Milan was entered; and on the 24th of March 1849 the insurrection received its death-blow at the battle of Novara. The veteran Radetzky was now handsomely rewarded for these valuable services. Twenty-six cities presented him with their freedom; every continental potentate showered honours upon him; and his own sovereign continued to cherish him with grateful affection till his death, in 1858. (See *Eine Biographische Skizze nach den eigenen Dictaturen und der Correspondenz des Feldmarshalls von einem Œsterreichischen Veteranen*, von J. G. Cotta'scher Verlag, Stuttgart and Augsburg, 1858.)

RADHUNPOOR, a native state of India, under British protection, lying in the N.W. of the province of Gujerat, between N. Lat. 23. 26. and 23. 58., E. Long. 71. 28. and 72. 3.; length, about 40 miles; breadth, 20; area, about 800 square miles. It is watered by the River Bunnos and other streams, and enjoys a soil generally fertile, and a climate which, though excessively hot during the summer months, and again after the rains of August and September, is for the rest of the year mild and agreeable. Salt is obtained here; and the principal products of the soil are cotton, wheat, and other kinds of corn. The state came under the British protection in 1819, when the Nawab applied for aid against the marauders who infested the country. This was granted, and, in return, an annual tribute exacted, which was remitted in 1825, on account of the inability of the state. No tribute is now paid; but the external relations of the country are controlled by the British agent at Pahlunpoor, leaving its domestic affairs entirely free. Pop. 45,000, chiefly Hindus.

The capital, a fortified town of the same name, 85 miles N.W. of Ahmedabad, and 270 S.E. of Hyderabad, is a place of some manufactures and commerce, though its inhabitants are for the most part engaged in farming. Coarse cotton cloth is made; and, along with corn, hides, butter, &c., exported. Pop. 15,000.

RADIUS (*a ray*, or *the spoke of a wheel*), the semidiameter of a circle, or a right line drawn from the centre to the circumference.

RADNORSHIRE, an inland county of Wales, lying nearly midway between the southern and northern extremities of the principality on the English border. It is bounded on the north by the counties of Montgomery and Salop, on the east by Hereford, on the south by Brecknock, and on the west by Brecknock and Cardigan. Its outline is an irregular oval, with a rounded protuberance on the north-west. Its greatest length from south to north is about 30 miles, and from east to west, measuring across the protuberance on the north-west, about 33 miles. It possesses an area of 425 square miles, or 272,128 acres, and is thus tenth in order of size of the Welsh counties. The Welsh name is *Sir Faesyfed*.

The greater portion of this county rests upon the Silurian group of rocks, but there are some tracts of old red sandstone on the east, and throughout the county there are considerable patches of feldspathic ash and greenstone, and on the eastern part, near the town of Old Radnor, there is a large patch of Silurian limestone, which is much used for dressing the land in the neighbourhood.

This district of country continued under the jurisdiction of the Lords Marchers until it obtained the privileges of a county by act of Henry VIII., and was divided into the hundreds of Radnor, Knighton, Painscastle, Rhayader, Coluyn, and Cefn Llys. By the same act it was also empowered to return two members to Parliament, one for the county, and one for the contributory boroughs of Radnor, Rhayader, Knighton, Knuclas, and Cefn Llys. The county is further divided into parishes and townships. The former are fifty-two in number, and all are in the diocese of St David's, except five, which are included in the English diocese of Hereford. New Radnor, said to have been at one period the principal town, is now a very poor village; it was an ancient borough by prescription, and has also had charters granted by Queen Elizabeth, and by George II.

Two-thirds of the whole area of the county are supposed to be uninclosed and uncultivated. An extensive mountainous tract, nearly in the centre, is usually called the Forest. A part of this range still belongs to the crown, although the forests of Radnor and Blathvagh have both been alienated, and are now held by Sir George Cornewall Lewis and Lieut.-Col. Price as foresters. No part of the range attains any great elevation. Its highest summit was ascertained by Colonel Mudge to be 2163 feet above the level of the sea. Within its limits is a torrent, called by a name which, when translated, is "Water-break-its-neck," that falls abruptly from a height of about 150 feet. The higher ranges produce only heath; but the sides and lower parts of the hills, which are less exposed to the winds, are entirely devoted to the pasturage of sheep and small horses. The north-western angle of the county is mountainous and uninclosed, and it was into the recesses of these wilds that the British monarch Vortigern retreated from the Saxons. In the eastern and southern districts the valleys are wider and more fertile, and abound with small rivulets; while the hills are less elevated, and are partially clothed with wood.

The soil of the county is chiefly an open shaly clay, which in sheltered situations yields, under good cultivation, excellent crops of turnips, oats, and Welsh barley. In the east there is an admixture of the red sandstone soils, which are of great fertility and of a loamy character.

The climate is wet and stormy, and the spring months are particularly cold and ungenial. It is nevertheless healthy; there are no peculiar or prevalent diseases, and the inhabitants are robust and long-lived.

The principal river is the Wye, which enters the county at Savan-y-Coed, and, flowing in a south-easterly direction, divides this county from Brecknock. Its tributaries are the Elau, the Ithon, the Edw, and the Marteg. The River Teme forms the county boundary on the north-east, and continues its course by Ludlow to the Severn. The Lug and the Arrow, in the more central parts, form considerable streams before they enter the county of Hereford. There are some small lakes or pools requiring notice only as contributing to the beauty of the scenery. These are,—Llyn-Llanbychllyn, Hendwell Pool, and Llyn-Gwyn. A cataract at Rhayader was formerly an object much visited by travellers; but the construction of a bridge has widened the channel, and deprived it of much of its remarkable character.

The agriculture of the county is gradually improving. Irrigation has long been practised to a considerable extent, and its effects on absorbent soils are found to be highly beneficial; but the process is not conducted in the most scientific manner. The ploughing was formerly usually performed by two oxen and two horses; but oxen are now seldom used, and the plough with two horses is in gradual adoption. Most of the farms consist of an equal portion of arable and of grass land. The latter is generally appropriated to the dairy, and the young cattle are reared on the more hilly and barren spots. About one-fifth of the county is under the plough, and one-tenth meadow; the remainder is chiefly occupied as sheep-walks. Large numbers of cattle, chiefly of the well-known Hereford breed, are annually reared; and these, with Welsh sheep, ponies, and butter, form the staple of the agricultural exports.

There is little commerce carried on in this county, as might be anticipated, from its remoteness and difficulty of access. There are some woollen manufactures carried on, chiefly of coarse cloth and flannel.

The county is not known to contain any valuable minerals. A lead mine has been opened and abandoned, and in some places an uncertain belief has prevailed of the existence of copper. Various mineral springs are known; and Llandrindod is a place of great resort on account of the medicinal qualities of its saline, sulphurous, and chalybeate wells. In several other parts there are similar springs, the properties of which have not been accurately ascertained.

In Radnorshire there are many vestiges of antiquity. The abbey of Cwm Hir stood formerly in a singularly retired and romantic situation on the banks of a rivulet which runs into the Wye. A small vestige remains of a castle at New Radnor, which was assailed and destroyed "by the irregular and wild Glendower," previously to the battle noticed by Shakspeare, in the first part of Henry IV., when Mortimer was taken prisoner. It was fought at Pilleth in this county. A Roman road, which reached from Chester to Caermarthen, traversed this county, entering its confines on the northern extremity, in the direction of Newtown, following the valley of the River Ithon, and crossing the Wye into Brecknockshire near the town of Builth. At Cwm, near Llandrindod, the remains of a Roman station on this road are still discernible.

This county returns one member to Parliament, and has done so since 1536. The district boroughs of Radnor, Cefn-Llys, Knighton, Knucklas, Rhayader, and Presteign returns another. The political influence is in the hands of Sir George Cornewall Lewis, Colonel Price of Norton Court, and the De Wintons of Maeslough. The famous Harley, Earl of Oxford, represented the Radnor boroughs from 1690 till 1711.

The population, by the census of 1851, was 24,716, of which number 12,693 were males, and 12,023 females. This gives 58 persons to a square mile, or 11 acres to each person; thus proving it to be the most thinly-peopled part of Wales, or indeed of England and Wales. The number of inhabited houses in 1857 was 4614; uninhabited, 217; building, 28; giving 11 houses to a square mile, and 5·4 persons to a house. The population had decreased in the ten years previous to 1857 by nearly 700 persons. The amount of real property assessed for the income-tax in 1857 was L.146,072; the amount of property assessed for relief of the poor was L.111,007. It is calculated that upwards of 18 per cent. of the population live by agriculture; nearly 8 per cent. by trade, manufactures, &c.; 50 per cent. of the whole are in the condition of labourers and servants; only 100 persons follow professions, and about 800 possess independent means.

In 1847 there were in this county 43 day-schools for the working-classes, attended by 1381 scholars, and 53 Sunday-schools, attended by 2309 scholars; of these 1146 were at Church of England Sunday-schools, and 1163 at dissenters' schools, chiefly Methodist. In 1847 it was ascertained that there were only from 2500 to 3000 persons in this county who could not speak the English language, out of a population of 25,000, while in the adjoining county of Cardigan only 3000 could speak English, out of a population of 70,000. (J. G.)

RADOM, a town of Poland, capital of a government of the same name, 56 miles S. of Warsaw. It is walled and defended by a castle. There are here a court of law, public offices, two churches, two convents, a piarist college, a gymnasium, &c. Pop. (1854) 10,231.

RAEBURN, Sir Henry, the Reynolds of Scotland, was the son of a manufacturer, and was born at Stockbridge, Edinburgh, on the 4th of March 1756. The circumstances of his early life were far from being propitious. He was only six years old when he was left an orphan. The elder brother, who undertook the charge of him, could not afford to keep him long at school. He was accordingly apprenticed, at the age of fifteen, to a goldsmith in a dingy alley of the old town of Edinburgh. Yet in spite of these disadvantages, the genius of the boy began, by its own innate strength, to assert itself. In the workshop of his master he took insensibly to sketching. Whenever the tools were laid down, the pencil was in his hand drawing caricatures of his companions. The growing habit soon ensured success, and success incited him to higher efforts. In course of time he was painting miniatures, which attracted the interest of some of his fellow-townsmen. David Martin, a popular portrait-painter, gave him encouragement, and lent him pictures to copy. People began to sit to him for their likenesses in miniature. His own master, recognising a great artist in what he formerly thought a mere idle shop-boy, absolved him from his apprenticeship, and allowed him to devote himself entirely to painting. Encouraged by these favours, the young enthusiast continued assiduously to study the principles of his art. He had mastered the difficulties of colouring; he had abandoned miniatures for portraits in oil; and he was earning a comfortable livelihood with his brush, when an incident occurred which was the means of accelerating his rise towards excellence and fame.

One day when Raeburn was out in the fields quietly sketching, a young lady sauntered into the landscape which he was drawing. Her appearance pleased him, and he put her down upon the paper as an enlivening accessory to the scene. Not long afterwards, much to his delight and surprise, the same young lady appeared at his studio to sit for her portrait. A mutual impression was the consequence; and before many months had elapsed she gave him her hand and a handsome dowry along with it. Thus furnished, by a happy incident, with competent means, Raeburn now resolved to devote himself to a more thorough study of his art. Accordingly, he set out along with his wife to make himself acquainted with the paintings of other countries. The object of his journey was successfully pursued. On arriving at London he had the good fortune to gain the approbation and friendship of Sir Joshua Reynolds. The kind-hearted president sent him to Rome with letters of introduction to the most eminent artists in that city, and with the advice to study Michael Angelo in the Sistine chapel. Full advantage was taken of both the counsel and the introductions; and at the end of two years he returned to his native city greatly improved, and set up his easel in George Street.

Raeburn now entered upon a career of portrait-painting surpassing everything of the kind that had hitherto been known in the Scottish capital. The great principle of his art was to endeavour, if possible, to represent the intelligence as well as the mere flesh of the human countenance. To achieve this object, he found it necessary to bring into play all the resources of his generous and highly-gifted nature. These, therefore, he employed in a very able and successful manner. No sooner were sitters admitted than, with his gentlemanly demeanour and frank address, he put them completely at their ease. They sat down on his platform too much fascinated with his conversation to be capable of looking affected and unnatural. The talk continued as he commenced to paint. He led them on from one subject to another until he had brought them to their favourite topic, and detected the highest expression of which their features were capable. Then he put that expression down upon the canvas, and finished the rest of the picture accordingly. The portraits painted in this manner went forth among the public to establish the fame of the artist. Their boldness of posture, vivacity of mien, and breadth of effect, put to shame the works of all his competitors. In no long time he was the acknowledged prince of Scottish portrait-painters, and had the finest heads and faces of the land for the subjects of his brush. The rank and intellect of the nation became his sitters. He had the honour of painting the severe shrewdness of the grandees of the south, and the martial air of the plaided chieftains of the north. He had the still higher honour of delineating the noble foreheads and thoughtful eyes of the chiefs of literature and science. In fact, there was scarcely an eminent Scotsman of the age of Blair and Hume whose portrait did not go forth to the world on his canvas, immortalizing the names of both the subject and the artist. Nor, at the beginning of the nineteenth century, when that generation had passed away, did Raeburn cease to be the painter of genius. In his new studio in York Place he depicted another race of great men, not inferior to their illustrious predecessors. There he executed those portraits of Henry Mackenzie, Sir Walter Scott, Francis Horner, Lord Jeffrey, and Lord Cockburn, in which their originals still seem to think and speak.

The life of Raeburn drew to a close amid circumstances of great prosperity. The fame of his genius had spread to foreign countries. His name was in the list of the Royal Academicians. His supremacy among Scottish artists was acknowledged by a knighthood from George IV. in 1822. At the same time, the vigour and healthy enthusiasm of his fine nature remained unimpaired. There was not an hour of the day which was not devoted to one or other of his favourite pursuits. He made experiments in mechanics and ship-architecture. He worked in the garden of his villa of St Bernard's. He superintended the building of that suburb at Stockbridge which was afterwards called Raeburn Place. He likewise laboured at his easel with all the ardour of his first love, painting portraits which surpassed the masterpieces of his prime. Thus was his green old age spent, until a short and painless sickness brought it gently to a close on the 8th July 1823. (See Chambers' *Biog. Dict.*, and Cunningham's *Lives of British Painters, &c.*)

Raffaelle.

RAFFAELLE, RAFFAELLO, RAFAEL, or RAPHAEL, SANZIO, was born at Urbino, in the Papal States, on the 6th of April 1483. The family patronymic had been originally *De Santi* or *Sancti*, but custom had gradually worn it into *Sanzio*. His father, Giovanni Sanzio, like others of his kindred at Urbino, was a painter of moderate ability, and what was still better, was possessed of a noble modesty which enabled him to foresee and acknowledge the future glory of his immortal son. Raffaelle was a painter from his cradle. He played with the implements of his father's art, and in no long time he exhibited a talent for drawing of such extraordinary precocity that his father chose for his master the most renowned painter of the day, Pietro Vanucci, called "Il Perugino." From the first he displayed a wonderful facility, and while engaged on the same canvas with his master the entire piece seemed the product of one hand. At the end of three years, business called Perugino to Florence, and Raffaelle, with the blessing of his generous master, set out at the age of seventeen to try his fortune with his pencil. The paintings executed by him at this early period, though very much in the manner of Perugino, display a subtle grace and delicacy altogether peculiar to himself. He visited Florence in 1504, where Leonardo's "Battle of the Standard" and Michel Angelo's celebrated "Cartoon" gave him much to study, and taught him how much he had still to learn. Raffaelle is commonly reported to have lost his parents before he was twelve years old; but this supposition is shown to be entirely groundless by the letter of introduction which he received from the Duchess of Urbino, dated October 1, 1504, and addressed to the gonfaloniere Soderini of Florence. In that document her ladyship alludes to his father as still living: "and as I know his father," she says, "who is dear to me, to be a virtuous man," &c. Raffaelle was at that period in his twenty-first year; but how long afterwards that "virtuous man" was permitted to watch the rising star of his son's fame we have no means of knowing. How very much he seems to have profited by what he saw and heard at Florence is abundantly evinced by his exquisitely beautiful pictures of that period, some of them very elaborate, as "The Entombment of Christ." They display a grace and a power of expression which was quite remarkable, and almost entirely new to Italian art. Pope Julius II. invited him to Rome towards the end of the year 1508, where he remained till his death. He commenced work on the Camera della Segnatura, and executed his figures of Theology, Poetry, Philosophy, and Justice on its ceiling, before undertaking the larger paintings which were to adorn its walls. In simplicity and beauty, in severity and dignity, in energy of execution and in beauty of individual character, the "Disputa del Sacramento" has never yet been surpassed. This is the character of nearly all his subsequent productions: they stand unrivalled in composition, and in grandeur of conception they have never been equalled. As a painter, sculptor, and architect,—in short, as a perfect master of design,—Michel Angelo knows of no equal; while Raffaelle, who was solely a painter, lavished all the treasures and various excellence of an uncommonly gifted nature on his art; in grandeur and in grace, in delicacy and in softness, in the strength of man and in the elegance of woman, he displayed every quality that can by any possibility distinguish a great painter. He died at the early age of thirty-seven, on the 7th of April 1520. His pictures number in all about 128, besides a large number of drawings which are scattered throughout various parts of Europe. An estimate of his works will be found in the articles ARTS, *Fine*, and PAINTING. Besides the works of Lanzi and Vasari, the reader may consult *The Life and Works of Raffaello*, by Quatremère de Quincy, translated into English by William Hazlitt, jun., London, 1846.

Raffles.

RAFFLES, SIR THOMAS STAMFORD, the son of a captain in the West India trade, was born at sea off the coast of Jamaica on the 5th of July 1781. Returning with his mother to England, he was placed in a boarding-school at Hammersmith, where he remained till the age of fourteen, when he entered the East India House as an extra clerk. While employed there, he occupied his leisure hours in various kinds of acquirements, and particularly in studying languages, for which he gave proofs of possessing great facility. In 1805 the directors of the India House having resolved to found a new settlement at Penang, or Prince of Wales' Island, on the coast of Malacca, for the purposes of trade, Raffles had risen so steadily in their good opinion that he was appointed assistant-secretary to that establishment. On his voyage out he acquired the Malay language, which stood him in good stead a short time afterwards, when, owing to the illness of the chief secretary, Raffles had to undertake the entire labour of arranging the forms of the new government, and of compiling all public documents connected with it. Such an accumulation of work proved too severe for his constitution, and in 1808 he had to visit Malacca to recruit his shattered strength. Here he enjoyed large opportunity of mingling with a very varied population congregated from all quarters of the Eastern Archipelago and the distant Asiatic continent. He likewise made the acquaintance of Marsden and the lamented Leyden, and in company with these two orientalists he began his elaborate researches into the history, the laws, and the literature of the Hindu and Malay races. In zoology he took a special interest, and ultimately became founder, on his return to England, of the Zoological Society, of which he was the first president. While on a visit to Calcutta in 1809, Raffles suggested to Lord Minto, then governor-general of India, the desirableness of wresting Java from the French, and rendering it a British possession. The governor-general grasped the idea with vigour; and ere many months had passed away a fleet of 90 ships dropped anchor before Batavia in August 1811. A short time effected the conquest of the island, and annexed Java to our East Indian dominions. Stamford Raffles was made lieutenant-general of the new territory, and resolved, at whatever cost, to give to the island, which had been subjected so long to the selfishness of a horde of Dutch robbers, a pure and upright administration. There were three sources of abuse which he resolved to eradicate. These were—the revenue system, the system of police and public justice, and the abolition of the slave trade. In a period of only five years Raffles had almost effected his design; he was adored by the native Javanese; all classes of society mentioned his name only with praise; and the revenue was eight times larger than it had been under the Dutch. However, the policy of some of his measures was considered doubtful by the home authorities, and he was in consequence recalled. Raffles reached London on the 16th of July 1816, and on his laying his case before the Court of Directors of the East India Company, they saw it expedient to express their conviction that the measures which he had adopted had "sprung from motives perfectly correct and laudable." To meet the growing demand for information about Java, he published a *History of Java*, in 2 vols. 4to, 1817.

Having received the honour of knighthood from the prince regent, Sir Stamford Raffles set out for the island of Sumatra as lieutenant-governor of Bencoolen or Fort Marlborough, a small district in the south-west of the island that belonged to Great Britain. He arrived at his new destination on the 22d of March 1818, and immediately set to work to abolish slavery, and gradually to liberate the convicts who had been transported thither. Anxious for some new settlement where some accredited British authority might be stationed to afford protection to British shipping, Sir Stamford

Raffles proceeded to Calcutta to consult the Marquis of Hastings, then governor-general of India. The marquis approved of his plan; and Sir Stamford proceeded down the Straits of Malacca, and on the 29th of February 1819 the British flag was waving over Sincapore. Returning to Bencoolen, he found that society was improving, and the foundations of good order were fairly laid. Sir Stamford and Lady Raffles began now to look forward to a return to England. They had sacrificed three children to the climate, and they were anxious for the safety of their remaining daughter. Before taking leave, however, of the Eastern Archipelago, he resolved to visit Sincapore, his “political child,” and see what progress it was making towards prosperity. He arrived there on the 10th of October 1822, and occupied himself for nearly a year in laying out the new city, and in establishing institutions and laws for its future constitution. It was expressly provided, among a multitudinous array of details, that Sincapore should now and for ever be a free port to all nations; that all races, religions, and colours should be equal in the eye of the law; and that slavery should have no existence. Java had been given up to the Dutch shortly after Sir Stamford left it, and now Bencoolen was granted to them in exchange for Malacca. A short time before the latter arrangement had been completed, Sir Stamford Raffles and his lady had landed in Plymouth. A most disastrous event occurred on setting sail from Sumatra on the 2d February 1824. The ship Fame, when about 50 miles from land, suddenly took fire. The crew and passengers were with difficulty saved. The loss to Sir Stamford was beyond all repair. The whole of his drawings, all his collections in botany and zoology, all his papers and manuscripts, of which there were many volumes, fell a prey to the flames. His pecuniary loss amounted to more than L.20,000. During one of his excursions into the interior of Sumatra, in company with the lamented Dr Arnold, he came upon the largest and most magnificent flower in the world, the *Rafflesia Arnoldi*. In 1820 he sent home a large collection of preserved animals, now in the museum of the London Zoological Society, and a paper containing a description of them was read before the Linnæan Society, and published in their *Transactions*. He died on the 5th of July 1826, in the forty-fifth year of his age.

RAEGANJ, a town of British India, in the presidency of Bengal and district of Dinajepoor, on the left bank of the Kooluk, 32 miles W. of Dinajepoor, and 292 N.W. of Calcutta. Its narrow, crooked, and dirty streets are generally crowded and bustling; for the town is a place of considerable trade, and forms the chief emporium for the fertile region around it. Pop. estimated at 5000.

RAGLAN, James Henry Fitzroy Somerset, *Baron*, the eighth son of the fifth Duke of Beaufort, was born in 1788, and entered the army in 1804. His military training was received under the Duke of Wellington. Becoming one of the aides-de-camp of that general in 1808, he continued during the rest of the French war to serve him with great efficiency and acceptance. On all occasions he was one of his great chief's most trusted advisers. In times of action, too, his cool courage and daring valour were notable. He was among the foremost combatants at every battle, and experienced a full share of the honours and perils of the war. At the storming of Badajoz he was one of the first to mount the breach; at Busaco he was slightly wounded; and at Waterloo he lost his right arm. Fitzroy Somerset next appeared in an administrative character. He was secretary to the embassy at Paris from 1816 to 1819. Then the Duke of Wellington, holding at that time the office of master-general of the ordnance, made him his secretary; and when appointed commander-in-chief in 1827, still retained him in the same capacity. No sooner had the term of that office expired in September 1852, than other appointments began to flow in upon him. He was promoted to the post of master-general of the ordnance, and was elevated to the House of Peers with the title of Baron Raglan. He was also acting as a privy councillor when the outbreak of the Russian war in 1854 summoned him to a higher sphere of duty. Lord Raglan now entered upon his office as commander of the British forces in the Crimea. His conduct in that tedious and disastrous campaign (of which a detailed account is given under Russia) was worthy of one who had been trained under Wellington. There was not in the entire expedition a single critical occasion during which his calm courage did not appear to advantage. At the battle of the Alma his French colleague St Arnaud declared that “his bravery rivalled that of antiquity.” During the fight of Balaklava he was seen coolly reconnoitring in front of his own lines, and within range of the enemy's guns. In the great battle of Inkermann it was his promptness in bringing a few guns into play which contributed in a great measure to check and rout the overwhelming masses of the enemy. Even the disasters of the ensuing winter, although they brought discredit upon his capacity as a general, did not impair his fortitude and firmness of purpose. He continued to act with magnanimity and energy, in spite of the dreadful misfortunes on the field and the clamorous discontent at home. It was not till after the severe repulse of the allies on the 18th June 1855 that his mental anxiety became too great for his brave spirit, and brought his life to a close on the 29th of the same month.

RAGMAN'S ROLL (*ragman*, an indenture or legal deed), the name given to the collection of those instruments by which the nobility and gentry of Scotland were compelled to subscribe allegiance to Edward I. of England in 1296. This document, which consists of four large rolls of parchment formed by stitching together 35 smaller pieces, is kept in the Tower of London, and was published in Prynne's *Records* (pp. 648–665), and more recently under the auspices of the Bannatyne Club in 1834.

RAGUSA, a town of Austria, formerly the capital of an independent republic which now forms part of the kingdom of Dalmatia, stands on a peninsula on the E. shore of the Adriatic, 40 miles N.W. of Cattaro. It is built partly at the foot and partly on the steep slope of two hills; and is defended by walls and bastions, and by several forts. The streets, generally narrow, are well paved, and lined with large and substantially-built houses. The finest buildings are the cathedral, the former Jesuits' church, and the beautiful Gothic episcopal palace. The manufactures consist chiefly of silk and woollen cloth, wines, tobacco, and soap. The trade and navigation of the port are considerable; and ship-building is carried on. Ragusa was originally founded by fugitives from the neighbouring Epidaurus, when that city was destroyed by the Slavonians. The constitution was republican, the executive being in the hands of a senate elected by a general council, and presided over by a supreme officer, called at first Count, but subsequently Rector. Until the tenth century Ragusa was under the protection of the princes of Narenta; afterwards, however, it became an independent and powerful maritime state. For more than a hundred years it was governed by Venetian rectors; but in 1368 it was made independent of that state by the King of Hungary, under whose protection it continued to flourish At a subsequent period Ragusa became tributary to Turkey. It was taken possession of by Napoleon in 1806, and on his fall in 1814 it came to Austria. Pop. 8800.

Ragusa, a town of Sicily, on the right bank of a river of the same name, in the province and 29 miles W.S.W. of Syracuse. Manufactures of cloth and silk are actively carried on; and there is much trade in the corn, oil, wine, and cheese produced in the vicinity. Pop. 16,800.

RAIKES, Robert, the founder of Sabbath schools in

England, was born at Gloucester in 1735, and succeeded his father as proprietor and conductor of the *Gloucester Journal.* The swarms of profane and vicious children let loose upon the streets of Gloucester on a Sunday long engaged his serious attention; and he resolved that some scheme should be tried for putting an end to this evil. Persons were employed to open a Sunday school in the locality. Every effort was made to induce the children to attend. The school in a short time was crowded; and before his death in 1811, he had the satisfaction of seeing several similar institutions established in most of the large English towns.

RAILWAYS.

Railways for the most part belong to the order of contrivances. The first man who, noticing the facility with which the bole of a tree rolled down a slope, converted it into a roller for the movement of heavy bodies, would very soon discover that, to gain the greatest facility of movement, it is essential to have a path free from all inequalities and prominences; and he would discover also that it was essential for his roller to be a true cylinder if he wanted it to move straight and easily. The difficulty of maintaining a soft surface as a straight surface would soon present itself, and he would lay down the boles of straight trees in the line of his path. Here, then, we have the earliest railway, still used by timber-cutters in wild countries. Light sticks of round timber are laid down for the rails. Other sticks are formed into rollers as a crude kind of wheels to run on them, and on the rollers are placed the trunks of massive trees which are required to be moved from the forest. A modern contriver has gravely proposed a modification of this as a means of transport for army stores and guns on an expedition.

But the boles of trees have soft and hard sides, arising from atmospheric influence while growing. Therefore they cannot long maintain their cylindrical form. Moreover, it would soon be discovered that a cylinder can only move forward in a straight line, and that the taper bole of a tree can only move forward in a circular line. Neither condition would fulfil the requirements of a crooked road with constant change of direction; and the next contrivance would be to divide the roller into two separate cylinders, capable of rolling independently of each other. This would be the germ of modern wheels. Another contriver would discover the advantage of connecting them together by a central bar around which they could revolve; but the load would still be borne on the peripheries of the rollers, on account of the difficulty of making an axle sufficiently strong and sufficiently free from friction to bear a heavy load. For this latter reason, in Spain, Portugal, Italy, and other rude districts, cars are still found in which two wheels are made fast on one shaft, which revolves with the wheels, without any power of independent movement on the wheels, and with a consequent enormous increase of resistance arising from differing diameters, eccentricity, polygonality, and other circumstances. Upon hard stony roads the resistance is almost destructive of utility, and it may be doubted whether a sledge would not be more useful. In Madeira a sledge kept moist by water is found to be actually preferable. Our modern railways have not yet attained to the condition of using perfect wheels. Rollers, in fact, not wheels in the correct sense of the word, are used thereon, similar in principle to the rude carts of rude countries: the wheels are keyed solidly on the axles, making one piece; and they are practically sledges wherever the path is uneven.

In the mineral districts of England, when coal and iron were dug, and had to be transported seaward, rollers, of necessity, soon gave place to wheels, after the cost of pack-horses had rendered this mode of conveyance impracticable. Wheels formed of wood could not last long, by reason of the wear of their peripheries, and, as a matter of necessity, gave rise to another contrivance in the form of strips of iron, or tyres, fastened to them. The meaning of the word "tyre" is something fastened round,—as attire round the body, tiara round the head, a tier of guns round a ship or fort.

A pair of wheels to a two-wheeled cart running on a bad road require to be of considerable diameter, and consequently weight. The difficulty of keeping a road in repair when in constant use from coal or iron mines would lead to many devices, and amongst others, doubtless, to laying planks or timbers at the bottom of the ruts, as a better contrivance than filling in stones. The inconvenience of the ruts, again, led to placing planks or timbers on the level surface; thus making a way or moveable road between the mine and the seaport, by leave or permission of the intermediate proprietors; and hence they are called "way-leaves." On these way-leaves, carts with two wheels were not convenient, and the way'n, wain, wagon, or waggon, with four wheels, was substituted. The planks forming the path for the wheels were, as a matter of course, connected by cross timbers, and thus a space was inclosed, from which apparently comes the term *rail,*—a cognate probably of apparel, which applies to dress and also to the tackle of a ship; also raiment and night-rail, expressing clothing which incloses the person. Probably the semblance of the timbers in form to the rails of a post-and-rail inclosure may have supplied the nomenclature.

The coarse make of the wheels would soon begin to abrade the timber, and we learn that it became a common practice to nail down strips of iron on the surface of the ascents, where the draught was increased by the use of the timber. Then a practice obtained of fixing down double rails,—a supporting rail below and a wearing rail above it,—to be taken up and replaced when too much worn. (See fig. 1.)

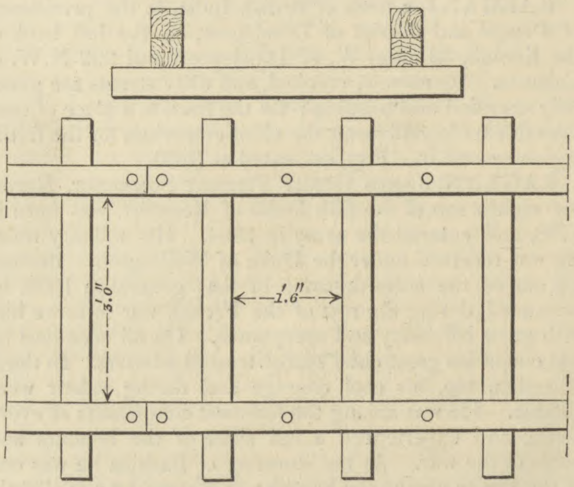

Fig. 1.
The Primitive Railway: Way-leaves.

The rapid wear of timber led to the structure of cast-iron rails to replace the wooden ones, and being limited in width, they were formed with a continuous flange or ledge on their inner edge, to keep the wheels on the track. (See fig. 2.) The roads were then called *tram-roads,* having been first laid down, it was said, by Outram, from whose

Mechanical Idea.

name, omitting the first syllable, the word is said to have been derived. The derivation would apply equally well to the word trammel—the rail-flanges being in reality trammels to guage the road and confine the wheels.

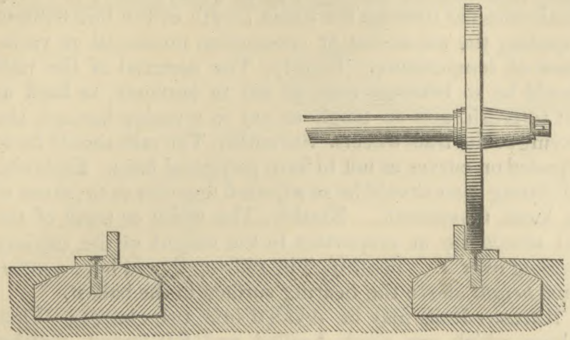

Fig. 2.
The Tram-Road, 1776-1800.

The leading objection to this system, the once famous tram-road, was, that the rail was liable to be covered with dust or gravel. Jessop, in 1789, to obviate these disadvantages, laid down at Loughborough cast-iron "edge-rails," from which the grinding ledges were removed, and applied round the edges of the wheels, forming flanges, the rails being elevated sufficiently to allow the descending flange to clear the ground. (See fig. 3.) This appears to have been the first system of rails laid on cast-iron chairs and on sleepers. The rails were pinned or bolted into the chairs.

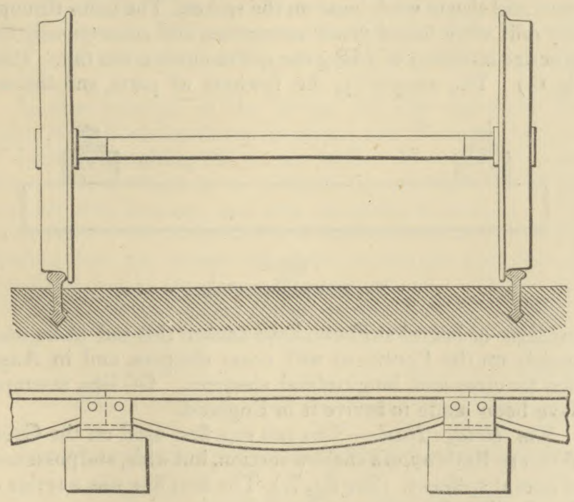

Fig. 3.
The Edge-Rail, 1789.

The substitution of rolled wrought-iron rails for cast rails was patented by Birkenshaw in 1820, as the "fish-belly" rail, similar in form and mode of support to Jessop's rail, but rolled in continuous lengths, embracing a number of spans, with stiffening ledges or flanges on the under side. This form of rails grew into favour, and was adopted in the construction of the Liverpool and Manchester Railway, which was opened in 1829. The rail weighed 33 lb. per yard, and was laid in cast-iron chairs, spiked down to square stone blocks at three-feet bearings. (See fig. 4.) It was fortunate for the country that this, the first important line of railway, had been entrusted to the consummate practical skill and experience of George Stephenson. The Liverpool and Manchester Railway, which descends to succeeding ages as a monument to his memory, happily served as a model railway for those which more immediately succeeded it. His son Robert Stephenson, and his pupils, were entrusted with the execution of several of the most important lines; and the same successful results which had attended the first railway were secured for those which came into operation afterwards.

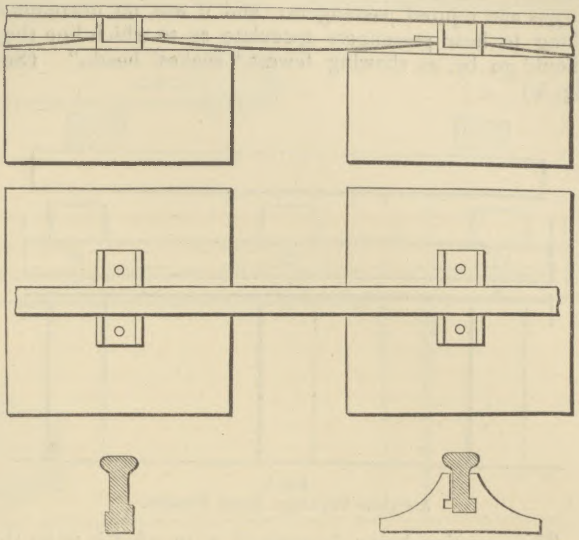

Fig. 4.
The Fish-Belly Rail, 1820.

The edge-rail and the flanged wheel are happily matched; they constitute essentially the mechanical idea of a railway,—the basis of the whole system.

Permanent Way.

PERMANENT WAY.

Guage.—The guage or measure of a railway is taken at the distance apart of the upper surfaces or treads of the two rails forming a line of rails, or a way. In England there are two guages, known as the "narrow guage," 4 feet 8½ inches, and the "broad guage," 7 feet between the rails. The narrow is the national guage of Great Britain, having been employed by the elder Stephenson for the Liverpool and Manchester Railway, and thereupon adopted for other lines, with a few exceptions, the most important of which is the broad guage, 7 feet, introduced by the younger Brunel on the Great Western Railway. The other exceptional guages have been reduced to a uniformity with the narrow guage. The Irish guage is uniformly 5 feet 3 inches, 6½ inches wider than the English guage, giving extra room for the construction of rolling stock. The European guage is for the most part the same as the English; but the Spanish is wider, 5 feet 6 inches, constituting a break of guage with France; commercially inconvenient, but supposed to be politically expedient. The Indian guage also is 5 feet 6 inches. The American guage is various, from 4 feet 8½ inches to 6 feet; some of the guages differ about an inch, and they interchange rolling stock, which of course runs tight and loose, but they blunder through it. The English national, or Stephenson guage, is practically of sufficient width.

As in all roads, the first consideration is the use to which a railway is to be applied, and the weight and damaging power of the wheels that are to run over it. A very common mistake is to make the road too weak for its work—to save materials and labour at the cost of destruction. This has been largely the case with American roads; their earliest system on the Baltimore and Ohio was a series of transverse timbers, on which were laid longitudinal timbers, trenailed down to them, to which was spiked a flat bar half-an-inch thick by 2½ inches wide, with counter-sunk spike heads. In the process of running the trains the iron was

Permanent Way.

curved, the spikes loosened, and the ends of the bars turned up, and were known by the technical name of "snake's heads." Occasionally they pierced the bottoms of the carriages and injured passengers; and it was no uncommon thing to hear passengers speculate as to which line they should go by, as showing fewest "snakes' heads." (See fig. 5.)

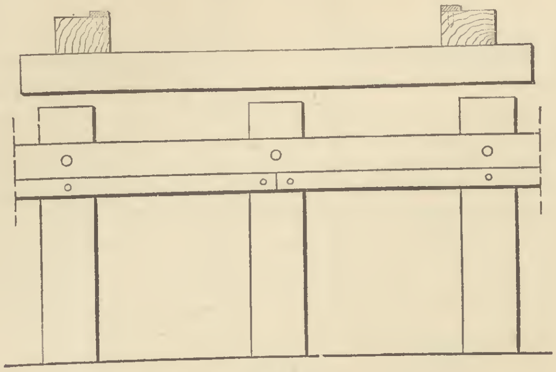

Fig. 5.
American Tramway: Early Practice.

The question being determined as to what is to be the weight of engines and trains, and their distinctive forms, the whole structure must be calculated on that as a datum-line. The most damaging part of the train being the driving wheels of the engine, that is the chief point to look to. It is desirable, if possible, not to exceed five tons on each driving wheel; if, therefore, heavy loads are required, four wheels must be coupled together; but in that case, though the load is distributed so as to avoid so much deflection of the road, the grind of the tyre and rail surfaces is increased, and speed is impeded by friction. An engine with two drivers will find less impediment than one with four. With a single driver the impediment would be at the minimum, supposing one of the wheels on the driving axle were loose. When two wheels are coupled, and *à fortiori* four, the diameters should be exact, and the rails also; if not, they will grind, and act as breaks. The workers of steam-coaches on common roads never used more than one fast wheel; if they did they broke their axles. The boys' toys called velocipedes, which work by cranked axles, have likewise only one fast wheel. The reason why the axles do not break more frequently is, that the rails afford facility for slipping.

The next consideration is, that the whole road be thoroughly well drained, that all rain-water falling on the line may have facility to run off the surface without soaking in, and that all running water crossing the line may be provided with culverts to pass below it. The sleepers or substructure should be bedded on at least 12 inches in depth of porous stone or gravel, constituting the ballast, without any clay or other material in it that may make a non-conducting bed. In many places natural ballast is not to be had, and where clay exists the process of burning it is resorted to. In districts where neither ballast nor clay occurs, as in the prairies of the United States, it is advisable to make such a bearing surface of timber, and such a strength of rail, so to distribute the load, that no sinking or pumping up and down could take place.

The level and the ballast being provided, the next consideration is that of the permanent way, the rails and their supports. Whether made in one form or another, the permanent way should, in the first place, have such an amount of bearing area on the ballast or ground as to prevent all sinking. Secondly, There should be such an amount of bearing area of the rail on the sleepers as to prevent all crushing. Thirdly, The rail should be so vertically stiff as to distribute the load over a great length without deflecting. Fourthly, The lateral stiffness should be ample to prevent all lateral deflection. Fifthly, The joints of the rails should be such as to produce a practically continuous bar through the whole length of the line without impeding the expansion or contraction incidental to variations of temperature. Sixthly, The material of the rails should be so homogeneous as not to laminate, so hard as not to crush, and so tough as not to crumble beneath the driving or the train wheels. Seventhly, The rails should be so adjusted on curves as not to form polygonal lines. Eighthly, All fitting parts should be so adjusted together as to permit of no loose movement. Ninthly, The width or tread of the rail should be in proportion to the weight of the engines running over it. Tenthly, The rail-top should have a *minimum height* above the bearing surface in the ballast.

Permanent Way.

RAILS.—Rails may be divided into two classes:—First, Those which are single-headed and flat-footed, forming their own support on the sleepers or ballast; secondly, Rails which are double-headed, and need chairs or other means of support on the sleepers. They may again be subdivided into:—Rails on cross sleepers of timber; rails on longitudinal sleepers of timber; rails on cast-iron sleepers without timber; rails on wrought-iron sleepers without timber.

The Flat-bottomed Rail.—This rail, with holes through the lower web to hold the spikes, was used to some extent both on cross and longitudinal timbers. The disadvantage was want of vertical stiffness in its ordinary form, and if made deeper it was apt to rock on the sleeper by reason of its small base, and also to work loose on the spikes. The holes through the rails were found disadvantageous, and subsequently the practice obtained of fixing the spikes outside the rail. (See fig. 6.) The simplicity, the fewness of parts, and the advantage of lateral stiffness, have caused this rail to be used largely on the Continent with cross sleepers, and in America for cross and longitudinal sleepers. Of late, attempts have been made to revive it in England.

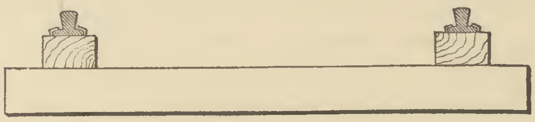

Fig. 6.
The Flat-bottomed Rail.

The Bridge Rail.—This rail was first used on the Great Western Railway, of a shallow section, but wide, and possessed of lateral stiffness. (See fig. 7.) The first line was a series of beech piles, 12 inches square, driven into the ground, to which were bolted at the surface level cross balks of timber, one on each side the pile-head on which they were shouldered. Longitudinal balks, 15 feet long, were laid on the cross balks. The longitudinals were covered with oak or elm planking screwed down to the surface. When the ballast was packed under the longitudinal balks, the surface of the oak planks was planed level, and the bridge rails screwed down on them, with felt between. It was supposed that there would be no yield whatever; but a very short time demonstrated that the piles formed a series of solid resistances, while the balks sprung between, and it was found necessary to cut away the piles. Transoms were then framed into the longitudinals, and secured by strap-bolts; and the whole resembled a long ladder laid on the ground. Eight different sections of rails were tried in succession; one section measured 1½ inch in height by 7 inches in width, weighing 44 lb. per yard; and the last section 2¾ inches high by 6 inches wide, and weighing 62 lb. per yard. The screws which held down the rails were counter-sunk be-

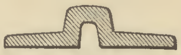

Fig. 7.
Bridge-Rail, first used on Great Western Railway.

neath the wheel flanges, and nut-headed on the other side. (See fig. 8.)

In consequence of the want of depth in the rails, they bent under the wheels, and crushed the timber in detail, though the total area of bearing was 5 inches in width, or 180 superficial inches per yard run. Had the rails been vertically stiff enough, the crushing would not have taken place. In fact the rails bent longitudinally, and the horizonal flanges curled up at the sides, and the holes through them bent into angles. One remedy tried was to cross-board the longitudinal timbers on the surface, and thus the fibre was less yielding.

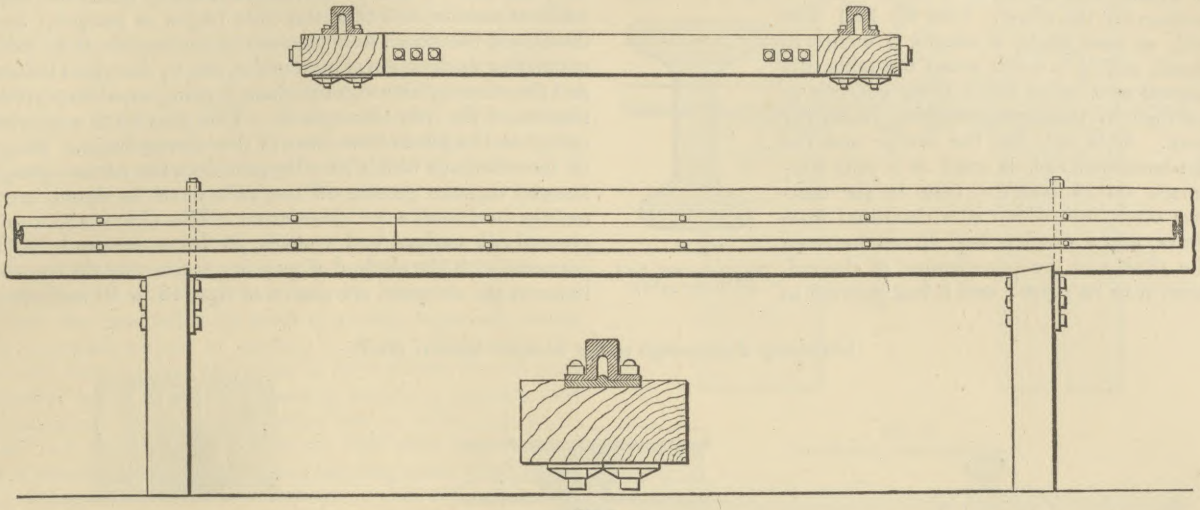
Fig. 8.
Recent Permanent Way of the Great-Western Railway (Bridge-Rail, 62 lb. per yard).

Another example of the bridge rail was applied by Sir John M'Neill on the Great Southern and Western Railway of Ireland, weighing 92 lb. per yard. It is laid on cross sleepers, into which it is notched by machine, the whole breadth of its bearing; and thus the guage is accurate. The cross sleepers are about 2 feet 6 inches apart, and the total bearing does not exceed 60 square inches per yard run, or one-third that of the Great Western system. Yet the rail does not crush the timber, partly because it does not deflect, and partly because it crosses the fibres of the timber. (See fig. 9.)

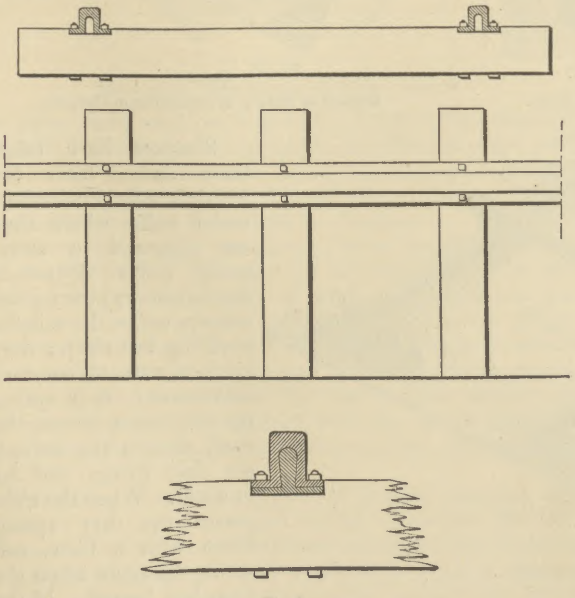
Fig. 9.
Permanent Way with Bridge-Rail on the Great Southern and Western Railway of Ireland (rail 92 lb. per yard).

On the Great Western the joints of the rails are supported by a piece of boiler-plate about 9 inches square, which was at first let flush into the timber; but being found to yield, it was subsequently laid on the surface, and pressed in by the running of the trains. It was secured by four bolts, two to each rail-end, the heads in the timber and the nuts on the rail flanges: they were quickly found to pull in and get loose. The bolts were then reversed, and long triangular fang-nuts were placed under the timbers: these also pulled in, and cast-iron nuts, measuring 4 inches by 2½ inches, were applied; the threads of these stripped, and they were replaced by wrought-iron of the same size. Thus the timber was as a packing between the upper joint-plate and the four nuts, comprising the same area. The rail-ends, however, still work loose, and the timber suffers.

The joint first applied by Sir John M'Neill was a dovetail fitting the hollow of the rail rivetted to a plate through which passed four bolts holding down the rail-ends. This worked loose, and the cross joint sleeper was continually splitting. This was, in fact, the defective part of the line. (See fig. 9.) An effective joint was subsequently applied, consisting of three castings, the centre one supporting the rail in the hollow, and two side clips holding the rail down by the angle of the flanges; the whole being connected by one or two side bolts fixing the three parts together in a wedge form, which makes a perfectly safe joint. (See fig. 10.) The bolted joint has also been adopted from the Great Southern on the Belfast and Ballymena Railway. Its horizontal area being considerable, it is sufficient to pack up the joint on the ballast, without using a cross sleeper under it.

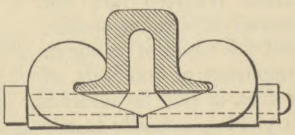
Fig. 10.
New Joint for Bridge-Rail.

The total height of this rail above the ballast is only 9 inches: it is very stiff vertically and laterally, and has little tendency to rock; but it is heavy, weighing 92 lb. per yard.

The Double-headed Rail.—We now come to the national rail of England, the double-headed rail, originated by Mr Joseph Locke, and first applied on the Grand Junction Railway, weighing 62 lb. per yard. (See fig. 11.) The top and bottom heads or tables of this rail are equal; it is more easy to roll than any other; and, if properly used, it is capable of being reversed, being in fact two rails in one. Formerly no means of fastening the rail to sleepers were employed except by

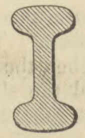
Fig. 11.
Double-headed Rail.

Permanent Way.

the agency of cast-iron chairs, and this has considerably damaged it, in fact and in repute; so that many engineers have been in the habit of late of making the lower table of smaller size, merely as a support, and not as a reversible surface for the wheel. (See fig. 12.) The rail, as now made, is usually 5 inches in depth, and 2½ in width across the table, the central web being about three-quarters of an inch in thickness, weighing 75 lb. per yard. This rail, like the bridge and the flat-bottomed rail, is used as a prop supported on its base; it rests in the cast-iron chair, into which it is deposited from above, and a wooden key, driven between the chair and the side channel of the rail, holds it in its place; and it is supported so firmly when newly inserted that it cannot get loose. (See fig. 13). Now, if it does not get loose, the chair and the rail will be as one piece, and no damage will occur. But practically the blows of the wheel-flanges laterally crush the key, which is outside, and then the rails begin to jump up and down, and the noise, so unpleasant to passengers, is an indication that destruction of both tables, one by the wheel below, and the other by blows on the chair, is going on, while crystallization of the iron takes place. This goes on to a greater extent in the joint-chairs than in the intermediates. Many of the accidents which have happened on the narrow-guage lines by engines getting off the rails have no doubt been mainly attributable to this cause. The chairs and compressed oak wedges and trenails, on Ransomes and May's patterns, with the method of guaging and boring the trenail-holes in the sleepers, are shown in figs. 13 to 19 inclusive.

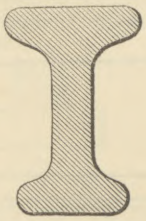

Fig. 12.
Double-headed Rail (62 lb. per yard).

Ordinary Fastenings of the Double-headed Rail.

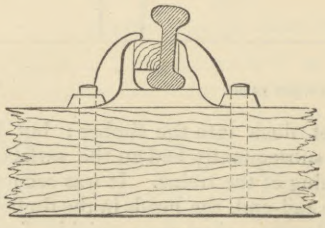

Fig. 13.
Chair for Double-headed Rail.

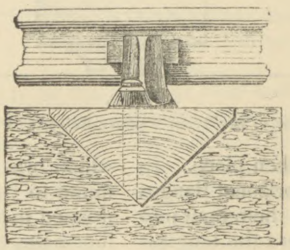

Fig. 14.
Intermediate Chair (Elevation).

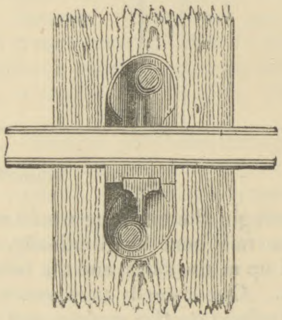

Fig. 15.
Intermediate Chair (Plan).

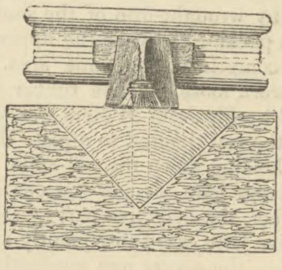

Fig. 16.
Joint-Chair (Elevation).

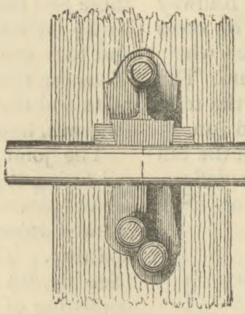

Fig. 17.
Joint-Chair (Plan).

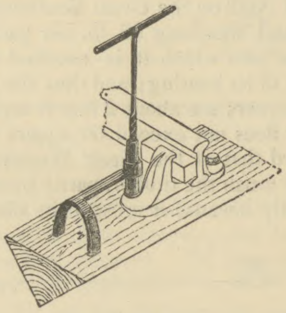

Fig 18.
Method of Boring Trenail-holes in Sleepers.

This rail has double the vertical strength of the Great Western rail, but laterally it is much weaker, and the mode of using it, supported at intervals of 3 feet, is not favourable. It yields plastically to the running of the trains, and is capable of being altered in form laterally by the packing of the ballast. It has also a disadvantage in its elevation above the bearing surface on the ballast. The rail is 5 inches, the chair 2 inches, and the sleeper 5 inches, —total, 12 inches elevation; and as the sleeper is only 9 to 10 inches in width, this induces a considerable rocking tendency in a forward direction. There is yet another consideration.

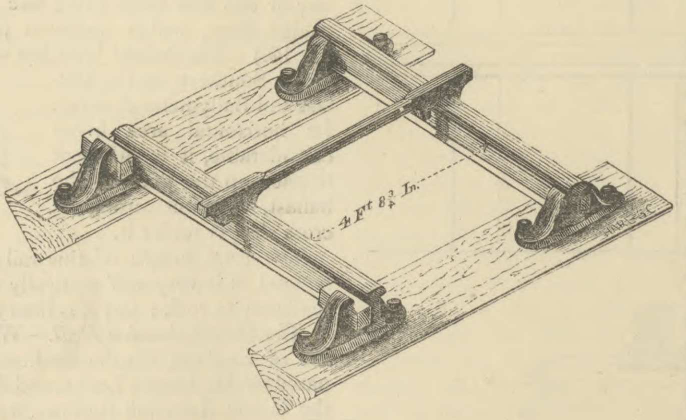

Fig. 19.
Method of Guaging Rails.

Sleepers have taken their name from the builders, who put timbers under walls, where they are supposed to sleep, being never disturbed. But in railway practice the timbers under the rails do anything but sleep; they are in a state of constant movement; they spring up and down across the road, disturb the ballast, set dust flying, and let in water. When the train passes by, they spring down with a blow, and spring up again when the train has passed. If the ballast be not porous and the weather be wet, a pond is formed beneath the sleeper which goes on increasing with every train; whilst the road cannot be meddled

Permanent Way.

with, as to open up the surface-ballast under such conditions is to make a quagmire for the reception of rain. To prevent the springing of the sleepers, it is required that they should be of greater size and strength, say 10 inches by 10 inches in width and depth; but this involves another difficulty. At present 12 inches depth of ballast must be dug out to get access to pack the sleepers below; and a really strong sleeper would make the depth nearly 18 inches, or the depth of the old stone-block. But according to former experience, the stone-block failed partly by rigidity, and partly because the height of the rail was so great compared with the base of the block. It was impossible to keep water from percolating below, and causing the block to subside unequally.

Joint Chairs.—It is obviously a great defect for a rail to lie loosely in an iron chair, but this defect is aggravated where the two rail ends meet in a chair, especially under the increased weight of modern engines. The most important consideration therefore is, so to secure the rail-ends together so as to convert them as nearly as possible into a continuous beam. One method was to widen the joint-chair to a double width, but as the rails were only fastened by a wooden wedge, this did not last long; and, when loose, the tilting action became worse with a wide chair than with a narrow one, and the joint-sleepers, though made wider, would not remedy the evil, and the rail-ends were in process of destruction under the heavy engines.

In the year 1847 Mr W. Bridges Adams applied a remedy, by moving the joint-chair away from the joint 3 inches on one side, and placing a second chair at an equal distance on the other side. The joint was thus suspended between the two chairs, and keys of iron called *fishes*, fitting the side channels of the rails, being driven in on each side between the chairs and rails, it was designed to convert the rails into a continuous beam, without any loose movement at the joints. (See fig. 20.) In subsequent modifications, the fishes were, and continue to be, bolted to and through the rails, the sleepers being placed considerably apart, and the joint suspended between them, constituting the famous "fish-joint." (See figs. 21, 22, and 23.) There is a difficulty in keeping the bolts tight on this plan.

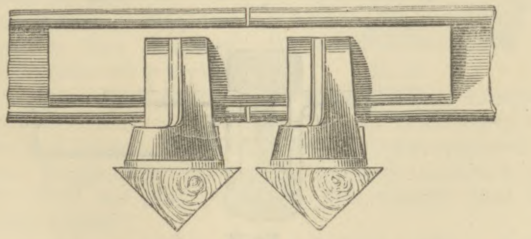
Fig. 20.
The original Fish-Joint, by W. Bridges Adams.

A more perfect joint has recently been introduced, called the bracket-joint. The rails are supported direct on the wooden sleeper, and a pair of brackets of angle iron are bolted to and through the rails, and also bolted or spiked down to the sleeper. In this mode there is no loose movement, and an economical as well as efficient arrangement is effected, the lower table of the rail being saved from all damage; the base is widened, and the rail is lowered. The same plan is applicable to intermediate chairs. (See fig. 24.)

Sleepers.—About the year 1848 general attention was called to the destruction and rotting of wooden sleepers. The contract system and improper inspection had resulted in many lines being laid with woody fibre, scarcely deserving the name of timber. Many such sleepers were like a mere pith before they were laid down, and they rapidly rotted. But there are abundant instances where good timber has been on the ground as sleepers from twelve to fifteen years without rotting. The creosoting system has also the effect of making inferior wood chemically durable.

Permanent Way.

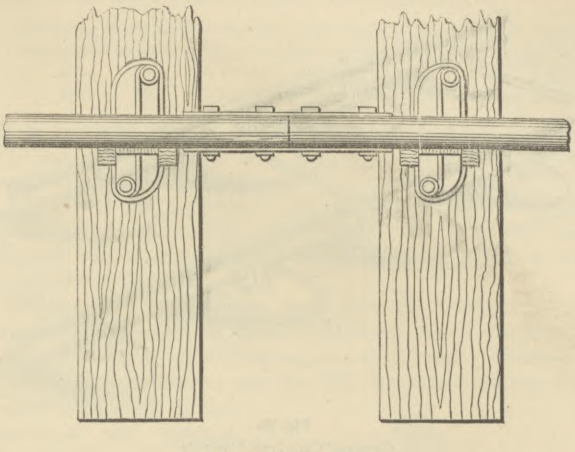
Fig. 21.
The Modern Fish-Joint (Plan).

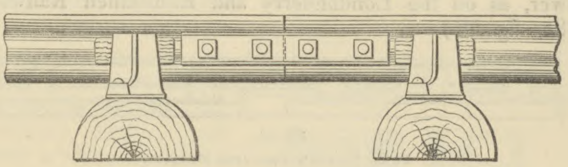
Fig. 22.
The Modern Fish-Joint (Elevation).

But the destruction of the sleeper is chiefly mechanical,—it is crushed and split by the detail bending of rails laid on longitudinals, and on the chair system by the driving of the chairs below the surface of the wood by blows. For this reason, chairs have grown in weight from 15 lb. to 42 lb. apiece, in order to increase the surface bearing on the timber.

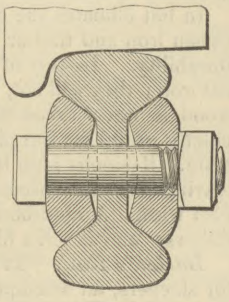
Fig. 23.
Section of the Fish-Joint.

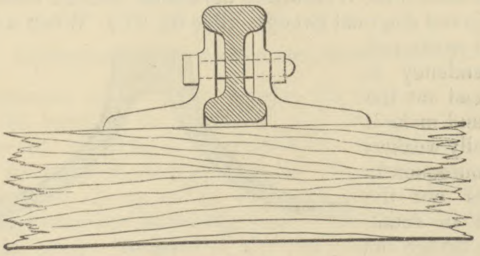
Fig. 24.
The Bracket-Joint.

On considering the question commercially, the materials of a railway should be governed by the locality. Where timber and labour can be had very cheap, it might be worth while to replace the sleepers every year. Where timber and labour are dear, iron is preferable. Cast-iron has been frequently used for sleepers, but the process has been in result little more than applying the usual cast chairs with extended bases of various kinds, and removing the wooden sleepers. Mr Greaves employs a bowl of cast-iron, with the chair cast upon it. (Fig. 25.) The South-Eastern went largely into it, on the plan of Mr P. W. Barlow, holding the rails between separate chair-heads like a vice. But, to keep down price, the rails were lightened, and the sleepers were cast thin and brittle like biscuit: they did not answer expectations, as the rails broke for want of continuous bearing.

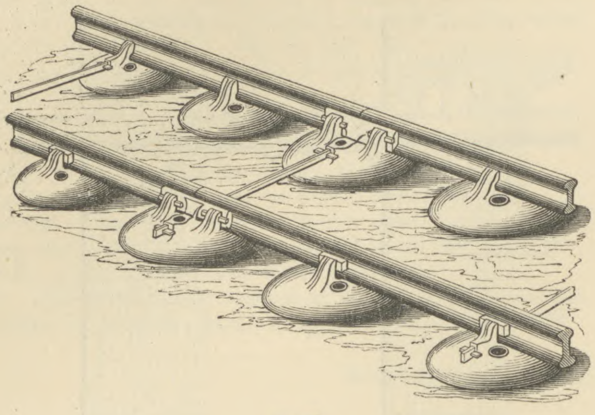

Fig. 25.
Greaves' Cast-Iron Sleepers.

On lines of small traffic and light loads the plan does answer, as on the Londonderry and Enniskillen Railway. (See fig. 26.)

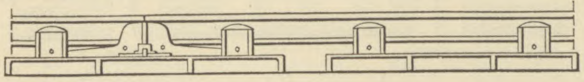

Fig. 26.
P. W. Barlow's Cast-Iron Sleepers.

Every form of cast-iron sleeper involving the chair construction is defective on account of irregular shape. The chair itself is much of a block shape, and not liable to warp; but when extended into a broad sleeper, it is very awkward to deal with.

In hot climates the question has yet to be decided between iron and timber on another account than mechanical durability. Insects of various kinds eat wood, but do not eat iron; they will not, it appears, eat creosoted wood. But wood is never creosoted all through; in fact, creosote is chiefly useful for soft pine and inferior woods containing no resin. Resinous pine is as durable as creosoted pine. But leaving out the insects, there are heat and moisture to deal with. A monsoon rain soaks the timber; a hot sun follows; and it splits like green timber similarly exposed.

Barlow's Rail.—At the time of the advent of cast-iron for sleepers, an attempt was made to use wrought iron, both in the form of sleepers, as a substitute for wood, and also in a form of rail bearing direct on the ballast without any sleepers, known as the saddle-back or Barlow rail. A bridge rail (fig. 8) consists of two vertical sides connected at the top, and the bottom spread into horizontal flanges. In the saddle-back these vertical and horizontal lines are connected into curved diagonal sweeps. (See fig. 27.) When a load is placed on this rail, the tendency is to spread out the base, and make it vertically weaker; it consequently crushes out the ballast in detail, as the bridge rail crushes into the timber. The mode of connecting the rail-ends together is by a saddle inserted in the hollow, through the lower edges of which rivets are passed. The strength of the joint, therefore, is little else than that of a piece of boiler-plate, and there is no provision for expansion and contraction under change of temperature. This rail fails in the essential conditions of a permanent way, and has not answered unless on lines of slow speed, and infrequent and light traffic. Curiously enough, as is not uncommon in inventions, it is largely applied for a very different purpose, to the wales of iron colliers as a fender against wharves.

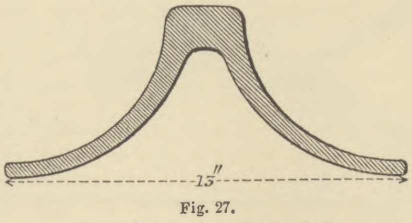

Fig. 27.
The Saddle-Back, or Barlow Rail.

W. B. Adams' Suspended Girder Rail.—In all the systems of permanent way hitherto described, the rails have been insistent, or supported on their base. They have consequently been limited in depth to insure stability against the lateral action of passing loads; and their capacity for resisting deflection has been correspondingly limited. The proper course to obtain a non-deflecting surface is to increase the depth of the rail, making it also a practically continuous beam, as strong at the joints as at the intermediate portions. Thoroughly to combine the conditions of stability and stiffness, hitherto but imperfectly accomplished, Mr Adams increases the rail to the necessary depth, and suspends it by the upper table, instead of supporting it on the base. The weight of the rail does not increase in the same proportion as the depth, if properly applied; whereas the stiffness increases in a high ratio. If, for example, with the same weight of material, having the same form and area of section, the depth be doubled, the stiffness would be increased four times; and if also the weight be doubled, the stiffness would be increased eight times. In the ordinary mode of supporting a rail on its base, the vertical web is from three-fourths to seven-eighths of an inch in thickness, to prevent it from bending under the weight of trains; and the deeper the rail, the thicker should be the web. But if suspended by the head, little more thickness is required than to prevent the top and bottom from separating. Thus an ordinary 75 lb. rail, 5 inches in depth, may be increased to 7 inches deep, and the vertical stiffness to resist deflection doubled, without an increase of metal. (See fig. 28.)

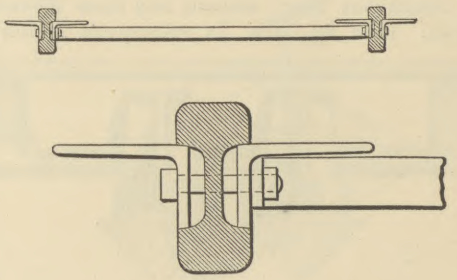

Fig. 28.
W. B. Adams' Suspended Girder-Rail, with Angle-iron Brackets.

By the suspension of the rail by the head, the bearing surface on the ballast is approximated to the bearing surface on the rail, and stability is insured independently of the depth of the rail; indeed the general stability is increased by extra depth of rail, as the rail descends into the ballast as a keel, and fixes itself there. The rail is 7 inches deep, and it is suspended by two continuous angle-brackets bolted in the side channels, affording a bearing surface within 2½ inches of the tread of the wheels. The bolts are applied at intervals of from 2 to 3 feet; all the joints intersect each other; so that wherever a joint occurs, either in the rail or the angle-bracket, two solids are in connection with it. Thus there is great stiffness laterally, as well as vertically, in the system. The total width may vary from 9 inches to 14, representing the largest amounts of bearing surface of the Great Western, and the smallest on the cross-sleeper system. The perfect distribution of the load over a large space by the vertical stiffness of the rail, will of course, with the continuous bearing, render a given surface more available than the same amount of surface on the discontinuous system. The guage of way is adjusted by tie-bars. The system is simple, consisting of only four types or parts,—the rail, the angle-iron, the tie-

Permanent Way.

bar, and the bolt; and the lower table of the rail is not exposed to the injury incurred by bearing on metal chairs, which wear into the lower sides of rails supported by them, and unfit them for reversal when the upper table is worn. This system, in wrought-iron, has been satisfactorily tested on two metropolitan railways; and is being used for railways in India, being portable, easily put together, and durable in a timber-destroying climate.

The principle of suspension by the upper table is applicable also with timber bearers, bolted in the side channels of the rail, the joints being made with angle-brackets 18 inches long, bolted to a cross sleeper at each joint. The timber may be 5 inches by 4 inches in scantling, keyed to the rails with flat bar-iron at intervals of 3 feet, making up a total width of 10½ inches. (See fig. 29.) When the upper table is worn, reversal is simply performed, the joint-bolt being taken out, and the rail and timbers together turned end for end, or upside down, to present a new surface for wear, without disuniting the timbers from the rail. The entire horizontal area is available for bearing surface on the ballast; in the cross-sleeper system only three-fourths is available. The horizontal bearing of the rail on the timbers is equivalent to 2 inches continuous width, or 504 square inches for a 21-feet rail. The timber suspension has been applied to the ordinary rails on the hardest-worked metropolitan railway with but an inch of bearing of the rail on the side timbers (see fig. 30); and after fifteen months' work, it was found that there had been absolutely no movement nor abrasion between the rails and the timbers; they had become, in fact, cemented together, contrasting forcibly with the bearing of a rail in an ordinary chair, and illustrating the essential difference between firm contact and loose contact of parts subjected to blows. It appears by this that the suspended system is upwards of 25 per cent. per single mile cheaper than the ordinary system.

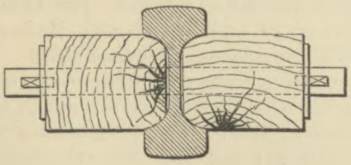
Fig. 29.
Adams' Suspended Rail, with Timber Bearers.

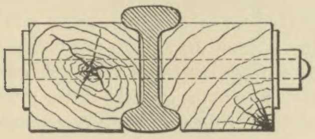
Fig. 30.
Ordinary Rail, with Timber Bearers.

In applying cast-iron for the bearing surface of the suspended rail, the disadvantage is, that on account of its inherent brittleness, it cannot, without great surplus weight, be used in long and continuous lengths; but with a stiff rail, using the iron in short lengths, so applied that it cannot get loose, but merely serving as a bearing, a good line may be made. (See fig. 31.) The cast brackets are bolted to the rail by flat iron key-bolts passing through from side to side. The brackets are each 2 feet in length, and when bolted to the rail make up a width of 12 inches. If pitched at 3 feet apart, leaving spaces of 1 foot between them, they would give a bearing equivalent to 9 inches continuous width through the whole length on the ballast. The rail is shown 6 inches deep, and 65 lb. per yard. Should the bolts slacken at all, the pressure would still be exerted against the head of the rail, and would prevent loose movements. If the brackets be laid continuously, they give a 12-inch continuous bearing.

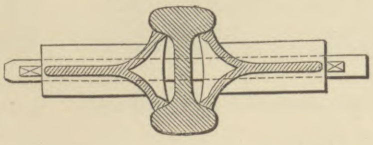
Fig. 31.
Suspended Rail, with Cast-iron Brackets.

The following are the relative costs of the ordinary cross-sleeper system, with 70 lb. rails, in 21-feet lengths, fished at the joints, and sleepers at 3 feet intervals, compared with the three varieties of the suspended system, with 65 lb. rails, and with continuous bearing:—

Earth-works.

Ordinary cross-sleeper system, per single mile run	L.1618
Suspended system, with wrought-iron bearers	1758
Do. do. on timber bearers	1200
Do. do. on cast-iron bearers	1431

It is assumed in this comparison that a 65 lb. rail on the suspended system is as efficient as a 70 lb. rail on cross sleepers.

There is an additional element of saving in the reduced depth of ballast required for carrying the suspended rail, compared with other systems, which is not reckoned in the comparison.

Ashcroft's Chair.—This chair may be accepted as the most recent exhibition of the combined use of timber and cast-iron for the immediate support of the rail. Chairs are cast in the form shown (see fig. 32), the jaws inclining outward and upward. Wood packings are pressed into the chair, of which the jaws are serrated to seize the wood; the wood cushions and suspends the rail in the chair. The chairs are of course heavier than ordinary chairs; and with a piece of oak on each side, they give a total bearing area to the rail of 18 inches in each chair. This on a 21-feet length rail will be equivalent to 126 inches, which might serve with a non-deflecting rail. But inasmuch as a chair of 48 inches area is found to drive into the sleeper, it seems scarcely possible that 18 inches inside the chair should resist the weight. If the rail springs, the whole must work loose in the same mode as the ordinary wood keys.

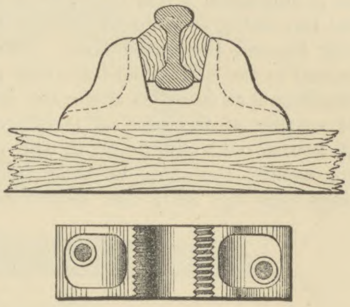
Fig. 32.
Ashcroft's Chair.

The chief defect in our permanent way, indicated by the noise familiar to travellers, is the number of blows or knocks arising from want of fit in the parts. With our present experience there is neither difficulty nor excessive cost in making a fit with either; and where wood can be applied as sleepers, it is commonly the cheapest. The principle of suspension in its application supplies a complete and general solution of the problem of a really "permanent" way; and though it is of comparatively recent origin, the method of laying rails by suspension must, in one form or another, supersede all the ordinary modes of supporting them by props. Stable equilibrium is undeniably preferable to unstable equilibrium.

EARTHWORKS—CUTTINGS AND EMBANKMENTS.

Engineers endeavour so to plan the works of a railway that the earth to be excavated shall be equal to the embankment, effecting a re-distribution of material rather than its removal, and arriving at the desired result by the simplest means and in the most economical manner. A straight and horizontal line is the standard of perfection; and the proper business of the engineer in laying out a railway is to harmonize the engineering and the financial conditions of the problem so as to yield the greatest return for the money expended; and that whilst the railway may be neither quite straight nor quite level, it should not be excessively costly in construction, in order to be free from severe curves and gradients, nor excessively cheap, making a heavy line, and incurring heavy working expenses.

The earthwork is the foundation and support of the whole superstructure, and, as such, must be uniformly firm, and carefully considered with respect to material, preparation, form, and drainage:—of liberal width, easy slopes, ample ballast, thorough drainage. (See fig. 33.) The figure shows in section the ordinary formation of a cutting in earth; the formation-level *aa*, 33 feet wide, is bounded by the side-drains *bb*, beyond which the slopes ascend to the natural surface at the rate of 1 foot rise to 2 feet level, or shortly 2 to 1. Upon the formation-level the ballast, *cc*, is deposited, 2 feet in depth, and about 23 feet wide at the top, being so wide, in fact, as to extend 4 feet on each side beyond the outer rails. The sleepers and chairs are buried in the ballast, and the rails partially also; the latter standing 2 to 3 inches above the ballast. The total width of cutting at the base *dd* is 42 feet; at the top it varies of course with the depth of the cutting. Embankments are usually the same in their ruling dimensions as cuttings (see fig. 34); the formation-level being, as in the other, 33 feet wide, sloping down to the natural surface. These dimensions are for narrow-guage lines. For the broad guage the cuttings are 38 feet wide, and the embankments are 43 feet wide at the level of forming. In both guages a clear space, 6 feet wide, is allowed between two lines of rails; and the total width over the up and down lines is over 16 feet on the narrow guage, and about 21 feet on the broad.

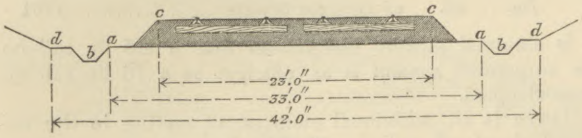

Fig. 33.
Section of a Cutting, with Ballast and Rails.

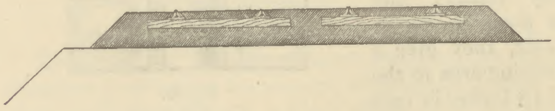

Fig. 34.
Section of an Embankment.

The slopes of cuttings vary according to stratification, soil, direction of the vein, moisture. In gravel, sand, or common earth, the slopes rise 1 foot for 1 to 1½ or 2 feet of base; in solid rock the slopes are nearly vertical. Cuttings are as deep as from 50 to 100 feet below the surface, and embankments similarly as high above. The London and Birmingham Railway had upwards of 12 millions cubic yards of excavation, and 10½ millions of excavation in the original estimates, or above 200,000 cubic yards of earthwork per mile. The heaviest cutting on the line is at Tring, 2½ miles long, averaging 40 feet deep, the greatest depth being 60 feet. The New Cross cutting of the South-Eastern Railway is 2 miles long, and is for some distance 75 to 80 feet deep. The Winchburgh cutting on the Edinburgh and Glasgow Railway, is 4 miles long, and from 25 to 60 feet deep, through solid rock; it is succeeded by an embankment 1½ miles long and 60 feet high, followed in immediate succession by a stone viaduct half a mile long and 80 feet high. The Olive Mount cutting of the Liverpool and Manchester Railway is 2 miles long, and, at some places, 100 feet deep. In the formation of the famous roadway over Chat Moss, on the same line, 670,000 yards of peat were consumed in forming 277,000 yards of embankment. Large quantities of embankment sunk in the moss; and when the engineer, after a month's vigorous operations, had made up his estimates, the apparent work done was often less than at the beginning of the month. Chat Moss was 4½ miles across. Cattle could not stand on it, and a piece of iron would sink in it. The railway was made to float on the bog; and it must be allowed that this situation, unprecedented at the time, afforded an unequivocal proof of that admirable self-reliance which never contemplated failure.

TUNNELS.

In passing through the consecutive cuttings of a railway, travellers usually consider that those through rock must have been desperate undertakings, very much more expensive than cuttings through clay. Their relative costs do not, however, greatly differ; for, not only does the vertical rock-cutting require less excavation than the wide yawning earth-cutting of the same depth, with extended slopes, but when it is executed, the rock cutting is not liable to the expensive slips which sometimes overtake the other.

In determining whether the line should proceed by cutting or by tunnelling, it is usual to prefer the former for any depth less than 60 feet; for greater depths it is usually cheaper to tunnel. The tunnel (see fig. 35) under Callander ridge, near Falkirk station, on the Edinburgh and Glasgow Railway, is a fair average representation of tunnels as usually constructed. It is lined with brick, 18 inches thick, founded on stone footings of greater breadth, in order to throw the load securely upon the subsoil, as shown in the transverse section. The sides and roof of the tunnel are curved from footing to footing, so as effectually to resist the inevitable external pressure of the earth, to a span of 26 feet in width, and a height of 22 feet. The sectional view shows also the centering or timber framing employed in the building of the tunnel, which was so braced diagonally and transversely as to resist the unavoidable inequalities of pressure without alteration of form whilst the arch was in course of construction. Externally, the entrances are built of stone, and the flank walls are three feet in thickness, with counterforts at intervals. This tunnel is not straight, but is formed on a curve of one mile radius; and it is 830 yards, or nearly half a mile in length.

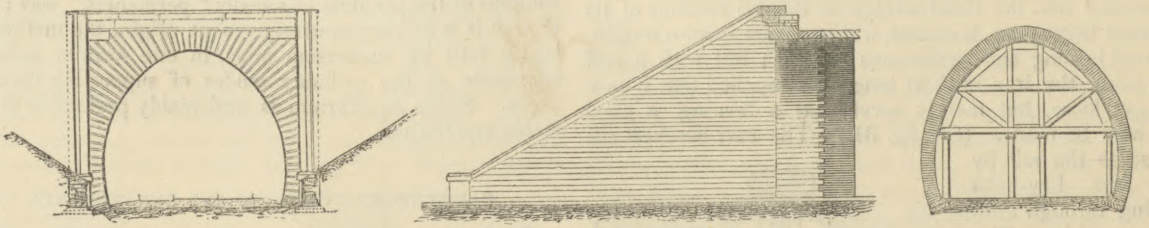

Fig. 35.
Tunnel under Callander Ridge, on the Edinburgh and Glasgow Railway.

The history of the Kilsby tunnel, on the London and Birmingham (now the London and North-Western) Railway, is interesting. It is known that the engineer's deliberate opinion was, that the line ought to pass through the town of Northampton,—an arrangement which would of course have vastly enhanced the commercial importance of the town. The inhabitants, however, urged and excited by men of influence and education, opposed the project, and succeeded in distorting the line, *via* the Kilsby tunnel,—which, if the projected plan had been adopted, would not have been required,—to a point five miles off. It was not then considered that railways could supersede mail and stage coaches; they were looked upon as, and declared to be, "but smoky substitutes for canals." The tunnel is driven 160 feet below the surface; it is 2398 yards in length, or about 1 mile and 3 furlongs, and is 30 feet in width, and 30 feet high, constructed with two wide air-shafts 60 feet in diameter, not only to give air and ventilation, but to admit light enough to enable the engine-driver, in passing through it with a train, to see the rails from end to end. The construction of the tunnel was let for the sum of L.99,000, or upwards of L.40 per yard run; but owing chiefly to the existence of unseen quicksands, undetected until they were broken into in the progress of the works, and which incurred a vast increase of expenditure, the tunnel is stated to have actually cost nearly L.300,000, or L.125 per yard lineal.

The famous Box tunnel, on the Great Western Railway, between Bath and Chippenham, was another difficult and expensive work. The tunnel is about 70 feet below the surface; it is 3123 yards in length, or rather more than 1¾ miles; the width is 30 feet, and the height is 25 feet. Where bricked, the sides are constructed of seven rings, and the arch of six rings of brick, and there is an invert of four rings. There are eleven air-shafts to this tunnel, generally 25 feet in diameter.

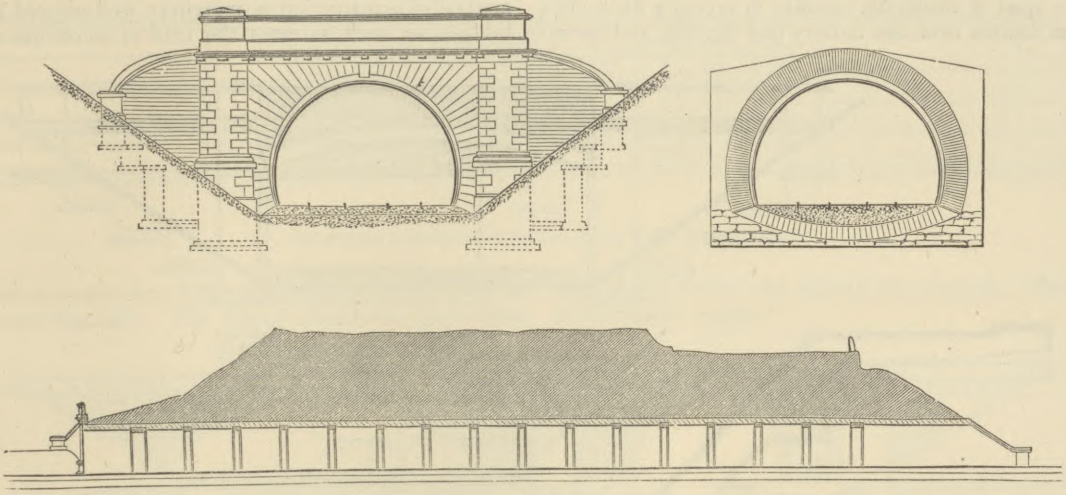
Fig. 36.
Tunnel under the Mound, at Edinburgh, on the Edinburgh and Glasgow Railway.

The tunnel under the Mound at Edinburgh (see fig. 36), on the Edinburgh and Glasgow Railway, supplies an excellent illustration of tunnels formed with inverts,—that is to say, inverted arches built under the rails. The first figure represents the elevation of the eastern entrance to the tunnel, which is architecturally good; the second figure is a transverse section, showing the truly circular arch of the tunnel, 28 feet in diameter, and 20 feet high above the rails, built of brick 3 feet thick, stiffened with counterforts externally, and with ribs of masonry internally, founded on a solid bed of mason-work, with an inverted arch to distribute the weight. The third figure is a longitudinal section of the tunnel, showing the stiffening-ribs, with a transverse section of the Mound standing 42 feet above the crown of the arch. The Mound,—or "Earthen Mound," as it is properly called,—is an accumulation of loose earth and rubbish excavated for the foundation of the houses in the New Town of Edinburgh, deposited in the valley which separates the Old Town from the New, on a boggy soil. The soil and the deposit were thus both of them unstable; and hence the necessity for the invert arch, on which the tunnel may be conceived to float.

The Shakspeare tunnel, or, more correctly, double tunnel, driven through the Shakspeare Cliff, near Dover, on the South-Eastern Railway, was peculiarly constructed, and under peculiar circumstances. It is, in fact, two narrow tunnels, carrying each one line of rails (see fig. 37), 12 feet wide, and 30 feet in extreme height, through the chalk, separated by a solid pier or wall of chalk 10 feet thick. The chalk is of variable quality, and the greater part of the tunnel is lined with brick, strengthened by counterforts at 12 feet intervals, which carry the weight of doubtful beds of chalk. The tunnel is 1430 yards, or upwards of three-quarters of a mile in length, rising westward, with an inclination of 1 in 264. The tunnel being within a short distance from the face of the cliff, the material excavated was discharged through galleries about 400 feet long, driven in from the face of the cliff, into the sea; the first operation being to run a bench or roadway along the face of the cliff. There are seven vertical shafts from the surface, averaging 180 feet deep.

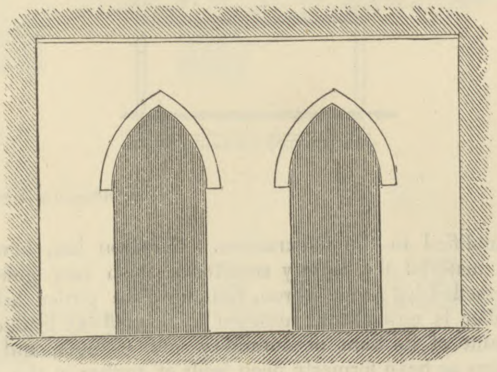
Fig. 37.
The Shakspeare Tunnel on the South-Eastern Railway.

There are about 70 miles of railway tunnelling in Great Britain, or 1 mile of tunnel for 130 miles of railway. The cost of tunnelling has averaged L.102 per mile. The longest tunnel is the Woodhead, at the summit of the

Bridges and Viaducts.

Manchester, Sheffield, and Lincolnshire Railway, being 3 miles 60 feet long.

BRIDGES AND VIADUCTS.

There are very few level crossings on English railways, —that is, the crossing of one railway with another, or with a common road, at the same level. The chances of accidents are so great as to have demanded, in general, the construction of bridges over or under the railway. The general appearance of an ordinary stone or brick bridge is represented by fig. 38, showing in elevation a bridge over or under the railway. The minimum height of a bridge over the railway is ruled by the elevation necessary to clear the top of the chimney of the locomotive. An excellent method of carrying roads over railways, where the height is limited and the span is moderate, consists in erecting flat-arched cast-iron beams over the railway (see fig. 39), and throwing brick arches of small span between the beams upon their lower flanges, to carry the roadway. Thus the vertical depth from the soffit or crown of the main arch to the roadway above, may but very little exceed the depth of the beam, which is apparent in the sectional views. This method of construction is, moreover, well adapted for skew-bridges, or such as cross the road at an oblique angle, as exemplified in the illustrations. Cast-iron has, however, as a material for railway structures, been very generally superseded by wrought-iron, forming plate girder bridges. Timber is now almost unheard of for railway bridges, on account of its want of durability and stiffness, and such bridges as have formerly been built of timber in this country are being rebuilt of stone, brick, or plate-iron. Nevertheless it may be proper to place on record the best and most successful form of timber-bridge structure for carrying a railway, introduced by Mr John Miller, C.E., in the works of the North British Railway. The Linton bridge on that line (see fig. 40) is a masterpiece of construction, the timber being so disposed as to combine a perfectly stiff, unyielding platform with lightness and economy of material and workmanship.

Bridges and Viaducts.

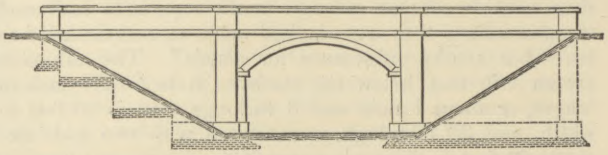

Fig. 38.

Ordinary Bridge over or under a Railway. The left-hand side is for a Cutting, and a Bridge *over* the Railway; the right-hand side is for an Embankment and a Bridge *under* the Railway; the difference is in the foundations.

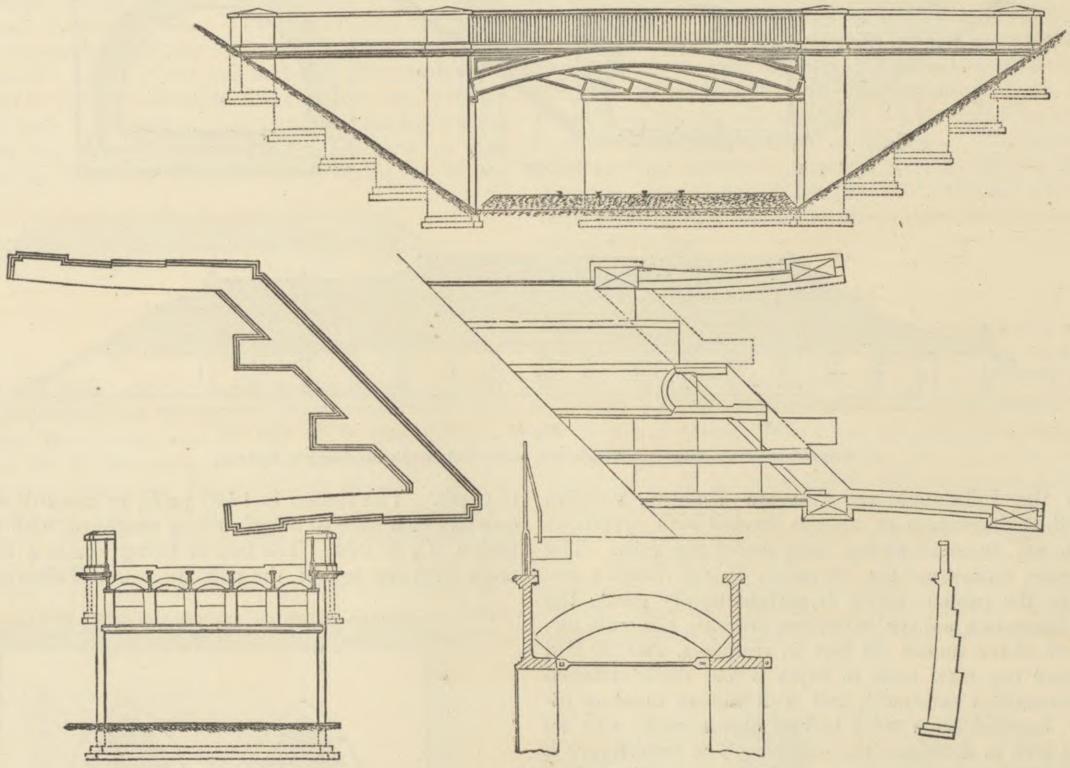

Fig. 39.

Skew Bridge, constructed with Flat-arched Cast-Iron Beams.

A bridge or viaduct, of a diversified character, was erected by Mr Miller across the Union Canal, near Falkirk, on the Edinburgh and Glasgow Railway. (See fig. 41.) The flat arch, crossing the canal to the left, has a span of 130 feet, and a rise of only 24 feet 6 inches. The lateral thrust of this arch is immense; and the precautions of the engineer to provide the necessary resistance have been commensurate, having constructed very formidable and weighty counterforts on the extreme left of the arch, with inverted arches above to distribute the thrust, as shown in the sections. The peculiar form of centering, or timber frame on which the arch was built, is also to be remarked. It receives no intermediate support from the ground, but rests exclusively upon the piers, contrasting strongly with the centering of the neighbouring arch, which, though the arch is nearly semicircular, and has only 63 feet of span (less than half that of the flat arch), is supported at two intermediate points directly from the ground. The difficulties here encountered arose not from physical causes, but from the ill-natured jealousy of the Union Canal Company, whose vested rights of traffic between the two terminal cities were

Bridges and Viaducts.

supposed to be infringed by the railway company. They would not allow the use of their ground for supporting the centering of the arch over their canal, and drove the railway company to carry it entirely from the piers. The intermediate piers were built, as shown, on timber piles, as the ground was soft. The Union Canal now pays better than it did before the railway was opened. The viaduct is 440 feet in length.

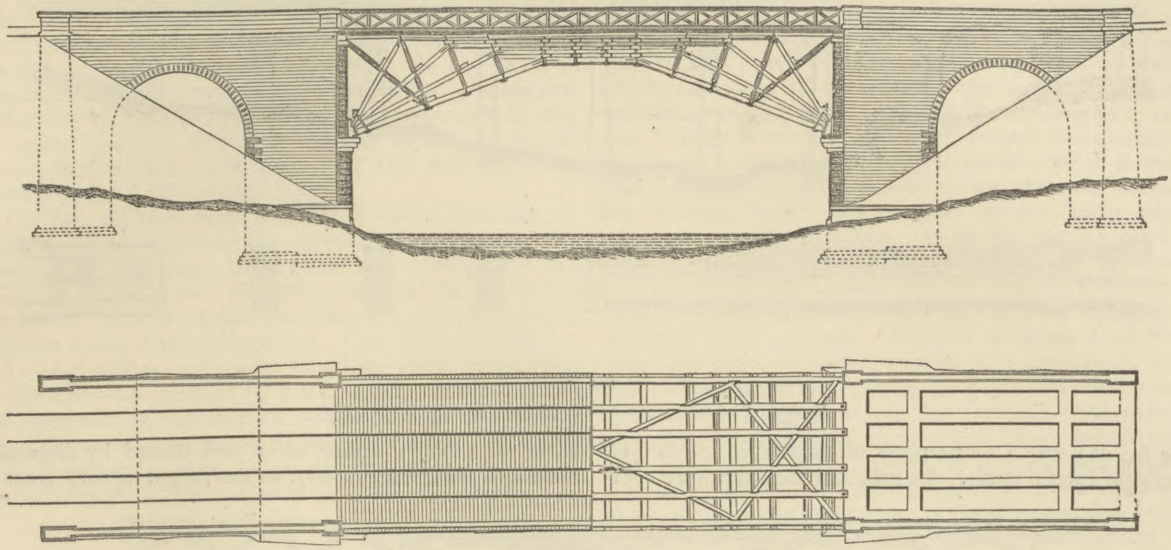

Fig. 40.
Linton Bridge, of Stone and Timber, on the North British Railway.

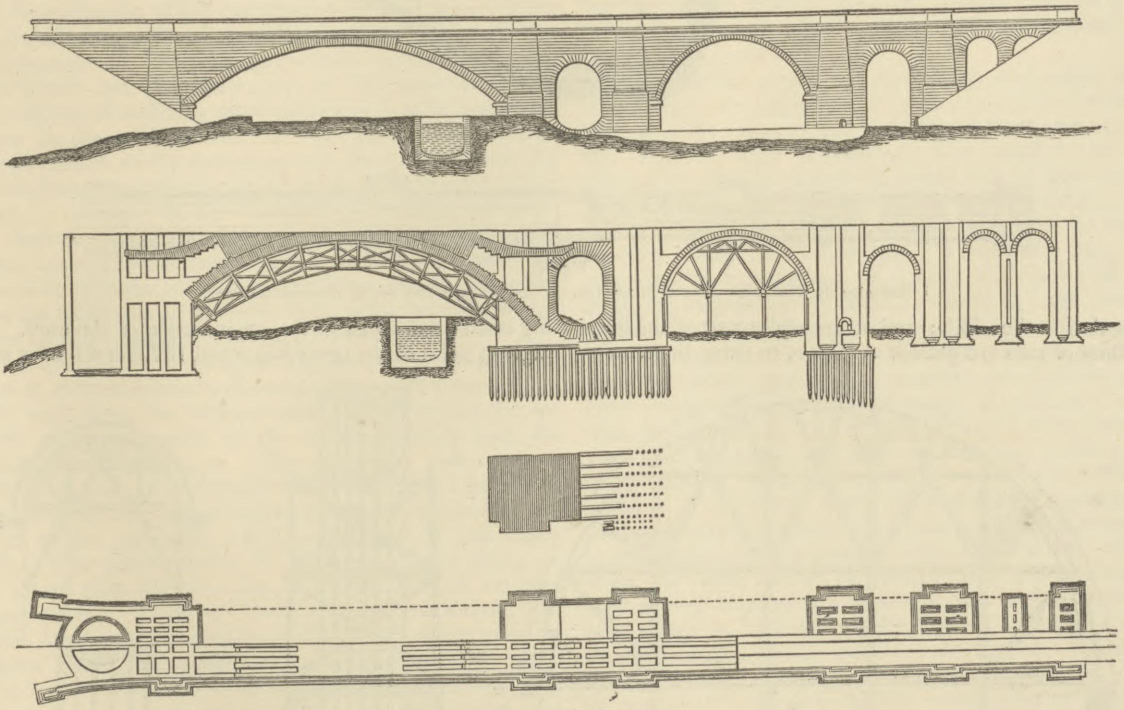

Fig. 41.
Viaduct over the Union Canal, near Falkirk, on the Edinburgh and Glasgow Railway.

There are several extensive viaducts on the Edinburgh and Glasgow Railway, the principal of which is over the Almond water. It is built of stone, and consists of thirty-six segmental arches, each of 75 feet span, and with piers 7 feet in thickness, at an average height of 50 feet; the whole length being 720 yards, not much less than half a mile. The Redburn viaduct (see fig. 42), consists of eight segmental arches, 50 feet span, and 16 feet 8 inches rise, on piers 7 feet thick at the upper part; the arches are 2 feet thick, and have a total width of 28 feet. The bed of the river is 90 feet below the level of the rails.

One of the most imposing structures of this class, forming part of the Glasgow and South-Western Railway, is the Ballochmyle viaduct over the River Ayr, built of stone, which spans the river by a semicircular arch of 180 feet, founded on rock,—the largest span of railway masonry in this country, or probably elsewhere, with six smaller arches of 50 feet span. (See fig. 43.) The arch-stones of the central arch are 4 feet 6 inches broad. The centering of timber erected for the construction of this arch (see fig. 44) was a masterpiece of carpentry, and is well worthy of careful study. Its principal members were composed of 14-inch square balks, well braced by diagonals, more especially transversely, as the height is very great in proportion to the width; and at the upper part of the framing, lines of rails are placed, as shown, to carry the traversing cranes employed in the construction of the arch. The highest point of the centering stood 157 feet 4 inches above the bed of the river, and the level of the rails of the viaduct stands about 167 feet high.

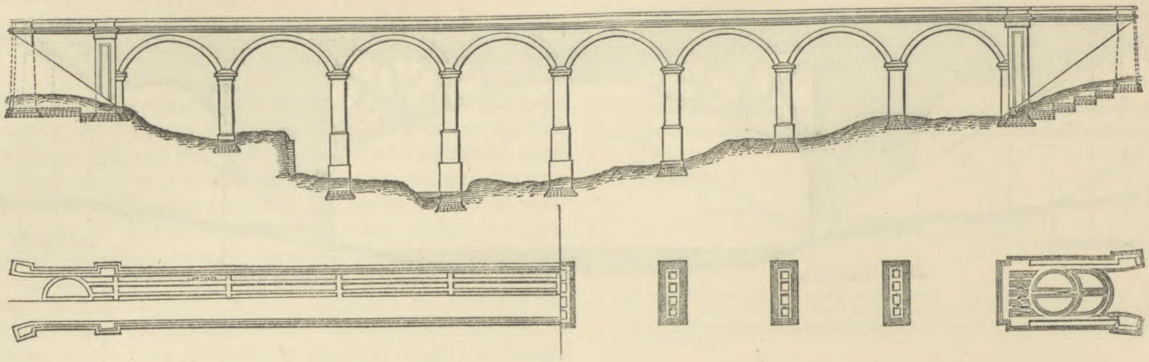

Fig. 42.
Redburn Viaduct, on the Edinburgh and Glasgow Railway.

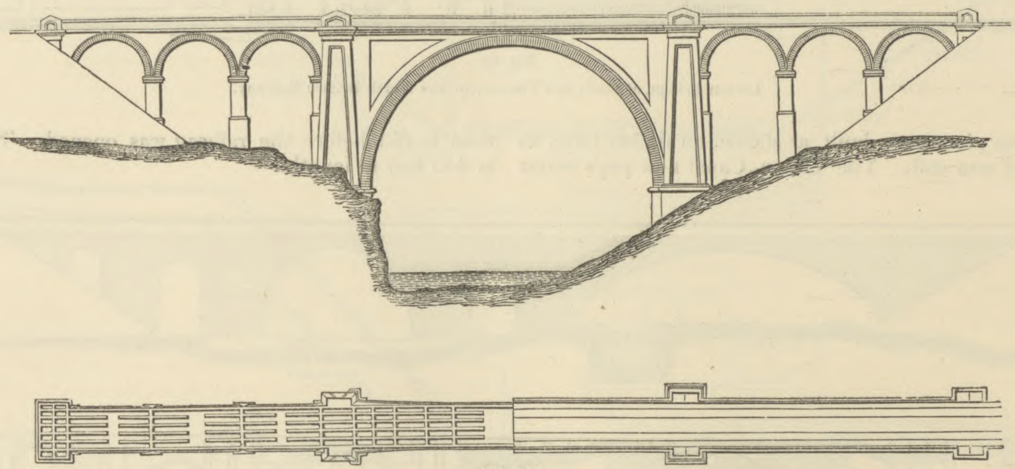

Fig. 43.
Ballochmyle Viaduct, over the River Ayr, on the Glasgow and South-Western Railway.

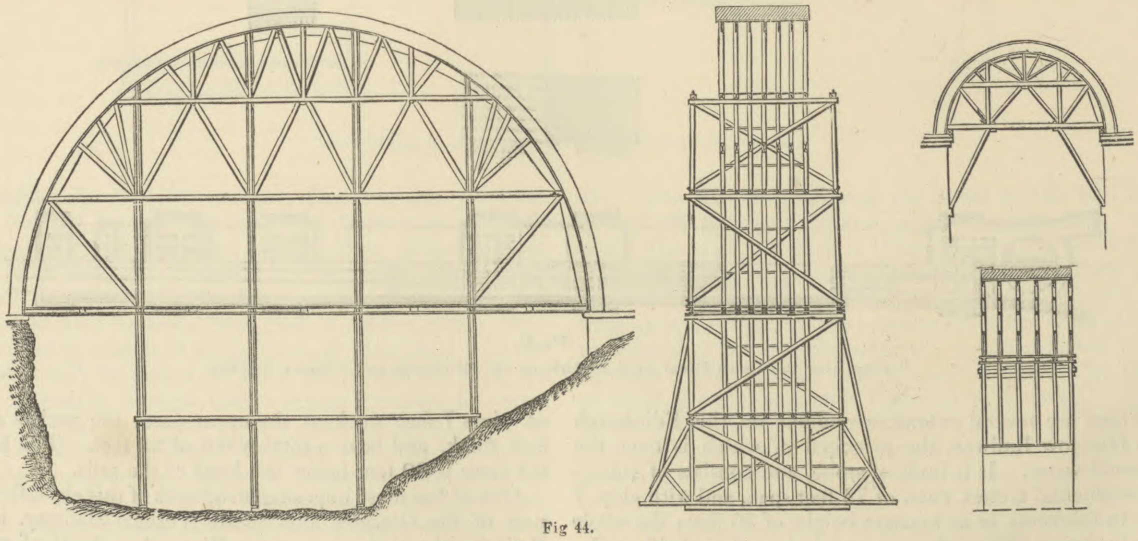

Fig 44.
Ballochmyle Viaduct.—Timber Centering.

The Congleton viaduct, on the Manchester and Birmingham Railway, is perhaps the longest in England; it is of stone, 1026 yards, or more than half a mile in length, and 106 feet high, and it cost L.113,000, or L.113 per yard run. The Dane viaduct, on the same line, is of brick, 572 yards long and 88 feet high, and it cost L.54,000, or L.95 per yard run, having 23 arches of 63 feet span. The Avon viaduct, on the Midland Railway, is of brick, 240 yards in length, 51 feet high, with 11 arches of 50 feet span; it cost L.14,000, or L.60 per yard run. For comparison, it may be stated that the Britannia Tubular Bridge across the Menai Straits, 616 yards long, and 104 feet high, cost L.600,000, or L.98 per yard run.

On the different lines entering London there are 11 miles of brick viaducts in the approaches to termini. At Manchester and other large cities and towns there are miles of similar works, extending often as far as the eye can reach. It is estimated that there are about 55 miles of viaducts in the United Kingdom. (See Iron Bridges.)

Level crossings—of public or private roads on the level of the line—are guarded by gates, one on each side of the line, generally of considerable width, to close the railway when the crossing is opened to the public road. Each gate is provided with a red or danger signal, so that when closed on the line, the signal is visible to approaching trains.

STATIONS.

The great theatres of the operations incidental to the transfer from place to place of persons and goods, preliminary and subsequent to the transport, as well as at certain epochs in its progress, are the *stations.* Stations are either "terminal" or "intermediate." The vast buildings and their dependencies which constitute a chief terminal station of a great line of railway, consist primarily of three distinct departments:—1. The passenger station, appropriated to the embarkment and disembarkment of the passengers, and other objects of traffic, as small parcels and mails, which are carried by the same trains. 2. The goods station which is appropriated to the reception and embarkment, and the disembarkment and discharge, of goods and live stock transmitted by railway. 3. The locomotive, carriage, and waggon depots, where the engines and the carrying stock repose, are cleaned, examined, and repaired. At many intermediate stations the same arrangements, on a smaller scale, are made; in all of them there is at least accommodation for the passenger and the goods traffic.

The stations for passengers and goods are generally in different and sometimes in distant positions; the place selected for each being that which is most convenient for the approach and arrangement of the traffic to which they are respectively appropriated. The passenger station abuts on the main line, or, at termini, forms the natural terminus, at a place as near as can conveniently be obtained to the centre of the population which constitutes the passenger traffic. The goods station is approached by a siding or fork set off from the main line, at a point short of the passenger station. Thus, at Liverpool terminal station, the branch leading to the passenger depot enters the town by a tunnel beneath the streets, and terminates near the centre of the town. The branch leading to the goods station, likewise conducted by a tunnel under the town, is carried to the docks and quays, where the goods are received directly from the shipping upon the rails, and reciprocally from the rails to the shipping.

To avoid the necessity of taking locomotives into the town under such circumstances, and sometimes because the lines are conducted to the terminus by inclined planes, these terminal branches of the railways are sometimes worked by stationary engines and ropes to the point where the locomotive joins the train.

The locomotive station is placed wherever the ground may most conveniently be obtained, at or near to the terminus; in some cases it is found at a distance of 3 or 4 miles.

The selection of intermediate stations, their number, situation, and arrangement, is influenced mainly by the nature, extent, and occupation of the local population; and the first step should be to get a good map of all the places within the scope of the railway, and to mark upon it the population of each place from the last parliamentary census. There is no doubt that the greater the number of stations, the more the travelling increases; for it is found that quick and cheap transit by railway not only increases the existing traffic, but actually creates traffic where none was to be found before. In an engineering point of view, every effort should be made to secure for a terminus or other important station, and for stations generally, a position on the surface, rather than on an enbankment, or a viaduct, or in a cutting. Facilities of access in all directions from the surrounding districts, with good roads in the case of passenger traffic, and good water and railway communication for goods depots, are obviously indispensable. For safety and regularity, there should be an uninterrupted view along the line of railway, by avoiding sharp curves and a complication of over-bridges, in the vicinity of a large station. For a terminus, a slightly-ascending incline on the approaches are convenient, to aid in controlling the ingress and assisting the egress of trains; but the inclination should not exceed 1 in 300, on account of the extra labour of handling vehicles on inclines. Intermediate and junction stations should be situated on dead levels, and when a good length of level can be had, with gradients falling from it both ways, there is the greatest possible facility for working the traffic. Falling gradients towards a station of any kind are obviously objectionable; but unfortunately they cannot in all cases be avoided.

An abundant supply of good water, and ample means of drainage, are important at stations; and it is notorious that in some cases it has been found necessary to abandon stations after completion, from neglect in these particulars. There should be ample area of land to admit of the greatest possible extension of accommodation; and the erection of buildings on land adjacent to the station-grounds should be discouraged. Companies have been compelled to re-purchase, at greatly advanced cost, land originally disposed of by them as "surplus," and generally with a view to building operations. When this course is adopted, prudent managers will take care to secure, in the conveyance, power to re-purchase the freehold at original prices, with allowance for outlay in building or otherwise, by valuation. The expediency of providing new railways with the station appliances necessary for working them in a complete form, before they are opened for traffic, is a question of moment. Some have preferred opening with temporary arrangements; others have constructed permanent works adapted for the greatest extension of traffic. Of late years the latter course appears to have been the most in favour; but whether the result of good general policy, or of a desire to facilitate the closing of the capital account, does not readily appear—probably the former. It may also be due in some measure to the recently-adopted system of guaranteed contracts for the construction of works requiring their completion, with all their adjuncts. The main objections to this system appear to lie in the impossibility of deciding in all cases beforehand upon the proper sites, and the future requirements of the traffic. Errors on these points cause inconvenience in working, and lead to a waste of money, in subsequent abandonment, or in extensive alterations or amendments. Let a comprehensive plan be devised and adhered to, and only such portions be executed from time to time as are necessary for current requirements. In this way, unnecessary pressure upon the funds, when they are generally at a low ebb, may be avoided, and credit is obtained for attention to public wants by appearing gradually to yield to the public demand for accommodation. Engineers are occasionally blamed for alleged errors and oversights, which are due entirely to their inability to make others understand the whole bearing of a scheme when presented on paper. Railway officers generally should possess so much engineering and architectural knowledge as to enable them to judge of the merits of plans whilst yet only on paper; and for the same reason that the engineer should be a machinist, the manager should be an engineer. Difficulties, again, arise from the employment of architects to design and execute station-works for want of special knowledge. In railway works, the function of the architect should be limited to architectural decoration. Buildings with sundry wings, recesses, and returns, though it may be architecturally very effective, induce a marvellous amount of confusion and delay.

In laying out the approaches and station-yard of passenger stations, ample width and space should be provided, with well-defined means of ingress and egress, to facilitate the circulation of vehicles; and the setting-down pavement should be as long as possible, to admit of several carriages discharging passengers and luggage at the same time. The pavement should be wide, and sheltered from the weather by a roof, overhung beyond the kerb, or spanning the roadway; but in all cases free from columns. The position of the main buildings relative to the direction of the lines of rails is the distinguishing feature in terminal stations. When space permits, the usual course is to place them on the departure side, parallel to the platform (see fig. 45); but they are frequently placed at the end of the station, at right angles to the rails and platforms (see fig. 46). Or these two systems are combined in a third arrangement, in which the offices are placed in a fork, between two or more series of lines and platforms (see fig. 47). Of the metropolitan termini, the Great Northern (Plate I.), the Great Western, and the South-Western stations, are examples of the first class; the London Bridge stations, comprising the South-Eastern and the Brighton lines, and the Fenchurch Street station, comprising the North London, Blackwall, North Woolwich, and Tilbury lines, are examples of the second class; and the Eastern Counties, and the London

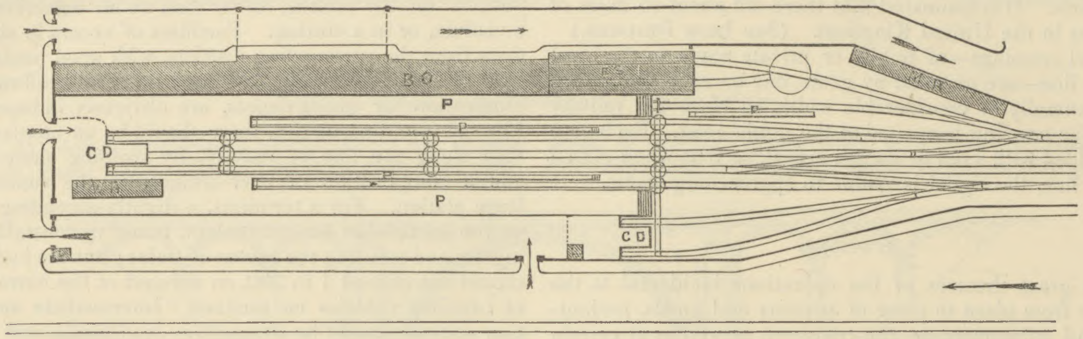

Fig. 45.
Terminal Station.—Offices parallel to the Platform.

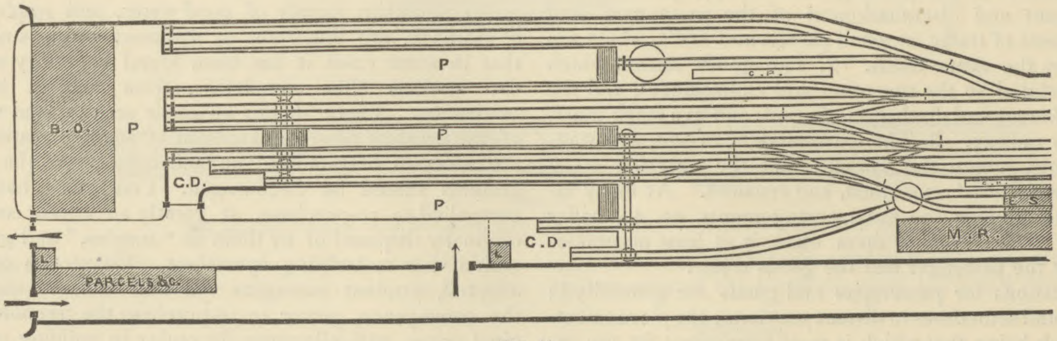

Fig. 46.
Terminal Station.—Offices at the end of the Station.

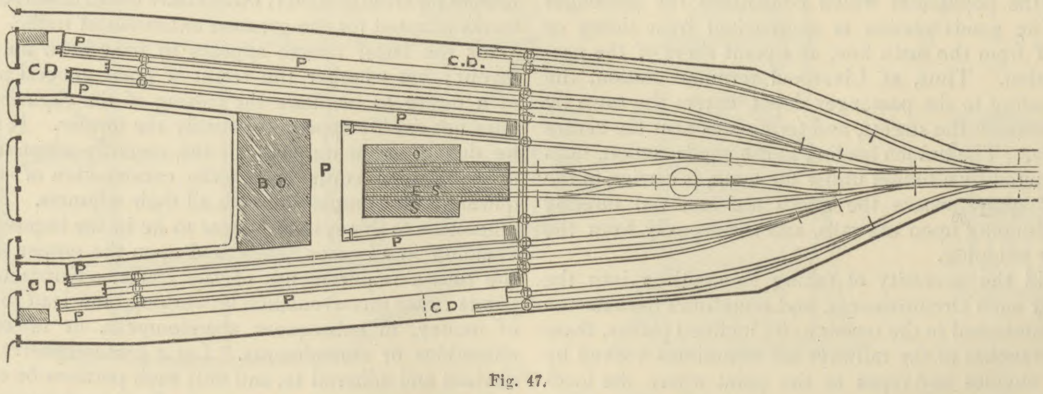

Fig. 47.
Terminal Station.—Offices between the Lines of Rails.

Stations.

and North-Western stations, are examples of the third class.

The first and usual class of stations commands the greatest length of setting-down pavement, ample space for booking and other offices, waiting-rooms, &c., and the shortest average distance for passengers and luggage from the offices to the outgoing trains. Nevertheless, where the traffic is various, involving the despatch of numerous trains to different points in quick succession, and necessarily with perfect regularity, the second system is the best. It admits of increase to any extent in the number of platforms for arrival and departure, with ready access to all; the rapid assortment of trains, with ready access to spare carriage-lines; and with the greatest economy of labour, the greatest facilities for the despatch and reception of trains, and the best general control over the business of the station. But where the frontage is limited, and for long traffic, there is inconvenience in the movement of luggage over a crowded platform. The third plan is probably the least commodious of the three; but it has the advantage of affording two arrival platforms, with carriage-roads alongside, the others having but one so situated. In all the classes, it may be observed, transverse lines are inserted with turn-tables, to place all the lines in compact communication, for turning on or off spare carriages, loaded horse-boxes, or carriage-trucks. Independently of the turn-tables, the lines of rail are connected by switches or points converging towards the two main lines of rail, outgoing and incoming; and thus the assortment and marshalling of trains may be effected by horse or engine power, independently of the turn-tables. Each plan of station comprises one or more large turn-tables for reversing the engine with its tender together.

The most convenient arrangement of the several offices and waiting-rooms, with all their accessories, is very important. A large exterior vestibule or hall, for those waiting for tickets, with ready communication from thence, for luggage, to the platform, clear of the stream of passengers, and a spacious well-lighted booking-office, with the greatest available length of ticket-counter, will give the greatest amount of comfort and convenience to the travelling public. The ticket-counter should be so constructed as to concentrate the business, and to reduce the number of clerks as much as possible; it should be provided with an inner glazed office, raised above the floor-level, to enable the head clerk to keep his eye upon his subordinates. The counter must be provided with numerous drawers for cash, spare tickets and books; and with a large number of ticket-tubes, arranged in series, according to the traffic requirements, each series having the means of being closed when not in use. These tubes should occupy the depth between the clerks' counter and the cash-shelf to which alone the public have access, the cash-shelf being placed breast-high, or about 4 feet from the ground. The ticket-windows ought not to be too numerous or too large, and should be legibly marked with their several distinctions. High barriers have usually been placed before each window to avoid crowding and to secure the pocket; but the recent substitution of wide tables is a decided improvement, as they permit the retention of parcels in the hand, and more effectually expose the pickpocket to detection. The separation of classes, before reaching the ticket-counter, is desirable under some circumstances; but offers many difficulties in arrangement, and increases the labour within the counter. Where the proportion of second and third class traffic is large, there can be no doubt as to the propriety of keeping it distinct, even at the risk of some additional outlay in duplicate conveniences of all kinds. After booking, it is the custom in this country to allow the passengers and their friends to wander almost indiscriminately over the company's premises,—much to the detriment of the convenient working of the traffic. It is a question whether it might not be desirable to adopt the continental system, and to provide large halls or saloons for each class, communicating with the booking-office and platforms, with a view to confine the passengers until a few minutes before the time of starting each train. Restricted space in building-area seems to be the obstacle to the adoption of so great an improvement; added to which, the inherent restlessness of the English traveller in the matter of luggage and its safety might present some difficulty. This, however, could be easily met, and with advantage in many respects, by altering the luggage system, and compelling the public to book and pay for the whole of it at an office distinct from the ticket-counter, and attached to the other vestibule. All railway managers know but too well how much the irregularity of trains is due to the want of punctuality on the part of the public, and in no small degree to their requirements in the way of luggage. Much of this might be avoided, if railway companies had the power of converting a portion of the fare into a toll upon luggage, combined with facilities for disposing of it upon the trains before the platforms are crowded with the passengers.

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In connection with the luggage question, reference must be made to the necessity for providing a spacious cloak or left-property room, which should be accessible from the outside of the station, be conveniently situated with respect to the arrival platforms, and be furnished with every requisite for ready stowage and sorting. If built fireproof, with an upper floor to serve as a lost-property store, additional safety and economy of space would be obtained.

The system of dividing the parcels office into two, distinguishing them as "in" and "out," or "up" and "down," does not seem desirable, as requiring more clerks and attendants than is otherwise necessary. One large, lofty, and well-lighted office, to combine the whole business, is preferable, if it can be placed centrally, so as to be readily approached from both platforms; but it is essential that there should be equally good access from the outside, with complete space for the vans and town-carts to stand under cover without impeding other traffic.

The same remarks apply to a certain extent to the position and arrangement of the telegraph offices; the main object being to give every facility to the public, without actually admitting them within the station premises, securing at the same time free communication with the platforms and offices for traffic purposes. Next in importance to the arrangement and construction of the offices are those of the platforms. The practice with regard to the height above the rails has varied considerably, the recent tendency being to raise them much higher than was usual at first. Three feet may be stated as the limit in this respect, but that height has probably been adopted as a necessary consequence of the increased width of the carriages, which prevents the use of a second step. Where there is no impediment, a mean of about 2 feet has seemed advantageous, as being sufficiently convenient for entering or leaving the carriages, and being safer for the station people, who frequently have to cross from one platform to another. Too much attention cannot be given to the necessity for obtaining the greatest possible width of platform. Where the platform is used on one side only, the width ought never to be less than 20 feet; and when both sides are required, 30 feet, or even 40 feet, should be allowed. The best mode of constructing the platform is undoubtedly with stone slabs laid hollow upon longitudinal walls, so as to admit of carrying beneath it the water and gas pipes, telegraph or signal wires, and the general drainage, with free access to each. Slabs of sawn slate have been used largely, and are found to be clean and quiet; but they are not to be depended upon for safety, as it is nearly impossible to obtain them thoroughly sound. There is also always a risk of lamination on the under side, which may proceed without dis-

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covery until the slab gives way suddenly under a weight of luggage or passengers. Hard Yorkshire landings are preferable, but they require rubbing on the upper surface, to avoid the accumulation of dust and dirt. Cutting out for turn-tables and openings for cross-lines of rails are frequently inevitable difficulties, which have given rise to various ingenious contrivances, as shifting-stages, draw-bridges, &c. The substitution of "traversers" for turn-tables goes far to remove one class of impediments, and the other is best met by the use of easy inclines, with crossings on the rail-level. Where the platforms do not exceed 2 feet in height, and the surface is smooth, gradients of 1 in 10 are not too steep for luggage barrows, nor are they dangerous in a crowd. The sorting of the different classes of passengers preparatory to entering the carriages is sometimes practised by means of barrier enclosures on the platform, as on the Greenwich Railway; but this is practicable only in cases where the trains are always uniform in length and arrangement. When the nature of the traffic renders it necessary, and time can be spared, the examination of the tickets before admission to the carriages, or before the starting of the train, is a more effective and simple precaution. Many serious accidents having arisen from carelessness in getting in and out of the trains while in motion at the platforms, attempts have been made by the companies, urged by the Board of Trade, to reduce the chance of casualty by some kind of barricade along the edge of the platforms. The danger of placing fixtures so near the sides of the carriages as would be necessary to obtain the desired result, seems to have hitherto prevented the adoption of any plan calculated to meet the case; but it may be worth consideration whether a system of rising barriers, counterpoised and guided from below, might not be contrived so as to secure safety, and to some extent to answer the same purpose as would be gained by separate waiting-saloons on the continental plan.

The greatest advance in station-works during the last few years has been the roofing over, in one span, of the lines and platforms, the main object being to do away with intermediate supports of every kind. That columns or pillars in a station are objectionable, seems to be agreed upon on all hands; but where two or more spans can be so arranged as to bring the columns in the centre of wide platforms, the great extra expense of large spans may be saved, and with some attendant advantages. Whatever may be the spans adopted, every effort should be made to obtain height, light, and ventilation. Too large a proportion of glass in skylights is to be avoided, as it is apt to render the heat in summer so great as to endanger the health of the men employed, and to injure the rolling stock beneath, to say nothing of the expense of continual repairs, and the difficulty of preventing leakage and condensation. Durability is of course the great desideratum; hence iron and slate will naturally form the chief materials of the structure. It is impossible, however, to avoid the use of timber to a large extent, particularly for the sash-bars for the skylights and the boarding for the slates. Iron sash-bars, though largely used, are not satisfactory in practice, as the effect upon them of changes in temperature is so great as to render it impossible to keep the glass water-tight. The slating is sometimes attempted on iron battens, without the intervention of boarding; but the unfinished effect below is so bad, and the deterioration of the battens so rapid, that there is nothing to recommend such a mode of construction. When boards are used to carry the slates, they should be laid horizontally, and not diagonally or vertically, with a view to discover readily through the droppings from the joints the position of any leaks in the slating. Louvre ventilators, from their exposed position on the summit of the roofs, should be made moveable, with the means of closing them at pleasure, as has been done with those at the Crystal Palace. Without such a precaution, there will either be defective ventilation or continual annoyance from the driving in of rain or snow. The use of galvanized sheet-iron, whether corrugated or flat, is not to be recommended as a covering material in or near a large town, as it will be found to perish rapidly, either through the galvanic action of the metallic compound, or from the chemical effect of the sulphurous fumes of coke and coal, when largely consumed in the immediate vicinity. That material may, however, be advantageously used in the country.

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The best position for the horse and carriage docks is a question not easily decided. Experience would lead to the conclusion that two sets, one for arrival and one for departure, are not absolutely essential; but if concentrated at one point it is doubtful at which end of the platforms they will work the most satisfactorily. Looking to the greater importance of time in the despatch of trains, as compared with a certain amount of delay attendant upon unloading on arrival, the balance of advantage points in favour of placing the docks at the extremity of the station-lines, where they may be so arranged as to communicate equally with both series of rails, securing at the same time ample length of siding space for spare stock. This system has been in use at the London terminus of the Brighton Railway for some years, and answers the purpose even in times of the greatest pressure; whilst at Brighton, where the plan is unavoidably reversed, outgoing trains are necessarily stopped after starting from the platform, to allow of carriage and horse boxes being attached—an arrangement obviously defective. Despatch and regularity will be found to depend not so much on the number of each kind of dock as in the perfection of the means provided for securing a constant succession of trucks, by passing off the loaded ones, and bringing in those that are empty, without allowing them to impede each other. The details of construction require attention, particularly as to the surface, which should be wood pavement for the sake of cleanliness, and to prepare horses for the floors of their boxes; also as to the means of admitting the buffers and draw-hooks without injury either to them or to the structure, the difficulty being to provide for variation in the heights of vehicles when loaded or empty, or when not uniform in build.

The correct arrangement and appropriation of the several lines of railway in a terminal station materially affect the economical and efficient working of the traffic. Circumstances will necessarily indicate a particular principle to be followed in each case, but there are a few general rules which cannot be overlooked. It is essential that every traffic-line, both in and out, should be provided with one or more spare sidings, in addition to those set apart for the break-vans, horse-boxes, and carriage-trucks, and for the locomotive department. All these lines should communicate with each other by means of points and crossings, to allow of shunting with engine-power, and to reduce to the lowest limits the number of turn-tables or their substitutes. Sharp curves are of course objectionable, and they ought never to have a radius of less than 800 feet. The use of self-acting points or switches may be assumed to be now universal, though it is believed that some managers still prefer the old eccentric or level switch, because they involve more constant attention on the part of the pointsman, and fix responsibility with greater certainty in case of casualty. The extensive use of three-throw and four-way points is sometimes objected to, as being more complicated and costly, but if they are well made and properly fixed, there is no real difficulty in working them, and siding space can frequently be so gained with much advantage. Turn-tables in a passenger-station, and especially when placed on the traffic-lines, can only be viewed as necessary evils. The wear and tear both to the rolling and to the fixed stock, the intolerable noise when passing over them and interference with the line of platform, and the waste of space between the lines of rails, are objections sufficiently obvious to condemn turn-tables where they can be dispensed with. The late Mr C. H. Wild secured some economy in width by the introduction of his three-way tables, fixed diagonally; but his plan of using inclines at the intersection of the cross-rails, to save the hammering of the passing wheels, is not approved, as it has been found injurious to the flanges of heavily-leaden vehicles, locomotives, and tenders. By far the best substitute for the turn-table yet introduced is the traverser. If well made and carefully worked, and attended to, the shifting of carriages from line to line can be performed without extra manual labour or interference either with the rails or the platforms. In cases where the edge of the platform is unavoidably indented by the position of a turn-table in the line adjoining, there is a choice of contrivances for preserving the line when the table is not in use; such as leaves folding back on hinges, circular trollies on low wheels, stages to slide or roll back above or below the platform, and sundry other plans, all of which are but so many additional sources of obstruction and expense; hence if the turn-tables can be so placed as to fall at the ends of waiting trains, the least evil seems to be to leave the platform open with barriers to prevent accidents.

The whole area of every large station ought to be paved with stones, or with Staffordshire blue bricks laid in mortar, great attention being paid to the surface drainage. Having regard to conveniences for washing carriages and general cleansing purposes, it will be found best to form the rise in the intermediate space, and the channels and gratings within or between the rails. A longitudinal timber road, with bridge-rails, will be found to give the greatest facilities for effective paving or pitching.

It is assumed that every terminus will be provided with one or more engine turn-tables according to the nature of the traffic, but it does not appear to be the general practice to construct engine-sheds as a part of the station, probably because most lines have suburban depots, which offer greater facilities for the purposes. If, however, space can be afforded, economy and convenience are obtained by placing a shed in communication with the turn-table and coke-lines large enough to contain as many engines as usually stand about during the day, or come out for working the morning trains. The lines leading to such a shed should connect directly with those of arrival and departure, and be distinct from those appropriated to the turn-table and the coke waggons; but the best arrangement of all is, to place the shed on a loop-siding connected at both ends with the main lines, so as to obtain the easiest means of access at all times. Good light and ventilation are essential points in a well-constructed engine-shed, with ample height to the roof, and width between and outside the rails. The gas-fittings should be such as to admit of examining any portion of the machinery with accuracy; and the water should be laid on with sufficient pressure to thoroughly wash out the boilers from time to time. It is not unusual to make the large water-tank for station use, do duty as a roof to the engine-shed. To this there can be no objection, provided the tank is fixed at a sufficient height to secure perfect ventilation; and this will also improve the pressure at the points of delivery. Such tanks cannot be too large, and should never hold less than one week's average consumption, to meet the chance of failure in the means of supply. Each line of rails within the shed should have engine-pits, properly drained, and contrived to admit of examining and repairing all parts of machinery from below; similiar pits should be constructed on each line outside the shed, to admit of raking out the fires or removing the clinkers, —operations which are best done in the open air. The arrangements for coking and watering are naturally connected with the turn-table and engine-shed. Large coke-sheds or stores are now generally considered unnecessary, it being found more economical to bring up the supply from the ovens or depôts as wanted, delivering direct from the waggon into the tender. For this purpose, coke sidings should be laid alongside those leading from the turn-table, with a platform intervening, on which the coke can be weighed or measured in transit. Much time is lost in watering if the cranes are not fixed in proper numbers or position; nor is sufficient attention generally paid to having them, and the service mains leading to them, of large diameter. The gain of a few minutes in filling a tender is frequently of vital importance in working the traffic to advantage.

The collection of tickets is a branch of railway business which generally involves special provision in the arrangement of a terminus. The practice of stopping the trains for this purpose at the entrance of the station is objected to by the public, but it cannot be avoided unless there is some station immediately preceding the terminus of sufficient importance to combine traffic purposes with collecting the tickets. When such is not the case, the next best course will be to utilize the time spent in collection by running the engine round from the head to the end of the train, instead of drawing it up to the platform. Every ticket platform is usually furnished with convenient offices and mess-rooms for the head collector and his men, fitted up for sorting and arranging the tickets, keeping the books, and taking their meals: attention of this kind to the comforts of the men is always highly appreciated by them.

The road for carriages-in-waiting, which adjoins the arrival-platform, should be wide enough to permit at least two ranks to stand, with passing room clear of them; and it is essential that the means of access should be distinct from that of exit, to secure a continuous stream of vehicles, and to avoid delay in turning or meeting others in an opposite direction. Protection from the weather and from cold draughts, by means of roofing and side walls, is important, where there is a good first-class traffic, because attention in a particular so apparently trivial will not unfrequently bias the owner of valuable horses in favour of one line as compared with another. The pavement should be of wood, creosoted, if the ventilation is good, and constant attention should be paid to sweeping and cleansing, without which the ammoniacal exhalations will prove injurious to the health of the men employed at the station. At the entrance to the cab road there should be a large area, sufficient to hold at least 100 cabs, as a reserve to meet the requirements of the heaviest trains, with proper conveniences of every kind, both for the men and the horses; and at the exit should be placed the cab-inspector's office for registering the departures.

Attention to the material comforts of the men employed, and particularly of those much exposed to the weather in the execution of their duties, being an important element of success in securing good and cheerful service, it is obviously politic to furnish every large station with distinct mess or waiting rooms for the engine-drivers, guards, porters, switch-men, &c. These should be spacious, well ventilated, lighted, and warmed, and be fitted with good cooking apparatus, cupboards, lockers, and tables, and be so placed as to be near the work of each class of men. Connected with the mess-rooms may be combined with advantage offices and store-rooms for the superintendents of the different departments, such as the permanent way, locomotive, and carriage superintendents, police, &c., thus giving each an opportunity of keeping an eye upon his men, and of readily communicating with one another.

Experience will dictate the necessity for constructing sundry other buildings as accessories to the effective working of a busy terminus. The lamp-room should, if possible, be detached and be fire-proof, with warm store-rooms for oil, tallow, and waste. The dressers for cleaning and trimming should be covered with polished zinc in preference to slate. The shelves or brackets for the lamps should be sufficiently extensive to hold the largest number in use, and there should be ready means for disposing of the waste and rubbish as they accumulate, to avoid all risk of fire. It is frequently found good economy to have a few small shops for the different classes of mechanics required for repairs and for odd jobs, such as smiths, gas-fitters, joiners, plumbers, &c., much time being wasted in sending men and materials to and from the general workshops of the line. Unless a large hotel is attached to the station, it will be found necessary to construct stabling for post-horses, and coach-houses for private carriages on arrival, or when waiting to go by the trains. The construction and arrangement of the closets and urinals are too important to be dismissed without brief notice. Comfort and decency will best be consulted by distributing the conveniences amongst separate buildings in various parts of the station area, and appropriating some of them to different classes of employés, distinct from those for public use. Urinals should be freely ventilated, and be paved with slate or some other non-absorbent material; the walls should be lined with glazed tiles for 7 feet or 8 feet in height, and the divisions and backs be of enamelled slate. Risers are objectionable, and quite unnecessary if the floor have a sharp incline towards the channel. Closets, whether for the passengers or for the company's men, cannot be too simple in their construction. All brass work should be avoided, or it will be stolen. The walls should be lined with glazed tiles, or be grained and varnished, to prevent the surface being defaced; a shelf should be provided in each closet for depositing parcels, and water should be turned on by the action of the door in opening and closing. In fact, a constant and abundant supply of water both to closets and urinals offers the only chance of confining within tolerable limits the annoyances necessarily connected with such structures. The importance of keeping a large station constantly swept and cleansed is too often overlooked, in consequence of the difficulty of disposing of the dirt and rubbish which so rapidly accumulate. To meet this, proper receptacles should be distributed at various points, with shoots or traps to receive from above, and means of access below for the scavengers' carts.

The details given thus far are obviously intended to apply in the main to metropolitan termini, or to those of equal importance and extent. The leading principles, however, will be found available, more or less, according to circumstances, for the arrangement and construction of terminal stations of every description. For the purposes of illustration, attention will now be drawn to the general features of small terminal stations on branch lines of railways, with the peculiarities of each, and the advantages and defects which have been met with in working them. The several parts of the stations are distinguished in the illustrations by their initials, thus:—B.O., Offices, &c.; P., Platforms; C.P., Coke Platform; W., Warehouse; C.S., Carriage-Shed; E.S., Engine-Shed; C.W., Cattle-Wharf; C.D., Carriage-Dock; G.Y., Goods-Yard; T.H., Tank-House; G.W., Goods Warehouse; L., Lodge; W.R., Waiting-Rooms; M.R., Mess-Rooms; S.B., Signal-Box.

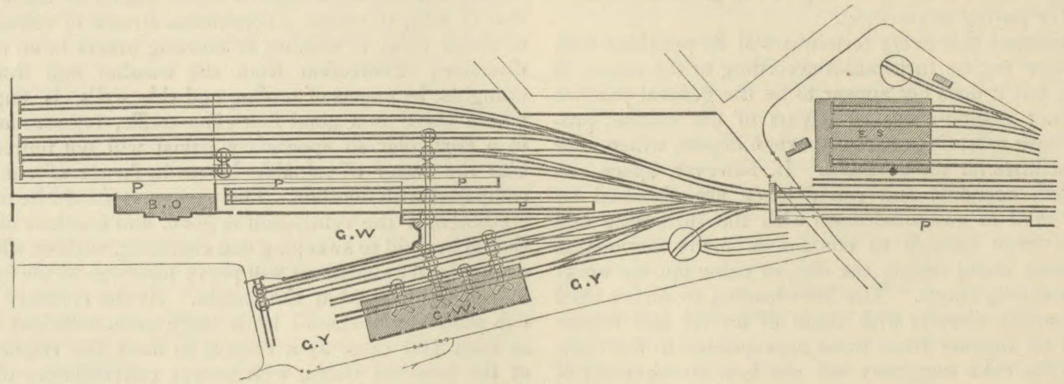


Fig. 48.

The first (fig. 48) is at the extremity of a double line of railway in an important town on the coast, and accommodates the traffic and trains of two separate companies. The peculiar shape of the land originally purchased, its position with relation to that part of the town from which the bulk of the traffic is derived, the necessity for providing means of extension, and the existence of a public street crossing on the level at the very entrance to the station, were the chief controlling elements in the original design. It will be observed that, by placing the offices and both platforms on one side, with the spare carriage lines adjoining, the frontage to the main street is economized, and left free for carrying one or more of the lines forward, as has since been done. The arrival and departure platforms are both accessible from the main lines at the same time, and are made long enough to allow one train belonging to each company to arrive and depart, or to stand one after the other; whilst an extra line, with its platform, is provided for special occasions. The great length of the station offers every facility for abundance of spare lines, which can be roofed over to any extent that may be desired at a moderate cost. The horse and carriage loading arrangements are combined with the goods and cattle lines and docks, and with the spare carriage sidings, and the whole of this department of the business is worked with great success. The approach, and the yard in front of the offices, are convenient as regards length for setting down and taking up, but are too much confined and narrow. The road should have been 50 feet wide at the least, including the footway, and the yard not less than 80 feet in width with roofing over some part of it. The position of the goods department is satisfactory, being sufficiently near to the town without any objectionable interference with the passenger station. The arrangements were not, however, so good as could be wished, having been devised under the impression that the goods traffic of two companies could be worked under joint management as easily as that of passengers. Experience has proved that separate warehouses, yards, and sidings ought to have been constructed, and that the whole accommodation should have been on a more extensive scale. The engine-sheds in duplicate, turn-table, offices, mess-rooms, shops, tanks, &c., are as well placed as the shape of the land would permit; but the table is too far from the platforms, and involves some loss of time, and the employment of extra police, to secure safety with so much crossing of the main lines. A second engine-table will be seen adjoining the goods-yard, which was found convenient, both to save time in turning, and to bring into use, with additional sidings, sundry corners of land which would otherwise have been wasted. The great defect in this station is the existence of a level crossing and a foot bridge close to the entrance, the thoroughfare being now a street, though originally but a narrow lane. Attempts have been made both by the public and by the Board of Trade to compel the companies to build a bridge, but neither being able to confer permissive or compulsory powers of purchase, nothing has been done in the matter.

Fig. 49 shows the outline of a station forming the terminus of a small single branch, the nature of the traffic on which necessarily admits of much simplification in all its arrangements. The trains being light, and only moving in one direction, a single platform suffices for passengers; but as goods are frequently attached to such trains, it becomes necessary to combine the goods-yard as intimately as possible with the passenger lines, so as to avoid loss of time on the arrival of the trains, and to clear the trucks, and leave the carriages ready for going out again, when the engine has been turned and brought round. On short branches, to which alone the single-line system ought to be confined, it is generally an object to despatch the incoming train back again as soon after its arrival as the engine can be connected for the purpose. It is therefore convenient to place the engine-table at the end of the station, beyond the platform, instead of connecting it with the engine-shed, as heretofore recommended, so that the engine may be turned round, run round the train by means of the middle spare line, and be hooked on, ready for starting, with the least possible delay, the coke and water being taken out after these operations, and while the outgoing train is being loaded. A station of this character should always be so arranged that a second line of way, as well as spare lines, may be added without involving the removal of any permanent works or buildings; in fact, it should combine in one the character both of a terminal and of an intermediate station. This rule will determine the position of the warehouses, goods and coal-yards, engine-shed, &c., and regulate the number of sidings. Reference to fig. 49 will show that such a course can be adopted by the simple removal of the carriage and cattle docks to the goods-yard, and of the engine-table entirely, the latter being no longer requisite. The position of the engine-table is convenient for working the goods traffic, and obviates the necessity for using any smaller ones. Attention may also be drawn to placing the warehouse directly opposite the offices, as affording facility for throwing a light roof from one to the other, to serve as shelter to the platform, and as cover for the spare carriages. Every such station should be provided with gas-works, large enough not only to supply its own lights, but the town also; as in most cases it will be found that the inhabitants are desirous of such a convenience. The proceeds from the sale of the gas and the carriage of coals will secure a handsome profit to the company, and the introduction of gas-lighting will encourage improvements in the town tending to increase traffic. The same course may be recommended with regard to water-works, when the station stands high, and good water can be obtained on the spot; added to which, there is economy in combining the gas-retorts with the boiler furnace. Too much stress cannot be laid on the importance of providing at first abundant space for goods traffic, with large yards for coal, lime, timber, &c., and plenty of siding space. Such traffic is generally by far the most remunerative for some time after the opening of a line of the nature indicated, and can only be secured by offering greater facilities. It should also be noted, that it is desirable, for reasons previously urged, to combine with the station comfortable residences for the station-master, porters, engine-drivers, and guards.

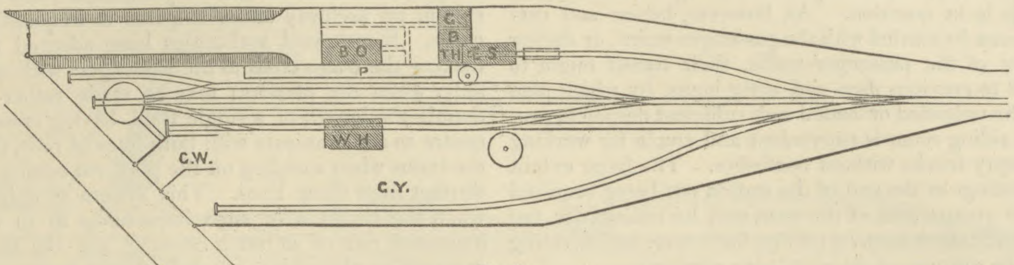


Fig. 49.
Branch Terminal Station.—Single Line.

Before leaving the subject of terminal stations, attention may be directed to one of a class indicated in fig. 50, the arrangements of which are peculiarly adapted for the working of unusually heavy passenger traffic on particular occasions, such as races or fairs. These consist mainly in placing a large number and considerable length of spare sidings at each end of the platforms, to admit of trains arriving, discharging, and drawing out of the way in rapid succession, and *vice versâ* on the return journeys. This system has worked very satisfactorily, and enables an almost unlimited amount of traffic to be conducted with perfect ease and safety. It may be objected, that with two platforms there will be

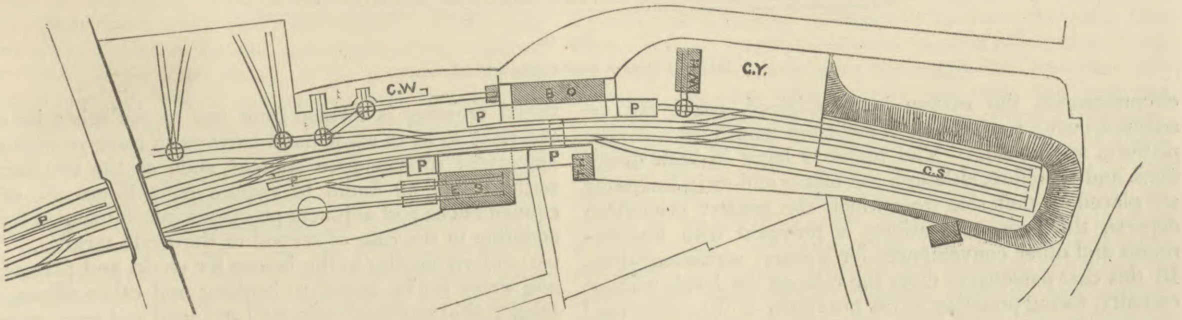


Fig. 50.
Branch Terminal Station for heavy Passenger Traffic.

some danger in crossing to the one opposite the offices; but in practice it is found that one platform only is necessary, as the traffic will always be in one direction at the same time. The second platform is convenient for special or foreign trains; and all danger can be avoided by connecting the two by a bridge over or under, though such an expedient is objectionable for this class of traffic. The small extent of carriage and horse docks may also be thought a defect when race traffic is in question. As, however, horses and carriages cannot be carried with the passenger-trains, or during the height of the passenger-traffic, their transit ought to be limited to previous days and early hours, by which plan they can be unloaded or loaded with sufficient despatch, provided the siding room is convenient and ample for working off the empty trucks without confusion. The large extent of spare sidings at the end of the station not being required during the greater part of the year, may be utilized for the time, to much advantage, by roofing them over, and devoting them to the purpose of stowing spare carriages.

Intermediate Stations.—Intermediate stations vary to a greater degree than terminals. The area to be occupied will naturally depend on the importance of the town, village, or district to be served; the character of the works on that of the railway where the station is to be placed; and the position of the offices, warehouses, and other buildings, on the special requirements of the traffic in each case. As respects extent of space and accommodation in the way of works, it has already been suggested that it is best to err, if at all, on the side of extravagance; but the situation of the offices, waiting-rooms, &c., relative to the platforms and lines of rails, when there are more than one, is a point of considerable importance. When the station is situated midway between towns of such extent as to cause an equal flow of traffic in each direction, offices may be requisite on both sides of the line; but where the bulk of the traffic tends one way only, it will be desirable to concentrate them on that side which involves the larger number of passengers and the greater extent of waiting space. This rule, again, will be modified by the position of the town or the district from whence the traffic is to be derived, especially if the railway lies on the natural surface, and adjoins a public road, whether crossing on the level or otherwise. This last condition is the most frequent one; and as some portion at least of the traffic must be expected to depart from the platform opposite to the offices, provision must be made for crossing with the least amount of danger to the public. When the passengers are numerous in both directions, over-bridges, as before stated, are objectionable; and in a surface-station an archway under the line is frequently impracticable. Some good authorities have adopted the plan of making the trains cross to the passengers with one platform only, when the platform may be made rather more than double the length of a single train, having crossings in the centre to communicate with both lines of rails, thus placing the trains when standing on the platform upon a loop-siding distinct from those lines. This system is only admissible when the traffic is of such importance as to warrant the increased risk of so much crossing, and the extra cost of maintaining the additional staff of men necessary to insure safety; in fact, it should never be adopted unless where all the trains are likely to stop, as the number of facing-points increases the elements of danger and of delay to the thorough traffic. Much will also depend upon the probable uniformity in the length of all the trains, as it is obvious that special provision must be made for the longest possible train to approach and to leave each station without interfering with the other; so that if there is much variation in the general length, unnecessary expense may be incurred without commensurate advantage. At the same time, it must be admitted that this system offers great convenience to the public when there is much first-class traffic and a large quantity of baggage; and it is especially applicable when the station partakes of the character of a terminal one, or is used as a receiver from branch or neighbouring lines, offering, as it does, great facilities for making up and receiving trains which may run over a portion only of the main lines, as well as for attaching and detaching the carriages intended or used for branch traffic.

An example is given (see fig. 51) of a large station where from the position of a level crossing, combined with other circumstances, the system last explained could not be adopted, owing to the want of sufficient length for a double platform on one side. The traffic is large in both directions, and therefore, although the offices and main buildings are placed on that side from which the greater proportion departs, the opposite platform is provided with waiting-rooms and other conveniences for general accommodation. In this case passengers cross the rails on the level, without casualty, owing probably to the proximity of the public road crossing where policemen are always in attendance. The placing of the platform wall opposite to the main buildings affords facilities for throwing a roof over in one span, which shelters both platforms most effectually at the least cost; and hence a satisfactory result is obtained, as there is a considerable amount of luggage to be conveyed across from one platform to the other. The extremities of both are furnished with easy inclines paved with smooth stones, and a paved crossing is formed from one to the other between the rails, so as to allow hand-barrows to traverse with ease. Important intermediate stations, such as the two last described, will be found to require most, if not all, of the conveniences and adjuncts previously recommended for the adoption in the case of second or third rate termini. This particularly applies to the houses for clerks and porters, gas and water works, complete booking and other offices, with comfortable waiting-rooms, well arranged and spacious warehouses for goods and coal and timber yards, with as much length of siding as can be obtained. Relative to the construction of houses for the company's servants, in connection with the general business premises, it may not be out of place to observe that there should be no door to communicate between the residence and any of the offices, both because such facilities frequently lead either to robberies or to neglect of duty, and especially because the whole

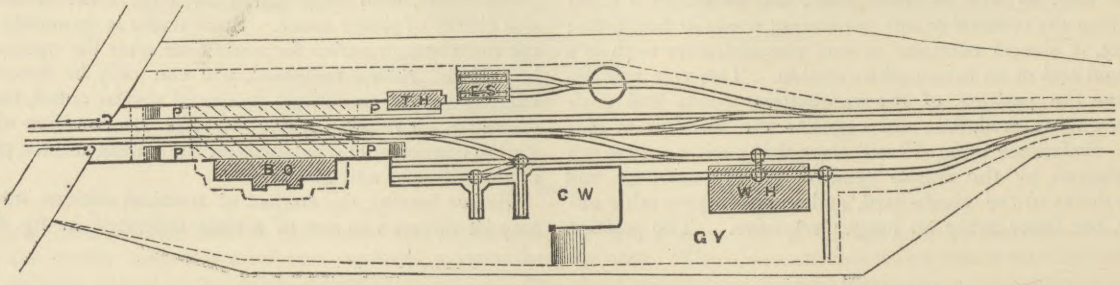


Fig. 51.

Railway Station with opposed Platforms.

block of buildings will be rendered liable to rates and taxes as an inhabited house.

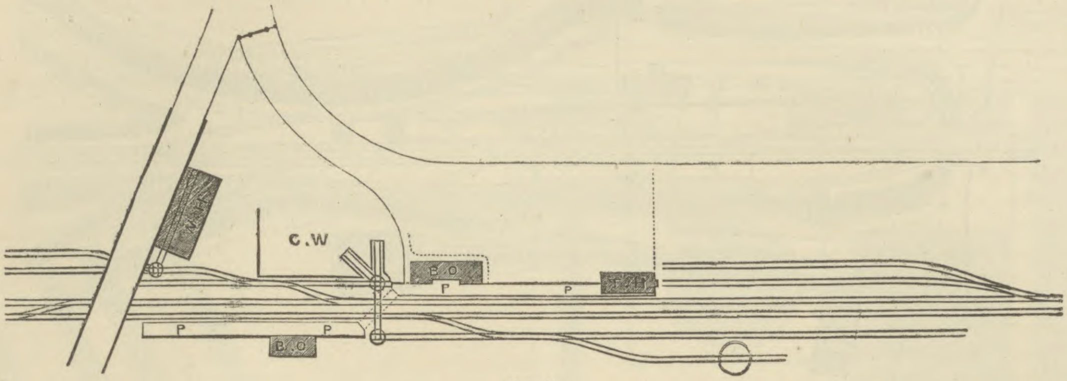


Fig. 52.
Railway Station with alternate Platforms.

The leading defect in the arrangement of the platforms (fig. 51), where no foot-bridge over or under is provided, lies in the difficulty of crossing where two trains arrive at the same time. This is sometimes met by arranging the platforms as shown in fig. 52, where the end of one is placed nearly opposite to that of the other, with a paved crossing between them, so that a clear space can always be maintained between the ends of the two trains when standing at the platforms. Such a plan offers many facilities for connecting sidings with the main lines and with one another, but is open to the objection of increased cost in consequence of the extra length, and is not popular with the public, on account of the greater distance to be traversed both by passengers and luggage.

It has already been urged, that when a station is necessarily situated on an embankment or in a cutting, it is true economy, in the first instance, to raise or to excavate a sufficient area to allow of conducting the whole of the business at the platform level, with easy inclined approaches to and from the public road. This applies particularly to cases where there is much "long" passenger traffic with heavy luggage, besides the ordinary horses, carriage, cattle, and goods business. Steps up or down ought, as a general rule, to be avoided at any cost; but when the station is situated near any large town, so that the traffic is chiefly confined to passengers, they may be adopted with some advantage, particularly if the line is in a cutting, and the offices can be placed over it and adjoining the public road-bridge, as at New Cross Station, near London. Peculiar facilities are offered by this plan when communication is desired with a middle platform, as must be the case when three or four lines of rails are used. It will then, however, be found necessary to build waiting-rooms on each platform, as the public will not be content to remain on the upper level until the trains arrive. There may also be some objection to the separation of the station-master from his platform duties, if he is confined to the booking-office; but this is partially met by the facilities given for general supervision over the subordinates below, as well as for an economical and simple concentration of the entire business of the station. A somewhat similar system is available when the station is on an embankment, and the offices can be constructed in connection with a bridge over the public road. But the advantages are by no means the same, as there is no power of supervision from the office; whilst the public will always object to the inevitable darkness, damp, and noise. Nor are there the same reasons for adopting the plan, as it is easy upon an embankment to place the offices on one side, and to connect them with the opposite or intermediate platforms by means of archways under the rails, which are not objectionable if well lighted and ventilated.

The junction station is a special variety of the intermediate or local class, which presents questions of too much importance and interest to be dismissed without distinct notice, however brief. Where two double lines of railway converge, it is frequently open to the engineer either to place the buildings and yards in the fork between the two, or beyond the point of junction. When the means of access for the public and of communication between the platforms are equally convenient, in either case he will be guided in his decision by the peculiarities of the traffic. If the branch or secondary line is simply a feeder to the main trunk, and the trains on both are worked in connection with each other, whether by attaching or detaching special carriages, or by transferring the passengers, the balance of convenience will lie with the second system, provided the sidings are so arranged as to enable the branch or subsidiary trains to clear the main lines before the others are due. If, on the other hand, the two lines joining belong to distinct companies, or are worked independently of each other, it will be far more convenient to adopt the first system, because two trains in both directions can draw up at the same time, without interference with each other, and special conveniences for accommodating subsidiary traffic or varying the size of the several trains can be arranged with the greatest facility. Judging from the general practice throughout the country, the latter seems to have become the more popular course.

Junction-stations for single-line branches may be arranged with greater simplicity, as the traffic upon them is generally of less magnitude, so that passengers and luggage can be transferred over a platform without the necessity of attaching or detaching carriages to or from the main line train. Fig. 53 supplies instances to meet either case, being the plan of a junction with two single-line branches, one of which connects directly with the main line, and the other only through the medium of an intervening platform, facing-points in both cases being avoided. On such a system, the offices will be placed on the side opposite to the through-line, the several platforms being connected by means of an archway under them and the rails wherever it is practicable. Waiting-rooms and their adjuncts must necessarily be placed on the further platform, and a roof in one or more spans should cover the platforms and sidings, such roofs being inclosed on both sides, and, as far as practicable, at the ends, to protect the passengers from the weather, to which their exposed position will render them peculiarly liable. Engine and tank houses, gas-works, engine-tables, and rooms for the men employed, will also prove as essential a portion of the general arrangements as in the case of terminal stations.

King's Cross station (Plate V.) is the most recently constructed, and the most extensive metropolitan station. It was built originally for the use of the Great Northern Railway only; but has recently been modified and extended in the goods department to accommodate the traffic of the Midland Railway, which, by an extension across the country from Leicester station to Hitchin station, on the Great Northern line, has found an entry into London by King's Cross, independently of the London and North-Western route. The whole station, for passenger and goods traffic, and for the purposes of the locomotive department, covers 26 acres of ground, and contains 18½ miles of lines of rail. The ground from King's Cross to Holloway, 1½ mile long, comprising the ground covered by the passenger and the goods stations at King's Cross, cost about L.470,000.

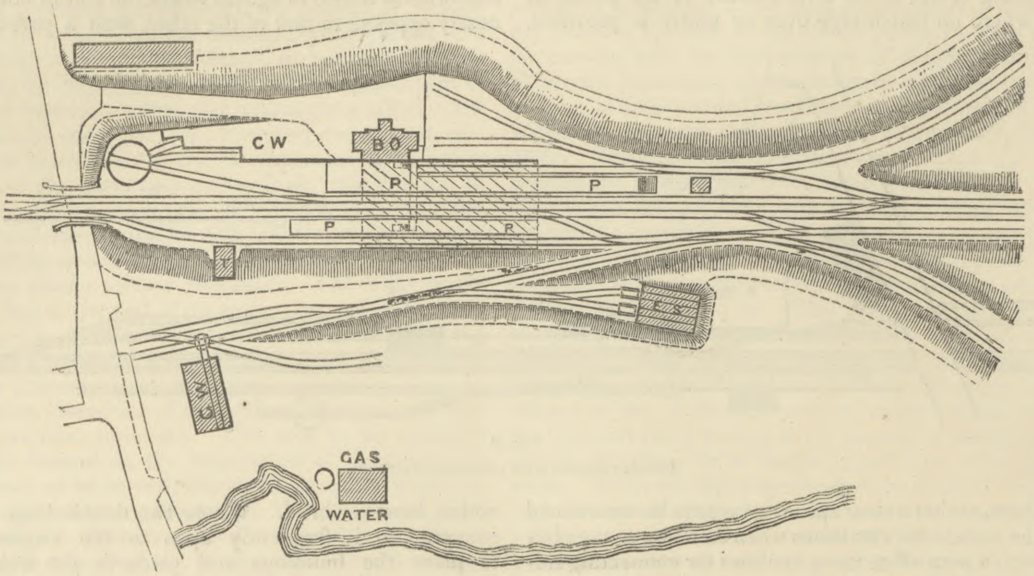


Fig. 53.
Railway Junction Station, having two Single-line Branches.

Huntingdon station, on the Great Northern Railway (see Plate V.) is one of the principal intermediate stations on the line. The station-yards are bounded by a road at one end and a river at the other, and the platforms are necessarily opposed. The main line is kept entirely free of turntables, which are placed only on sidings. The station is 760 yards in length, or nearly half a mile, between extreme points, and there are 3430 yards of siding, single line, or about 2 miles of siding in all, besides the up and down through lines.

The ordinary stations on this line are, with a wise economy, constructed to accommodate a great expansion of traffic. They are 700 to 800 yards in length, between extreme points, or nearly half a mile, and they contain about 2000 yards of sidings, single line, or more than a mile total length.

EXTENT OF SIDINGS.

The increasing traffic of the older railways has led necessarily to a greater use of the side lines, an increase of siding room, and an extension of stations. The distribution of siding accommodation on the London and North-Western Railway, as it existed in 1853, is instructive. On the main line of the southern division, from London to Birmingham, 113 miles, there were in all 53 miles of siding, single line; and on the total length of line, 315 miles, there were 88 miles of siding, single line:—in the proportion of about half the whole length for the trunk, and above a fourth for the whole division, or one mile of sidings, single line, to 3⅝ miles of railway. For the total length of railway, 635 miles, there is one mile of siding, single line, to 5½ miles of railway,—the stations averaging about four miles apart. The great preparation for the accommodation of the traffic, thus forcibly indicated by the proportion of siding room, suggests the great magnitude of the business done.

The stations of the Great Northern Railway are placed at average distances of 4 miles apart; so that the sidings of ordinary stations, each containing 2000 yards of single line, average of themselves more than one-fourth of the whole length of the railway. At King's Cross station there are 18½ miles of siding; and it may be assumed that there are many more miles of extra sidings at the principal stations down the line. The total length of siding accommodation on the whole line would then amount to one-third of the length of the railway, or one mile of siding for every three miles of railway. It would thus appear that the Great Northern Railway company have forestalled the demand for siding-room, which, in the experience of the older lines, has been found necessary, to meet the demands of growing traffic.

In estimating the total length of sidings on the whole railway system, it should be known that there were in 1858 upwards of 2950 railway stations in England, Scotland, and Ireland, for 9082 miles open for passenger traffic in that year; being at about the average rate of one station for every three miles of railway.

From what has been said, one mile of siding, single line, may be taken as the average allowance per station, including, of course, terminal accommodation of every description, which would show that the total extent of single line laid for sidings averaged one-third of the total mileage of railways. In addition, therefore, to the 9116 miles of line open for passenger and goods traffic, or for goods only, in 1857, of which 30 per cent. were only single line, there were 3000 miles of siding; which would make a total of upwards of 18,000 miles of single line in Great Britain and Ireland.

LOCOMOTIVE-STATIONS.

Locomotive-stations should be situated at or near the principal terminus of the railway, sufficiently near to a large town to insure the facility for obtaining materials and workmen; and sufficiently far off to be clear of the heavy local taxes with which such large establishments in all large towns are burdened.

The locomotive-station of the Manchester, Sheffield, and Lincolnshire Railway is selected for illustration. It is situated at Gorton, about two miles from Manchester, the first position where the railway and the land take the same level. The total quantity of land purchased is nearly twenty acres, about nine of which are occupied by the workshops and store-yard; the remainder is used for the construction of reservoirs for supplying the works with water, and for erecting cottages upon it for the work-people in the company's service.

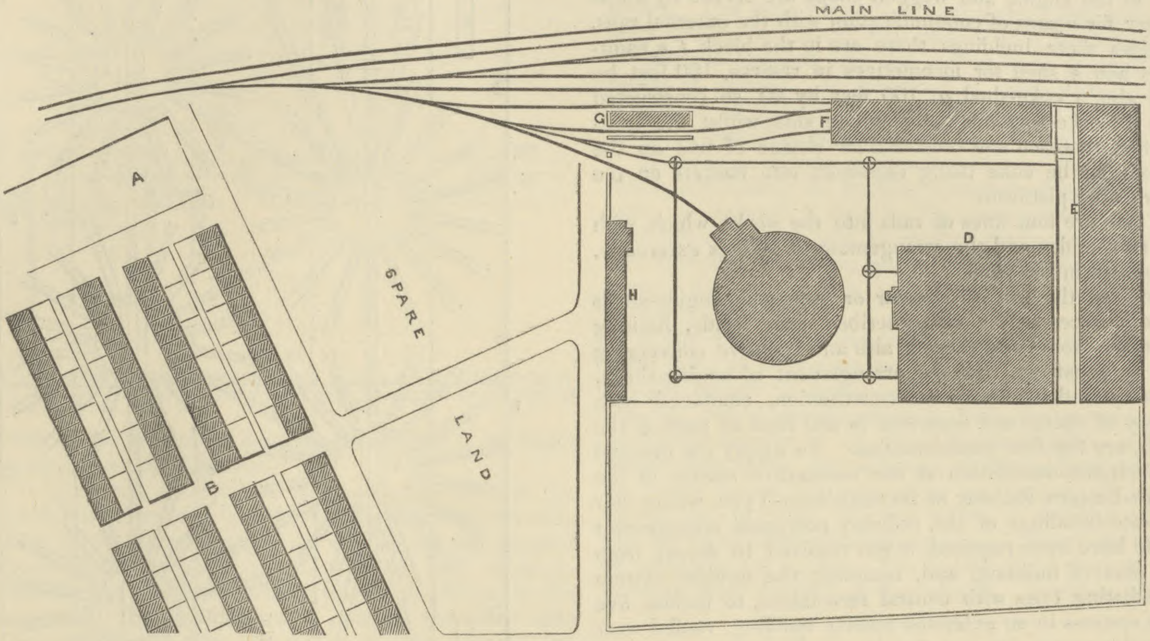


Fig. 54.
Gorton Locomotive-Station, on the Manchester, Sheffield, and Lincolnshire Railway.

The block-plan (fig. 54), shows the general arrangement and relative positions of the shops, cottages, reservoirs, &c. The reservoirs *a* are calculated to hold a month's consumption of water, and are supplied from the adjoining canal, the water passing through filter-beds in its course from the canal to the reservoirs. These reservoirs, from their elevated position, supply the water directly into the tenders upon the railway, and throughout the workshops, the canal being at a sufficiently high level to supply them. The cottages *b* are 140 in number, arranged in four blocks. The plan of the works is nearly square, the entrances being placed towards the cottages on the east side of the works; and adjoining are the offices and general stores *h*.

The engine-house, or shed for engines on duty, *c*, is a rotunda of 150 feet in diameter inside, and is capable of holding seventeen engines with their tenders, leaving the entrance and exit lines clear. The advantage of this arrangement, shown more in detail (fig. 55), over the ordinary polygonal engine-house, is in the absence of pillars for supporting the roof, of which there are twelve for a twelve-sided polygon; in this building there is but one column at the centre. To the left of the entrance is a furnace for holding live fuel, from which the engines are lighted; and there are two lines of rail across the central turn-table, on one of which the engines enter, and on the other depart. Between the rails of each radiating line a pit is constructed to afford access below the engines for inspection. The roof is of wrought iron, surmounted by a louvre for ventilation, which is glazed to admit light freely. To the left of the rotunda are the workshops, with stationary engine-house and boiler. The fitting and tool shop contained in the block *d*, is 120 feet by 60 feet, and contains nearly the whole of the tools. The smiths'-shop is contiguous to the fitting-shop, in the same block, and of equal dimensions; it contains sixteen smiths' fires, eight on each side. Next to this is the boiler-shop, of the same size, with eight smiths' fires and four fires for heating boiler-plates, and a finishing and shearing machine. Next to these is the erecting-shop, 150 feet long by 60 feet wide, containing nine transverse lines of rails, each to hold two engines; so that eighteen engines may be housed here at once. There are travelling cranes in the shop which traverse it for its full length, and capable of lifting any engine and moving it to any part of the shop.

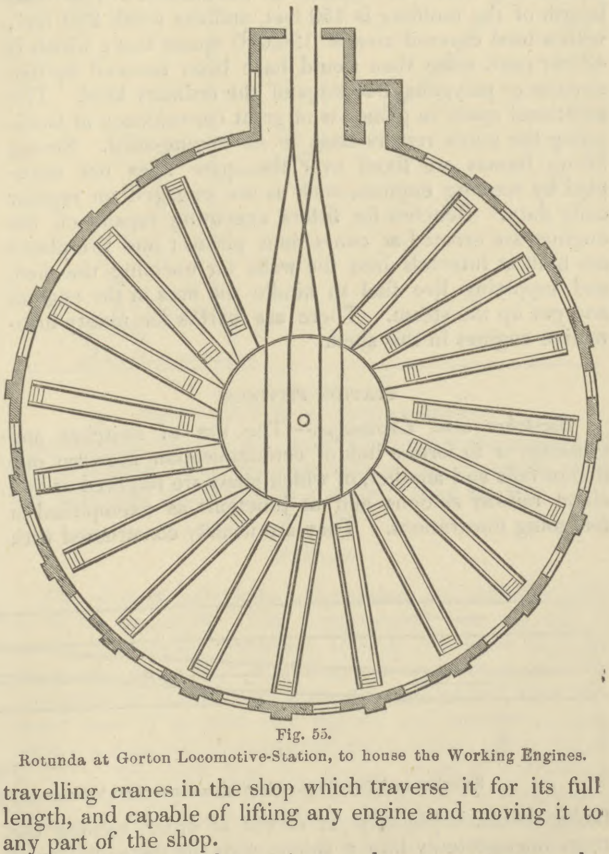


Fig. 55.
Rotunda at Gorton Locomotive-Station, to house the Working Engines.

To the left are the carriage and waggon shops *e*, the waggons being on the ground floor and the carriages above, to which elevation they are raised by a self-acting worm-

Station Fittings.

hoist worked by the stationary engine. These shops are 320 feet by 70 feet, and can receive fifty waggons and thirty-eight carriages; and attached to them are the lifting-room and the trimming and saddlery room. The lines of rail in the engine and waggon shops are served by a traverser, for means of communication with the external rails. Besides these buildings there are in the block *f* a paint-shop and a shed for locomotives in reserve, 160 feet by 40; also, a coke-shed *g*, 100 feet by 40, so constructed that the coke-waggons stand on one side, whilst the locomotives approach and receive their charge of fuel on the other side, the coke being measured into baskets on the intervening platform.

There are four lines of rails into the works, which, with the turn-tables and the arrangement of sidings externally, are shown in the plan.

But, in the use of circular or polygonal engine-sheds there is necessarily a circumscribed space inside, limiting the spare room; and there is also an expensive converging roof to construct. In the arrangement of engine-sheds, capacity and economy of construction, combined with facility of access and departure to and from all parts of the sheds, are the first considerations. To supply the demand for such accommodation at the locomotive station of the North-Eastern Railway at Newcastle-on-Tyne, where four separate buildings of the ordinary polygonal arrangement would have been required, it was resolved to depart from this plan of building, and, retaining the circular system of radiating lines with central turn-tables, to inclose five such systems in an extended oblong building, roofed over its entire area in five parallel bays, supported on the side walls and on four rows of columns. (See fig. 56.) The circular systems, as arranged in two rows, and alternating with each other, afford numerous direct lines of communication from one system to the others. The total length of the building is 450 feet, and the width 280 feet, with a total covered area of 126,000 square feet; which is 43 per cent. more than would have been covered by five circular or polygonal buildings of the ordinary kind. The additional space so gained is of great convenience in facilitating the minor repairs done in an engine-shed. Strong lifting frames are fixed over the spare lines not occupied by running engines, such as are engaged on regular daily duty. Benches for fitters executing repairs on the engines are erected at convenient places; and fire-places are built at intervals into the walls for warming the shed, and supplying live fuel to kindle the fires in the engines and get up the steam. There are berths for ninety locomotive engines in this shed.

STATION FITTINGS.

Switches and Crossings.—The use of switches and crossings is to form a link of communication between one line of rails and another, of which many are required at and about railway stations and at junctions, as exemplified in foregoing illustrations. They are usually constructed with ordinary rails, and are carried in cast-iron chairs spiked down to sleepers. The switch-rails are moveable, and are worked by rods to which heavy weights are attached; the function of the weights being to retain the points in one position, and to act as a self-acting adjustment in restoring them to it—their normal position—after having been shifted for the passage of a train. (See figs. 57 and 58.)

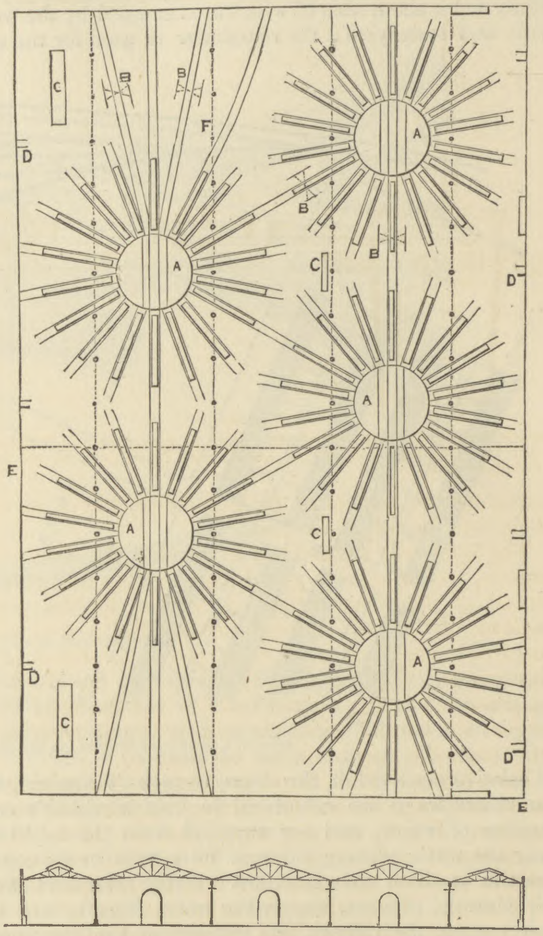


Fig. 56.
Locomotive Engine-Shed on the North-Eastern Railway.—A, Turn-tables; B, Lifting-frames; C, Fitters' Benches; D, Fire-places.

When only one of the terminal rails is moveable, it is called a single switch, and is used only on sidings or branch lines of rail; the double switches being more perfect in action, are adopted on the main line; and, as a general rule, switches on the main line are ordered to be laid with the points in the direction of the traffic, so that passing trains may run out of the points, and not into them. "Facing-points," as they are termed, are such as are laid on the main line, facing or pointing towards the regular advancing trains. Many accidents have been caused to trains by facing-points, improperly set or out of order, turning the train unexpectedly into a siding, with the impossibility of pulling up in time to prevent a collision; or throwing the train off the rails altogether, producing what is called "derailment" in modern railway parlance. So dangerous are facing-points felt to be, particularly on high-speed lines, that on some railways they are absolutely forbidden at all except terminal stations, and at intermediate stations

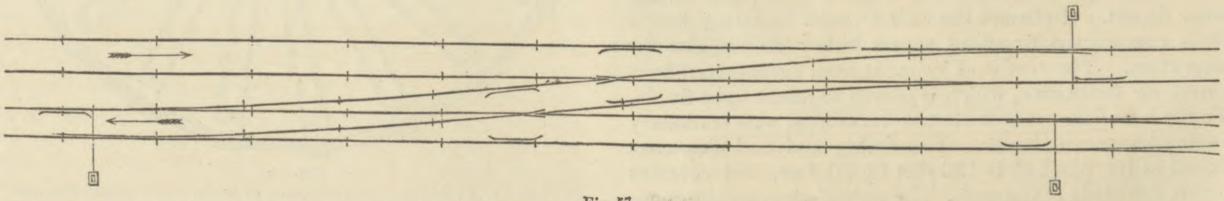


Fig. 57.
Switches and Crossings.—Showing a connection between two lines of rail, and the position of the Switches, Boxes, and Rods.

where every train is ordered to stop. In some situations this rule can only be followed by sacrificing simplicity and increasing the number of backing-points, but it no doubt diminishes the risk of accident.

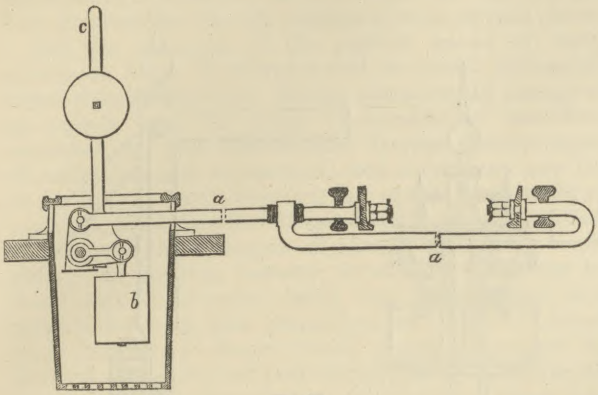


Fig. 58.
Switch-Box.—Rod *a* attached to the Points to work them; *b*, Weight to retain the Points in position; *c*, Lever, with Disc-signal, to act also as Counterweight.

The stock-rails are notched to receive the ends of the tongues, and in order to guard these notches from the rude contact of the wheel-flanges, as well as for the general guidance of the train through the switches and crossings, guard-rails are fixed at suitable places, as shown in the illustrations. In some designs of switches the fixed rails are preserved entire, without notches, and the sides of the tongues are housed under the rails, in lateral recesses; in these cases the guard-rails are not required.

Turn-tables.—These are of two classes—for turning carriages and waggons, and for turning engines and tenders together. For the carrying stock, they are 12 to 14 feet in diameter, sufficiently large to receive conveniently vehicles of which the wheels are 8 to 10 feet apart between the centres. Turn-tables ordinarily used are of cast-iron, carrying two transverse lines of rails, and revolve upon a central pivot, and conical rollers near the circumference, which are upheld and turn upon a cast-iron base bedded in cement, or on a built foundation. (See fig. 59.)

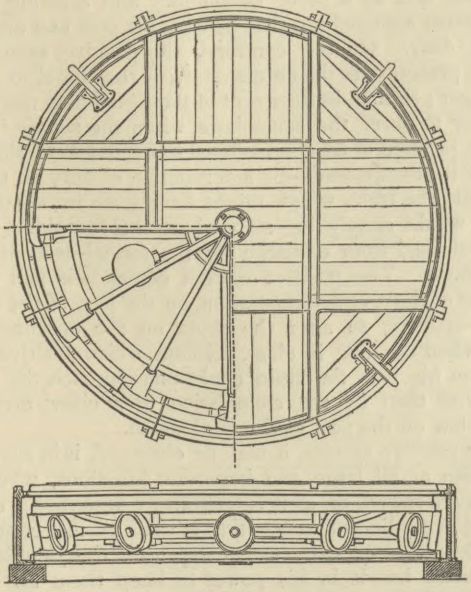


Fig. 59.
Carriage Turn-table, for Stations.

For turning engines and tenders together, and thus superseding the necessity formerly experienced of uncoupling them to be turned on small tables, turn-tables 40 feet long, or thereby, are required. A common plan of table consists of two longitudinal balks of timber, to carry a line of rails, framed together with cast-iron beams, to support the centre on a pivot and the extremities on rollers. The table revolves in a pit about 4 feet deep, on a large circular race of cast-iron bedded on a firm foundation, to carry the rollers, and the motive force is applied by means of gearing. In situations of much thoroughfare it is needful to extend the deck of the table laterally, like wings, to complete the circle, and so cover in the pit.

Traversers.—These are a convenient substitute for turn-tables, particularly for working a number of parallel lines of rails. A traverser is simply a low rectangular frame, made with two overhung rails, to receive carriages or waggons, and moveable on rollers across the lines of rail, so as to receive the carriage from any one line of rail, and deposit it on any other.

Water-cranes.—Water-cranes are erected at convenient spots for delivering water to the locomotives. The upright column is firmly erected, and contains the supply-pipe, which ascends within it from the ground. The horizontal member is in direct communication with the supply-pipe within the column; revolving freely, so as to be swung out of the way when not in use. It is sufficiently long to reach over the middle of the line of rails, and has attached to it a leathern hose to direct the current of water into the tender. The handle of the shut-off valve is shown near the base of the column. In other plans of water-cranes, the shut-off valve is placed at the upper end of the column, or at the extremity of the swinging pipe, and is opened and closed by a screw. (See fig. 60.)

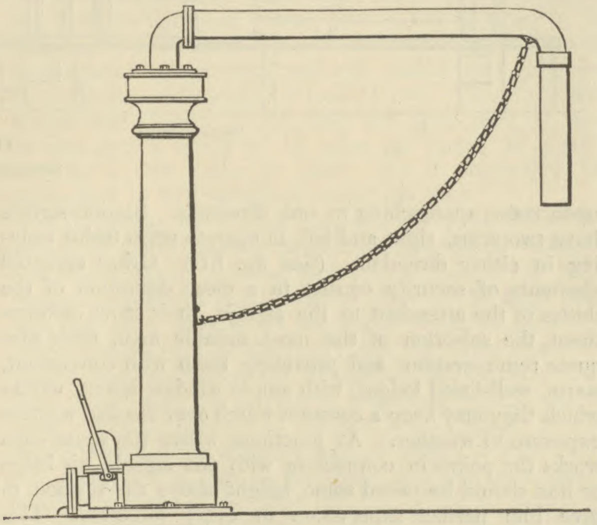
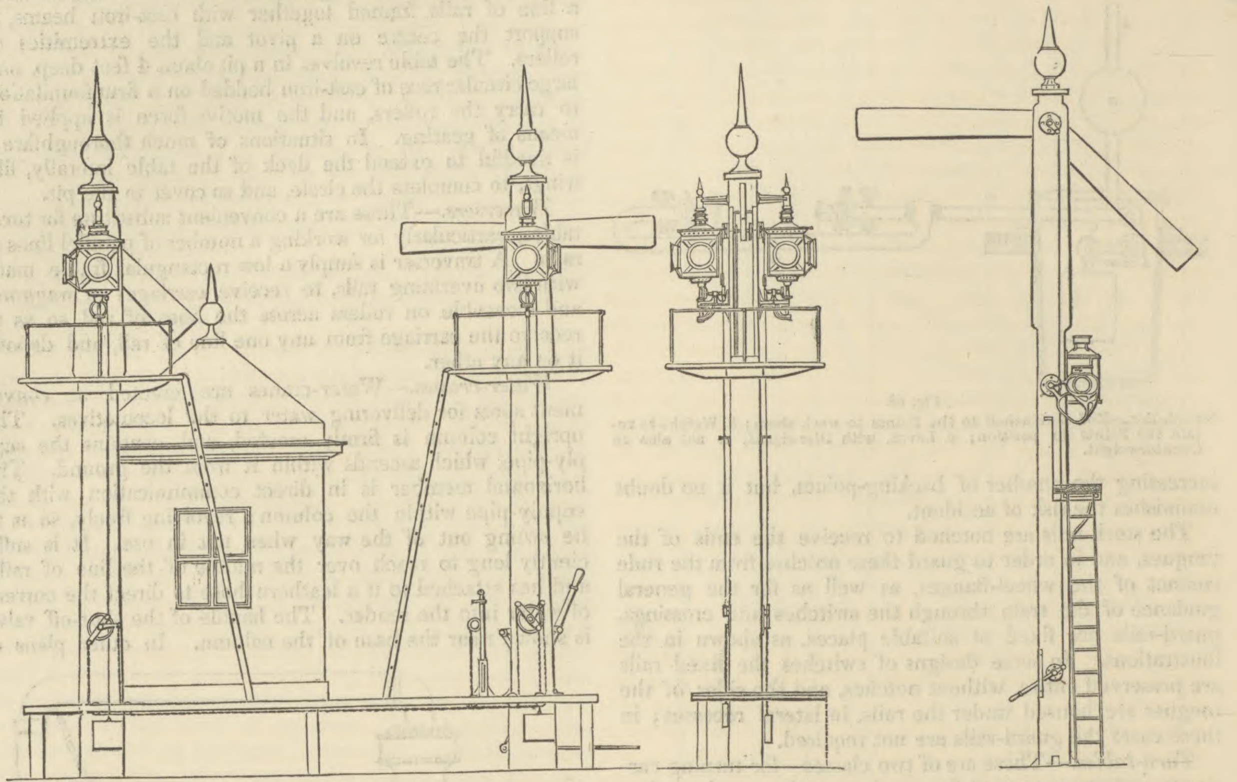


Fig. 60.
Water-Crane, to fill the Tenders of Engines.

SIGNALS.

The want of uniformity in the system and code of signals is to be regretted. The "semaphore" (see fig. 61) is now very generally employed, and has in a great measure superseded the "disc" as a means of signalling; but the companies do not all work it by the same code. One manager uses it to give two signals, and another to give three; a third will have an auxiliary or distant signal placed at 500 or 600 yards from the station, to act as a repeating signal, his neighbours perhaps preferring to use it only as a caution. There are companies which, rejecting the semaphores, use sundry varieties of the disc; and this, though simple and cheap, is limited in its application.

In the employment of the semaphore, the arm is turned straight out, perpendicular to the post, as the signal of danger; diagonally downwards, at an angle of 45°, as the signal of caution; and it is turned home, disappearing within the post, when the line is all right for the approach of the train. Distant-signals have but one arm, as they act only upon trains approaching in one direction. Station-signals have two arms, right and left, to operate upon trains arriving in either direction. (See fig. 61.) Other essential elements of security consist in a clear definition of the duties of the attendant to the signals, their strict enforcement, the selection of the most suitable men, their adequate remuneration, and providing them with convenient, warm, well-fitted lodges, with ample window-space, within which they may keep a constant watch over the line without exposure to weather. At junctions, where the signal-man works the points in connection with the signals, his lodge or box should be raised some height above the surface, to give him perfect supervision in every direction. This keeps him out of the way of gossips, and he is less likely to be distracted in the discharge of his duties. A similar precaution is of service at all other important signal-stations, even where points may not be wrought in connection with signals.



Junction Signals. *Station Signal.*

Fig. 61.
Semaphore Signals.

At night it is needful to supply the place of semaphores or discs by large and powerful lamps, with reflectors, capable of showing lights of three colours,—a white light, a blue or green light, and a red light,—signifying respectively safety, caution, danger. They are changed either by revolving the lamp on its axis, to present a different side with a differently-coloured glass, or by retaining the lamp as a fixture, and sliding differently-coloured glasses in "spectacle-eyes," or otherwise, before the light. Both of these methods of changing the signal are illustrated in the figures annexed.

Signalling has been a subject of much controversy; it has been distinguished by controversialists into two systems,—the "positive" system, and the "negative" system. The so-called negative system is in fact the current practice of the day; and by the epithet "negative" it is implied that, inasmuch as the normal state of the signal is that of caution, or that of safety, as the practice may be, and as it is only turned on to danger when specially required for the protection of the station on the line, the habitual caution or safety-signal is in effect no real signal at all, as except in cases of danger it does not demand any active demonstration from the signal-man as to the state of the line, and as a proof satisfactory and assuring to the engineman approaching that he is at his post and attending to his duty. On the contrary, the positive system, so-called, presupposes the normal state of the signal to be that of danger; so that, in the event of the signal-man neglecting his duty to lower the semaphore when the station is clear for the passage of an approaching train, it will at the most —so it is presupposed—be a dereliction of duty on the safe side, and the train, which might have gone innocently forward, would simply be stopped at the forbidding signal until released from embargo by the formal descent of the semaphore. The positive system demands in fact a positive act of duty, or demonstration, on the part of the signal-man,—namely, to alter the signal on the approach of a train when the line is clear, without which positive act of duty on his part the train could not approach the station otherwise than by the commission of a clear breach of signal-law on the part of the engineman.

The positive system, it may be observed, is in successful operation at all large and important junctions, where the signals are raised, or, as it is technically described "closed" against every line of rails,—that is their normal condition; and when one or more trains approach the junction, the signal-man has it in his power to keep them all out, or to "open" the signals, one at a time, for the safe and successive passage of the trains through the junction. In such a situation, the use of the positive system is manifestly conducive to the greatest degree of safety, as by the unavoidable intersections of the lines of rails there are many

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chances of collision. Peculiar situations of risk require peculiarly stringent codes of signals, and the exceptional character of the situation, and of the system of signals, is the best guarantee for the safe conduct of trains at such places.

But the extension of the positive system to every station on a line of railway would, no doubt, thoroughly defeat the object in view. For the uninterrupted passage of an express train, the active co-operation of successive signalmen at 3-mile intervals (the average distance apart of stations) would be essential; and should any one fail in the duty of timely lowering the signal, there would of course be an interruption of speed and a loss of time, and all the consequent dangers of want of punctuality would ensue. In practice, however, it would undoubtedly be found that engine-men, losing their respect and their patience for such false precautions as signals of danger when there was no danger, would generally disregard the elevated semaphore, and push through, to the extensive and dangerous demoralisation of engine-men and signal-men. It appears to be overlooked that the human brain is an indispensable element of the machinery of signalization, and that simplicity in the working of the brain is an element in the question, just as simplicity is, in the manœuvring of the semaphore. The use of the electric telegraph will be considered in treating of railway accidents.

LOCOMOTIVE POWER.

It is hardly necessary to observe that a locomotive engine differs in many particulars from other steam-engines. The source of power—the principle of mechanical life—is a point of agreement; it determines the order to which the locomotive naturally belongs. But in this we have a new species, adapted to other purposes, and possessing different capabilities. The machine, as its name imports, is intended for locomotion; and in order that it may fulfil its purpose, it must carry along with it the fuel and water which are necessary to maintain its action. This condition implies compactness and lightness of construction, combined with the requisite power. To obtain those first, the engine and boiler are united together in the same machine, and the parts are made of much smaller dimensions, in proportion to the power, than in other steam-engines. The requisite power is obtained by using steam of very high pressure—of such a pressure as will allow the steam-cylinders, when the power is developed, to be of small capacity; but, in order to obtain steam in sufficient quantity and of sufficient pressure from a boiler which must also be portable, it was necessary to depart from the common form, and to adopt a mode of construction by which the evaporative power of the boiler—that is, its power of generating steam—would be greatly augmented. The condition of locomotion at high velocity in so weighty a mass as the lightest and most compact locomotive must be, implies, moreover, subjection to violent strains and shocks, which must as far as possible be provided against by strength and firmness in the framing together of the whole.

It may readily be conceived that locomotive machines did not at once start into their present state of approximate perfection, but have been gradually matured by successive modifications and improvements. The first suggestion of the application of steam-power to the propelling of carriages is due to the illustrious Watt, who proposed it in 1759 to his friend Dr Robison, at Glasgow college. Oliver Evans, of Philadelphia, thought of the same thing in 1782, when he patented a "steam-waggon;" but it does not appear that anything more than a good high-pressure stationary engine was the result of his labours. In 1784 Mr Watt patented a locomotive carriage; and in the same year Mr Murdoch, his friend and assistant, constructed a non-condensing steam-locomotive of lilliputian dimensions. This locomotive was placed on three wheels; the boiler was of copper; the flue passed obliquely through it, and was heated by a spirit-lamp; the steam-cylinder was only ¾ths of an inch in diameter, with a stroke of 2 inches, turning a crank on the axle of the larger wheels, which were 9½ inches high. This little locomotive, standing not higher than 15 inches above the ground, could run at a speed of six or eight miles per hour.

Locomotive Power.

In 1804 Mr Richard Trevithick constructed a high-pressure locomotive for the Merthyr Tydvil Railway, in South Wales; but the great defect consisted in the slipping of the wheels, which Mr Blenkinsop endeavoured to obviate in 1811 by employing a rack-rail, in which a large toothed wheel was to work. In 1813 Mr Brunton of Butterley contrived a locomotive carriage, to be propelled by levers like horses' feet. In 1814 Mr George Stephenson constructed an engine for the Killingworth Railway, near Newcastle, in which toothed wheels were employed to engage and turn all the four wheels of the engine, and so to utilize all their adhesive power, to "bite" the rails.

The year 1829 is famous in the annals of railways for two things—the opening of the Liverpool and Manchester Railway, the type and forerunner of modern railways; and the invention and construction of the first high-speed locomotive of the standard modern type, the railway and the locomotive by Mr Stephenson and his son, Mr Robert Stephenson. This engine was made under competition for the Liverpool and Manchester Railway, and it gained the prize for lightness, power, and speed, awarded by the directors. It weighed 4 tons 5 cwt.; the tender following it weighed 3 tons 4 cwt.; and two loaded carriages drawn by it on the trial weighed 9 tons 11 cwt.; thus, the drawn weight was 12 tons 15 cwt., and the gross total 17 tons. It averaged a speed of 14 miles per hour; its greatest velocity was 29 miles per hour; and it evaporated 18¼ cubic feet, or 114 gallons of water, per hour.

This engine, the Rocket, comprised the three elements of efficiency of the modern locomotive, the internal water-surrounded fire-box, and the multitubular flue in the boiler, being a number of small tubes in place of one large tube; the blast-pipe, from which the waste steam of the engine was exhausted up the chimney; and the direct connection of the steam-cylinders, two in number, one on each side of the engine, with the driving or propelling wheels, on one axle. The subdivision of the flue into a number of small tubes proved to be of marvellous advantage in accelerating the absorption of heat by the water, and the generation of steam, in virtue of the great increase of heated surface exposed to the water, without adding to the size or weight of the boiler. But the evaporating tubes would have been of little avail practically had they not been supplemented by the blast-pipe in the chimney, which, by ejecting the steam from the engine after it had done its work in the cylinder, straight up the chimney, excited a strong draught through the boiler, and caused a brisk and rapid combustion of fuel, and generation of heat. The heat was absorbed with proportional rapidity through the newly-applied heating-tubes. The blast-pipe, thus designedly applied, was undoubtedly the invention of Mr Stephenson; in conjunction with the multitubular flue, it altered and vastly improved the range and capacity of the locomotive; and, in further conjunction with the direct connection of the steam-cylinder to one axle and pair of wheels, it was tantamount to a new and original machine.

Fledged and armed with wings, this locomotive, the Rocket, subsequently drew an average gross load of 40 tons behind the tender at 13·3 miles per hour. The old Killingworth engine could only work at a maximum of 6 miles per hour with 50 tons. The Rocket, in the earlier trial, attained a speed of 29 miles per hour. George Stephenson came eminently at the right time in scientific history, gathering into one magnificent fact all the floating prophecies of possibilities, solving the problem, and setting the question of the railway and the locomotive engine at rest for ever by his grand and masterly invention.

The key-note was struck. Constructors on all sides worked, each in his own way, at the locomotive, to improve the detail and increase the efficiency; and for many years the practice of builders was moulded into two general classes of engines, with two cylinders placed horizontally inside the smoke-box, under the chimney, and otherwise essentially similar to each other, except in one great feature, the number and disposition of the wheels. In one class there were six wheels, of which one pair was placed behind the boiler, typified in the engines of the day made by Mr Robert Stephenson; in the other class there were but four wheels, placed under the barrel of the boiler, leaving the fire-box overhung, typified in the engines made by Mr Bury for the London and Birmingham Railway. Experience has demonstrated the disadvantage of an overhung mass, with a very limited wheel basis, in the four-wheeled engine running at high speed; and now it is the general practice to apply six wheels to all ordinary locomotive stock.

The general features and characteristics of modern locomotive practice are represented by the illustrations (figs. 62 and 63). There are two leading types of passenger-engines, distinguished chiefly by the steam-cylinders being, in the first, situated within the framing, under the boiler, with the main driving axle cranked at two points to receive the power from the two cylinders; and in the second type, the steam-cylinders are placed external to the framing, and connected, not to the axle, which is straight, but to crank-pins fixed between the spokes of the wheels, in connection with the nave. From these distinguishing features, the two types of engines are known respectively as "inside-cylinder locomotives" and "outside-cylinder locomotives." In the latter, the general contour of the cylinders is usually visible at the fore-end of the machine. The tenders have six or four wheels, according to the taste of the designer, and they are supplied with powerful brakes, worked by screws, with blocks of wood placed against each wheel. A water-tank forms the upper part of the tender, namely, the two sides and the back, in the form of a horse-shoe, holding 800 to 1200 gallons; and in the hollow of the shoe the fuel is deposited, of which a full charge may weigh 30 cwt. to 2 tons. The engine and tender are suspended on springs placed over the axle-bearings.

Similarly, there are inside-cylinder goods locomotives, and outside-cylinder goods locomotives. In the former the wheels are all of one size, in order that the driving force may be transmitted from the central pair of wheels to the front and back pairs, by means of coupling-rods attached to crank-pins in the wheels, hence called a six-coupled engine. In the latter engine the hind-wheels only are coupled with the central wheels, and the fore-wheels are of less diameter, as, being free, they are not required to be so large; hence called a four-coupled engine. The six-coupled engine can take the heaviest train on a good straight railway,—that is, on one free, to a large extent, of curves or sudden turns in the line of direction of the train; but the four-coupled works most economically on curved lines, and may be made so as to take, in average practice, as heavy a load as the six-coupled engine.

American practice, after having passed through various phases, has arrived at two great types of locomotive for passengers and for goods traffic, which are universally adopted in the United States. The passenger-locomotive has eight wheels, of which four in front are placed in a moveable frame, called a "bogie" or "truck," which swivels on a central pivot, and adapts itself to the curves of the lines; the four wheels behind are the "drivers;" they are larger than the front wheels, and of equal size and coupled. The cylinders are placed outside, just over the truck, horizontally. A "cab" or "house" is placed upon the hinder part of the machine, behind the boiler, for the protection of the engine-driver and the stoker from the weather, with ample glazed opening, to afford a clear view ahead. The chimney or "stalk" is in form externally like an inverted cone, expanding upwards; internally, it is cylindrical, and the space between the outer and inner chimneys forms a reservoir for cinders and ashes thrown up through the inner chimney, which are deflected by a baffle-plate at the top, and thrown over into the reservoir, trap, or "spark-catcher." This contrivance is specially designed for the use of wood as fuel, and to prevent the risk of conflagration arising from the numerous sparks which would otherwise be discharged in passing through forests and other ignitable districts. As a further precaution for the prevention of sparks, the top of the stalk is covered with a fine wire-net. The steam-whistle is situated above the boiler for ordinary use; and the bell is hung near to the cab, with ropes within reach of the engineman. The bell is used in passing through the streets. The cow-catcher is hung in front of the engine, to ward off stray cattle, &c., and the American flag is hung behind it. The tender is carried on eight wheels, disposed under two trucks, fore and aft, to facilitate the turning of the tender on the curves. The goods-locomotive is placed on ten wheels, of which six are coupled, to supply driving-power, and the leading four wheels are hung in a swivelling truck.

Weight, Dimensions, and Cost of Locomotives.—The earliest four-wheeled engines made by Messrs Stephenson & Co. as an article of manufacture weighed 9 tons "with the steam up,"—that is, with a supply of fuel and water in the boiler. The six-wheeled engines weighed 11½ tons. An ordinary passenger-locomotive of the present time weighs 19 to 23 tons, and occasionally as much as 27 tons, which is excessive. A goods-locomotive of the most powerful stamp weighs 27 to 32 tons, distributed on six-coupled wheels. Tenders weigh from 10 to 15 tons, with fuel and water supply. Tank-locomotives, or such as are constructed to carry their supply of fuel and water in reserve, without the aid of a tender, weigh a few tons heavier than the same engine if fitted with a tender. But tank-locomotives are usually made of small size, to work light, branch traffic, and weigh lighter in consequence than most other engines,—from 12 to 20 tons gross. The Great Western broad-gauge 8-wheel passenger-engines weigh 35 tons, or with tender, 50 tons. The goods-engines are not so heavy, weighing about 30 tons, or with tender, 45 tons. But the heavy tank-engines used on the steep lines of South Wales and elsewhere weigh 40 tons gross.

Passenger-locomotives are commonly made with cylinders 15 or 16 inches in diameter, with a stroke of 20 to 24 inches, and driving-wheels varying from 5½ to 7 feet diameter, according to the duty for which the engine is made; for high-speed express trains the larger wheel is used. The cost of a modern passenger-locomotive and tender is about L.2300.

Ordinary goods-locomotives have cylinders 16 inches diameter, and 24 inches stroke, with 5 feet wheels. They cost about L.2800 with tender.

The fire-grates are 3 feet to 4 feet in length, and about 3 feet 6 inches wide; and the boilers contain 150 to 230 small flue-tubes, about 2 inches in diameter, and 10 to 11 feet in length. Some account of the performances of locomotives will be given in another section. The comparative magnitudes of recent broad-guage and narrow-guage engines and tenders may be apprehended from the skeleton elevations (figs. 62 and 63).

Carriages and Waggons.

Carriages and Waggons.

CARRIAGES AND WAGGONS.

The carriage-stock comprises all vehicles concerned in the conveyance of passengers and their luggage, and of private carriages and horses, the vehicles to carry the latter usually being attached to, and run as part of, the passenger train in which their owners are conveyed. The waggon stock comprises the vehicles employed in the conveyance of merchandise, minerals, and live stock. The common varieties of vehicles employed in railway traffic are as follows:—

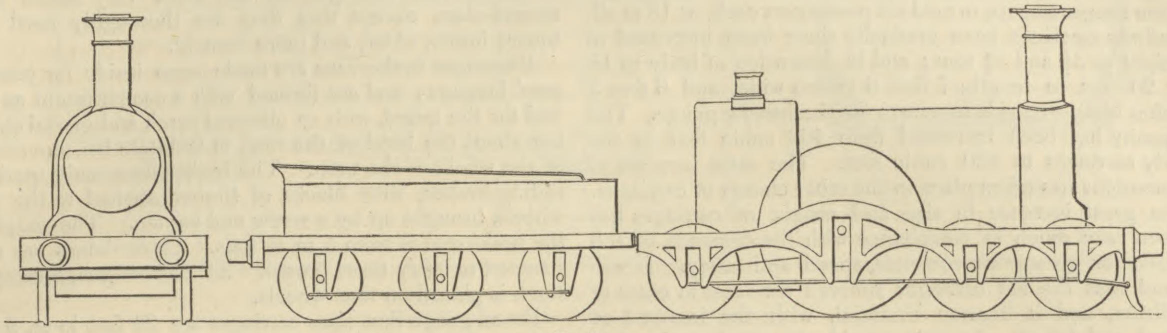

Fig. 62.

Broad-Guage Passenger Locomotive (skeleton elevation).

Passenger-train Stock.—First-class carriage, second-class carriage, third-class carriage, composite carriage, luggage brake-van, horse-box, carriage-truck. To these may be added the mail-carriage or travelling post-office.

Goods-train Stock.—Platform-waggon, open or box waggon, high-sided round-end waggon, covered goods-waggon, cattle-waggon, sheep-waggon, coal-waggon, coke-waggon, brake-van.

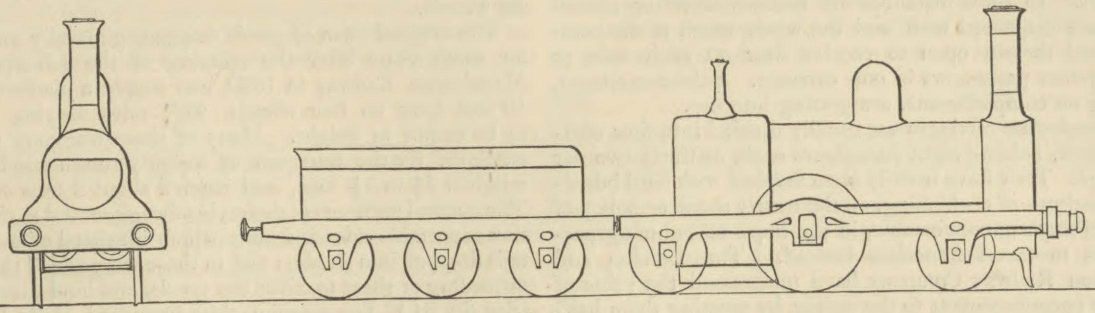

Fig. 63.

Narrow-Guage Passenger Locomotive (skeleton elevation).

Besides these, there are other waggons specially designed for special traffic, as gunpowder, salt, and lime. Also ballast-waggons, for the private use of the engineer's department.

The classification of carriages is designed to meet the various requirements of the travelling public; some preferring seclusion, ease, luxury, high speed; others preferring society, if tolerable, and economy, with moderate comfort and moderate speed; others looking to economy simply. For the sake of uniformity externally, and in many of the details, carriages are usually made of the same external length, width, and height, and suitably in the interior. The under-works of the stock may thus be identical in construction, and a uniformity of working and wearing parts is thus secured, which is conducive to economy of maintenance.

The waggon-stock should be as nearly uniform as possible. Uniformity of waggons is more important than that of carriages, as their total number and cost are much greater, and the supervision with which they are favoured is less minute; besides, the cost of maintenance is less than where many varieties of waggons exist on the same line. But whatever may be the upper-works, the under-works of the whole of the waggon stock should be entirely uniform. One of the greatest engineering evils that have been inflicted upon railway companies has arisen from the want of arrangement or consultation between the officers of different lines, in order to consider the question, common to all, as to the best plan and construction of vehicles to be used by them. The result has been, that several companies have built classes of stock unsuited to work conjointly the traffic of their own and other lines. The diversity of practice is no doubt partly occasioned by the growing wants of traffic, and the gradual increase in capacity and tonnage of the carrying stock, incurring unavoidable structural alterations of plan. Amongst the early contributors to the production of the railway waggon were to be found the great carriers, their agents, road-contractors, farmers, builders, wheelwrights, salesmen, graziers, timber merchants, and others whose occupations and opinions, it may be imagined, gave birth to a wide diversity of practice.

Another reason for the want of harmony in past practice has been the separation of the duties of engine and of carriage and waggon superintendence. The carriage superintendent, aiming at the utmost economy of maintenance in his department, has been continually adding to the quantity and weight of material employed in the construction of the carrying stock, as the remedy for the observed failure of weak parts; and thus the stock, particularly waggons, has been increased in strength rather by adding to the mass of matter than by studying to throw the same weight of timber and iron into superior combinations. Doubtless the stock was made very lasting and serviceable, but meantime the heavy trains, handed over to the locomotive department, induced similarly the construction of heavier and more powerful locomotives, when the maximum was quickly reached, and strongly evinced by the sufferings of the permanent way.

It was of course unavoidable, from the need of enlarged

Carriages and Waggons.

dimensions, capacity, and increased strength, both in carriages and waggons, that the dead weight should be to some extent increased. The early first-class carriages weighed 3¼ tons, the bodies or upper parts being 15 feet long, 6 feet 6 inches wide, and 4 feet 9 inches high, in three compartments, to hold six passengers each, or 18 in all. Railway carriages have gradually since been increased in weight to 5½ and 5¾ tons; and in dimension of body to 18 or 20 feet in length, 7 feet 6 inches wide, and 6 feet 3 inches high,—outside measures for the narrow guage. The capacity has been increased from 462 cubic feet in the early carriages to 820 cubic feet. The same increase of dimensions has taken place in the other classes of carriages. The great increase in size and weight of carriages has arisen very much in compliance with the demands of the public for greater convenience, speed, and safety. It was found that the old carriages suffered the most in cases of collision, and it became essential, with the increase of speed and length of trains, to add very much to the size, strength, and weight of the carriages. The wheels weighed originally 17 cwt.: they now weigh from 25 to 30 cwt.

First-class narrow-guage carriages are commonly divided transversely into three compartments, each six feet long, and well lined with cushions; in each compartment there are six seats, and there are in all seats for eighteen passengers. In some instances the seat-partitions or elbow-rests are dispensed with, and the whole width of the compartment thrown open to receive four on each side, or twenty-four passengers in one carriage. Saloon-carriages, having no compartments, are getting into use.

Second-class carriages are usually divided into four compartments, holding eight passengers each, or thirty-two per carriage. They have usually been finished with hard boarding, destitute of cushioning, on the nearly obsolete policy of making them uncomfortable, in the hope of inducing passengers to travel first-class instead. The London and Brighton Railway Company have understood the value of a little encouragement to the public, by meeting them halfway, and supplying comfortably-padded seats in the second class. The receipts in 1858 were materially benefited by the gracious experiment; and other companies must do the same.

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Third-class carriages do not differ very much from second-class, except that they are thoroughly hard and square inside, older, and more homely.

Passenger brake-vans are made open inside for passengers' luggage; and are formed with a compartment at one end for the guard, with an elevated perch and glazed chamber about the level of the roof, to facilitate his supervision of the whole of the train. The brakes commonly used are sliding-brakes, with blocks of timber applied to the four wheels, brought up by a screw and handle. The weight of the brake-van is from 5 to 6 tons. Horse-boxes are constructed to carry three horses. All narrow-guage carrying stock is placed on four wheels.

Broad-gauge first-class carriages are 24 feet long, 9 feet wide, and 6 feet high in the body, divided into four compartments, holding four passengers on each side, or altogether thirty-two. The second and third-class are 27 feet 2 inches in length; the second-class has five compartments for sixty passengers, and one for luggage; and the third-class has six compartments, for seventy-two passengers and a guard's brake compartment. All carriages are placed on six wheels.

The original form of goods waggons generally employed for some years after the opening of the Liverpool and Manchester Railway in 1829, was simply a platform about 10 feet long on four wheels, with sides varying from 4 to 10 inches in height. Many of these waggons are still employed for the transport of weighty rough goods; they weighed 2½ to 3½ tons, and carried about 2 tons of goods. The general unfitness of this style of waggons led to the adoption of portable sides and ends, which consisted of open crib-rails dropped into staples; and to these were added the costly tarpauling or sheet to cover the goods, and bind them down. (See fig. 64.) The waggon, thus appointed, made 13 or 14 feet in length, and weighing about 3½ tons, was fitted to carry 4 or 5 tons of ordinary goods. But loose or moveable parts of waggons are objectionable, as they occasionally fall away or are lost, or get out of order, and are costly to maintain. The use of tarpaulings is said to have amounted to an annual charge of L.12,000 on one railway. So uncertain is the duration of a tarpauling, that a new one may be spoiled the first day of its use, by injury from projecting angles of goods under cover. Crib-rails and tarpaulings have been to a great extent superseded by built covered waggons, 14 to 16 feet long, with sliding doors and moveable roofs (see fig. 65); so that the crane-chain can deposit or move a bale of goods, however heavy, from any part of the interior of the waggon; and the goods may be perfectly inclosed and protected from damage by fire, wind, or rain.

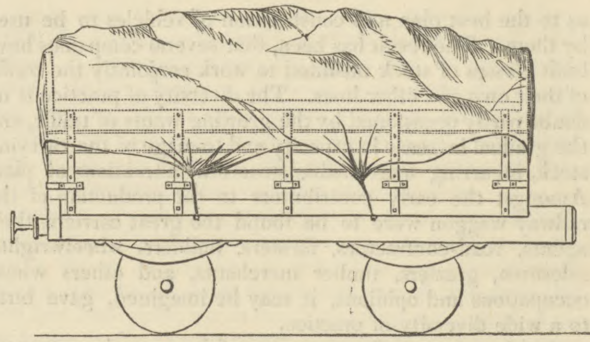

Fig. 64.

Ordinary Open Goods Waggon, loaded and sheeted.

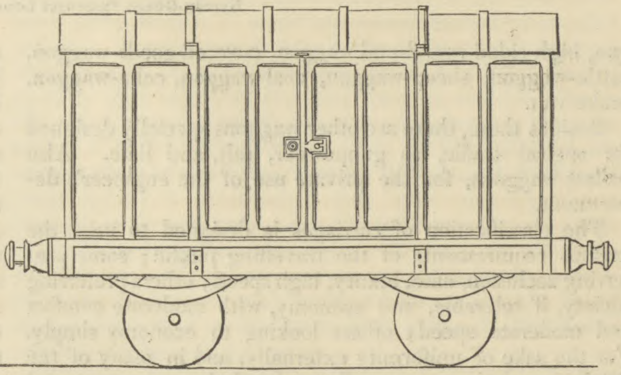

Fig. 65.

Covered Goods Waggon.

Covered waggons weigh from 4 to 5 tons, and can carry, according to their dimensions, 6 to 8 tons. The cost of maintenance of ordinary open waggons is said to amount to from 7 to 10 per cent. of the first cost, as against that of the covered waggons, which is stated to be only 4 per cent.

The Great Northern Railway coal-waggons, which are well designed and constructed, are made with open sides 2½ to 3 feet high, weigh 4 tons empty, and carry 7½ to 9 tons of coal (see fig. 66).

It may be stated generally that properly-made open waggons may carry twice their own weight of goods, and covered waggons 1½ times their own weight of goods; but that ill-designed, heavily-made waggons may carry no more than their own weight in goods. The great demand for weight in waggons arose, as much as from anything else,

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from the absence of spring-buffers at the ends, and the imperative need of strength to resist the inevitable hard concussions to which they were subject in daily use. To reduce the violence of such contingencies, and also not to add very much to the cost of the waggon, buffing-springs were applied at one end of each waggon, leaving the other end "dead," as shown in fig. 64. The benefits of this partial arrangement became evident; and as at the same time several forms of external buffers—compact, efficient, cheap, and easily applied,—had been matured, and had become regular articles of manufacture, the practice of springing one end of the waggon has been gradually extended in new stock to the other end, as in fig. 65. Waggons, as formerly made, were, in long trains, likewise subjected to violent shocks in starting into motion at stations and otherwise; and therefore the draw-bars also were placed upon springs. Some persons have gone further, and placed the guard or side chains upon springs. Thus the waggon has come to be defended by springs at all points. The substitution of elastic action for dead shocks has proved very beneficial in promoting the durability of waggon stock; and there is no doubt that the extra cost so incurred has been amply compensated in saving of materials and in durability. Spiral springs for buffing and drawing, made of round or of oval steel, have answered very well.

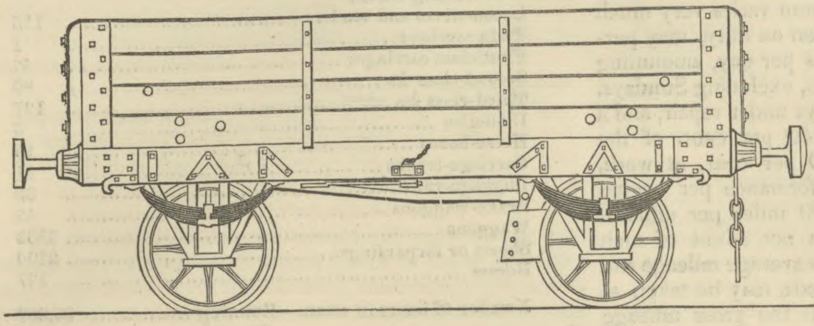

Fig. 66.
Coal Waggon on the Great Northern Railway.

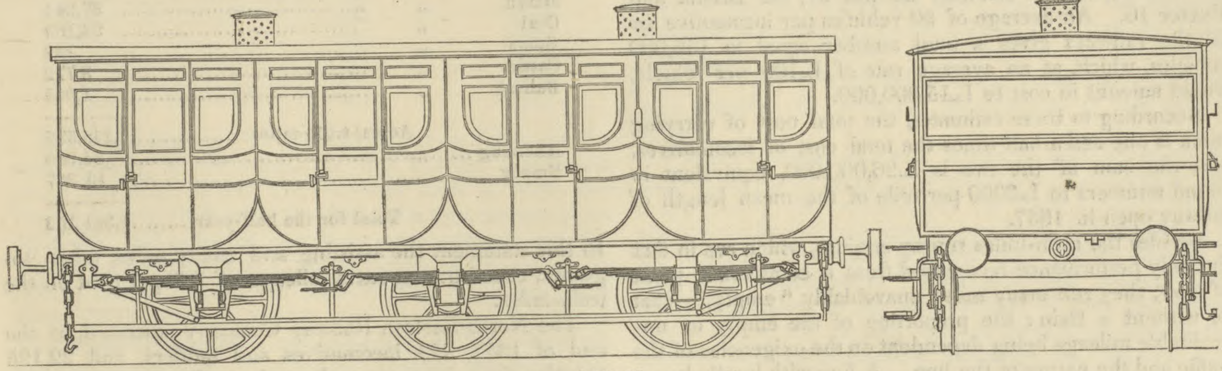

Fig. 67.
Broad-Guage First-Class Carriage.

Broad-guage waggons have been constructed sufficiently strong to carry 20 tons of load. But they are not generally made to carry more than 10 tons. They are carried on six wheels.

An impression of the relative dimensions and bulk of broad and narrow guage carriages may be gathered from the outline elevations of a first-class carriage of each guage (figs. 67 and 68) on the same scale. The relative costs are about L.340, narrow-guage, and L.640, broad-guage. A narrow-guage open goods waggon costs L.80, as compared with a broad-guage waggon costing L.140.

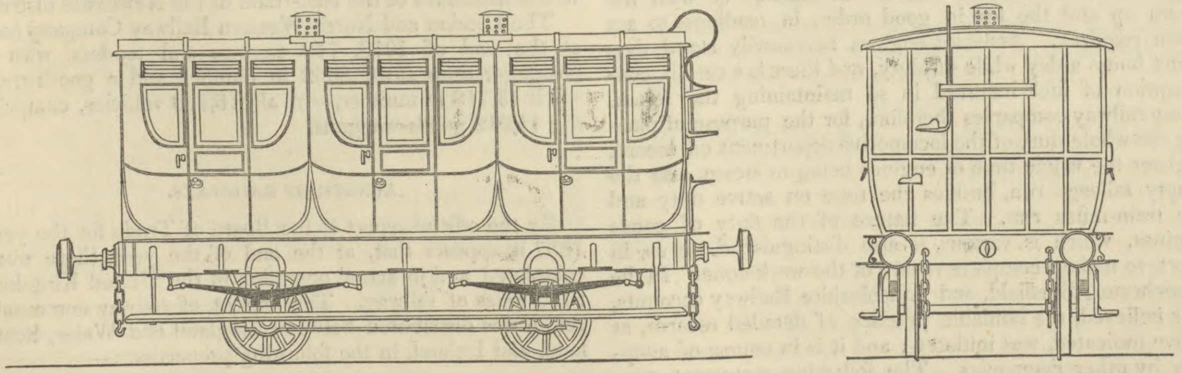

Fig. 68.
Narrow-Guage First-Class Carriage.

Magnitude, Cost, and Mileage of Railway Stock.

TOTAL MAGNITUDE, COST, AND MILEAGE OF RAILWAY STOCK.

The number of miles run per annum varies very much with circumstances. An engine, when on duty, may perform a duty averaging 120 train miles per day, amounting to upwards of 37,000 miles per annum, excluding Sundays. But as a portion of the stock is always under repair, and a portion in reserve, it is safe to allow 50 per cent. of the total number as off duty, leaving 50 per cent. at work, which would reduce the average performance per engine of the whole stock to 18,000 or 20,000 miles per annum. The circumstances of many lines do not admit of such a high average mileage; and the gross average mileage run by each locomotive, passenger and goods, may be taken at 16,000 train miles per annum; and as the gross mileage performed in 1857 amounted to upwards of 83,000,000 train-miles, there would be 5200 locomotives then on stock, which, if they be estimated at an average cost of L.2000 each, would amount in cost to L.10,400,000. The number of vehicles of all classes varies within very wide limits in proportion to the number of locomotives on different railways. The North-Eastern, doing a very large mineral traffic, has probably the largest proportion,—namely, 53 vehicles per locomotive. The Manchester, Sheffield, and Lincolnshire has 38 per locomotive, the Glasgow and South-Western 36, the Great Northern 27½, the Eastern Counties 27, the London, Brighton, and South Coast 25, the Midland 24, the Scottish Central 21, the Bristol and Exeter 16. An average of 30 vehicles per locomotive for all the railways gives a total number equal to 156,000 vehicles, which, at an average rate of L.100 per vehicle, would amount in cost to L.15,600,000.

According to these estimates, the total cost of carrying stock is one and a half times the total cost of locomotives, and the sum of the two is L.26,000,000, equivalent in round numbers to L.3000 per mile of the mean length of railway open in 1857.

Besides the train-miles run by engines, which are in fact the only performance recognised from a commercial point of view, they run many miles unavoidably "empty,"—that is, without a train; the proportion of the empty or unprofitable mileage being dependent on the exigencies of the traffic and the nature of the line. A line with locally heavy gradients must have "assistant" or "pilot" engines in readiness to assist the trains up the inclines, which usually have to return empty to the depot; and in cases of special trains, empty engines are run to or from the train, before or after duty, according to the situation of the engine-depot, as the case may happen.

There is another duty, of a passive description, which is imposed on engines,—to stand "in steam," or with the steam up and the fire in good order, in readiness to act when required. Assistant engines necessarily stand thus many hours a day while on duty, and there is a certain consumption of fuel incurred in so maintaining the steam. Some railway companies therefore, for the purpose of placing the whole duty of the locomotive department on record, register the whole time of engines being in steam, also the empty mileage run, besides the time on active duty and the train-miles run. The nature of the duty of goods engines, which is various, is also distinguished, so as, in short, to make a complete record of the work done. In the Manchester, Sheffield, and Lincolnshire Railway accounts, it is believed, the laudable practice of detailed records, as above indicated, was initiated; and it is in course of adoption by other companies. The following statement contains a list of the rolling stock of that line, and the particulars of the duties performed by the engines during the second half-year 1857; and it may be taken as an example of the proper method of recording such duties:—

Magnitude, Cost, and Mileage of Railway Stock.

Manchester, Sheffield, and Lincolnshire Railway.—Half-year ending December 31, 1857.

List of Rolling Stock,—

Locomotives and tenders	115
Twin carriage	1
First-class carriages	51
Second-class do.	89
Third-class do.	127
Dummies	6
Horse-boxes	19
Carriage-trucks	11
Luggage-vans	32
Brake-waggons	55
Waggons	3963
Sheets or tarpaulings	2200
Horses	107

Number of hours in steam—	Running	95,337
" "	Shunting	49,093
" "	Standing	28,842
Total hours in steam		173,272

	Cwt.
Coke consumed	241,527
Coal "	229,681
Cost per hour	23·05 pence
" mile	2·45 "

Mileage run by Engines.

		Miles.
Passenger train-miles		693,921
Goods	"	360,243
Mixed	"	87,244
Coal	"	94,189
Stone	"	162
Cattle	"	8,772
Ballast	"	1,045
Actual train-miles		1,245,576
Assisting		34,250
Empty		81,327
Total for the half-year		1,361,153

In this statement the assisting and empty miles, taken together, constitute an extra mileage of 9·3 per cent on the train-miles.

The North-Eastern Railway Company possessed, at the end of 1857, 414 locomotives and tenders, and 22,125 vehicles for passenger and goods traffic, amongst which there were 2321 goods-waggons, 1362 trucks for timber, and 15,073 coal-waggons. The Midland Railway, with 413 locomotives, just one less than on the North-Eastern, had only 9944 vehicles, or less than half the number on the other line, including 8727 waggons; but the Midland waggons are of much larger capacity, as there are amongst the North-Eastern stock 10,050 chaldron-waggons suited to the habitudes of the coal-trade of the Newcastle district.

The London and North-Western Railway Company had, at the end of 1858, 779 engines and tenders, with a passenger-train stock 2552 in number, and a goods-train stock 13,718 in number,—in all, 16,270 vehicles, comprising 11,012 goods-waggons.

LENGTH OF RAILWAYS.

By the official report to the Board of Trade for the year 1857 it appears that, at the end of the year, there were completed and in actual operation in the United Kingdom 9116 miles of railway. This extent of railway communication was distributed between England and Wales, Scotland, and Ireland, in the following proportion:—

	Miles.
England and Wales	6777
Scotland	1269
Ireland	1070
Total	9,116

Railway Employés.

Of the 9116 miles open in 1857, there were only 740 miles of broad guage, and 261 miles of mixed guage; together 1001 miles in England, or 12 per cent. of the whole mileage in England and Scotland.

Of the 9116 miles open in 1857, the following were the lengths of single line:—

	Miles.		Of whole Mileage Opened.
In England and Wales	1715	or	25 per cent.
In Scotland	409	„	32 „
In Ireland	651	„	64 „
Total	2775		30 „

The rate at which the construction of railways has proceeded during the last fourteen years in these countries may be estimated from the following statement, showing the consecutive additions to the gross length of railway, year by year, in the second column, and the total lengths in the third column:—

Year.	Length of Line opened during the Year. Miles.	Total length of Line opened at 31st Dec. Miles.
1843	...	2036
1844	204	2240
1845	296	2536
1846	606	3142
1847	803	3945
1848	1182	5127
1849	869	5996
1850	625	6621
1851	269	6890
1852	446	7336
1853	350	7686
1854	368	8054
1855	243	8297
1856	421	8718
1857	398	9116

It may be observed that, subsequently to 1845, the annual addition to the length of line opened, which was about 300 miles in that year, doubled itself in 1846, and rose to nearly 1200 miles in 1848. During the five years 1846–50, 800 miles of new lines were opened annually. These accelerated rates of construction arose out of the railway mania of 1845–46, when, during these two years alone, 7238 miles of railway were authorized by acts of Parliament to be made. Subsequently to 1850, when the extreme pressure of construction subsided, the annual increase of mileage opened averaged 356 miles per year to the end of 1857; and, according to recent returns, about 340 miles were opened in 1858.

There were 774 miles of railway in course of construction in 1857, not opened in this year; and they make, in addition to the lines already opened, a total of 9890 miles, or nearly 10,000 miles.

RAILWAY EMPLOYÉS.

Upon the lines in course of construction during the ten years 1848–57 the average number of persons employed varied from 63·6 per mile in 1848, and a maximum of 69 per mile in 1849, to 44 persons per mile, or 44,037 persons on 1004 miles in June 1857.

Upon lines open for traffic on the 30th June 1857, in all 8942 miles, 109,660 persons were employed, or 12·26 persons per mile, variously employed, and distributed as in the annexed statement:—

			Per Mile.			Per Mile.
Secretaries or managers	221	or	·024			
Treasurers	26	„	·003			
Superintendents	398	„	·044			
Accountants or cashiers	201	„	·022			
Station-masters	2,471	„	·276			
Ticket-collectors	404	„	·045			
Guards or brakesmen	3,716	„	·415			
Switchmen	3,263	„	·364			
Carry forward				10,700	or	1·196
Brought forward				10,700	or	1·196
Engineers	150	or	·017			
Storekeepers	198	„	·022			
Draughtsmen	156	„	·017			
Foremen	1,335	„	·149			
Engine-drivers	3,563	„	·398			
Stokers	3,644	„	·407			
Artificers	21,337	„	2·386			
Platelayers	8,260	„	·923			
				38,643	or	4·321
Inspectors or timekeepers	997	„	·111			
Clerks	8,712	„	·974			
Gatekeepers	1,998	„	·223			
Policemen or watchmen	2,349	„	·262			
Porters or messengers	17,091	„	1·911			
Labourers	26,285	„	2·938			
Miscellaneous	2,885	„	·322			
				60,317	or	6·745
Total				109,660	or	12·263

In 1848, 52,688 persons were employed upon 4252 miles, or 12·391 per mile, as against 12·263 per mile in 1857, showing that the total numbers per mile are the same. An analysis of the component elements, however, indicates a proportional reduction in the numbers engaged in the more general services of railways, and an increase in the numbers engaged in the out-door service of the traffic; thus, there were ·364 switchmen per mile in 1857, against ·249 per mile in 1848, showing an increase of nearly one-half more; gatekeepers, ·223 per mile in 1857, against ·094 in 1848, or two and a half times the number; guards or brakesmen, ·415 per mile in 1857, against ·352 in 1848, or one-sixth more. This comparative increase would appear to show that the safe working of the trains has been well provided for with the development of the railway system.

If it be assumed that each employé contributes to the support of two or more other persons, it would appear that 1 per cent. of the population of the United Kingdom was maintained by the railways in operation, independently of the considerable amount of labour employed on railways in course of construction. Mr Stephenson has estimated that, collaterally, in the manufacture of iron, the felling and transport of timber, the production of stores, the erection and improvement of buildings, &c., railways give employment to at least 50,000 men; and that, taking every one together, 2 per cent. of the population derive their maintenance from railways.

Money invested in Railways.

MONEY INVESTED IN RAILWAYS.

On December 31, 1857, the total amount of capital raised for the construction of railways was a small fraction under L.315,000,000 (or L.314,989,626), representing an expenditure of about L.35,000 per mile (or L.34,950). Some small portion of this cost belongs to the lines in course of construction at that date. The money has been raised in the following proportions:—

In 1857.

By ordinary share capital,	L.178,567,935,	or 57 per cent.
By preference shares	58,061,655,	or 18 „
By loans	78,360,236,	or 25 „
Total capital,	L.314,989,826	

Say L.315,000,000.

Average interest on preference shares	4·86	per cent.
Do. do. loans	4·52	„
Do. available dividend on the ordinary share capital	3·60	„
Average percentage of nett receipts to total capital and loans	4·06	„

The relative proportions of ordinary capital, preference capital, and loans above given, have been stationary during the three years 1855, 1856, and 1857; but during the previous six years the proportions of preference and loan

Money invested in Railways.

capital had been increasing from 9 per cent. and 22 per cent. respectively in 1849, to what they have just been stated to be in 1857, namely, 18 per cent. and 25 per cent.

In 1845–6 the dividends of railways appear to have been at their maximum, of which the following are examples:—

Railways.	Dividend on Share Capital in 1846.	
Dublin and Drogheda	4	per cent.
Eastern Counties	6¾	,,
Edinburgh and Glasgow	6	,,
Glasgow and Ayr	7	,,
Great Western	8	,,
Lancashire and Yorkshire	7	,,
London and North-Western	10	,,
London and Brighton	6	,,
London and South-Western	9⅔	,,
Midland	6¼	,,
South Eastern	6⅓	,,
York and North Midland	10	,,
York, Newcastle, and Berwick	9	,,

The precipitate influx of new lines during the four years from 1846 to 1850, the expensive contests before Parliament to prevent such competing lines from being made, the unhappy competitions for the privilege of constructing branch lines, the leasing of new lines by older lines at unremunerating rates, competition for traffic, and other causes leading to great extensions of capital, and arising from the attempts to execute works in three or four years which might advantageously have been spread over twelve or fifteen years,—such causes have been in operation to depress the dividends of railways, and with such power as to reduce the average proportion of nett receipts in 1849 to 2·83 per cent. of the total capital and loans raised at that time. Such, however, is the virtue of railway property that the nett receipts have increased since 1849 from 2·83 per cent. to 4·06 per cent. of the total capital and loans raised in 1857; and notwithstanding the accumulation of preference capital and loans, both taking precedence of ordinary capital, the available dividend on the latter increased from 1·88 per cent. to 3·6 per cent.

The average cost of railways per mile open in 1857 was as follows:—

England and Wales	L.39,275
Scotland	28,225
Ireland	15,664
Total average	L.34,950

—say L.35,000 per mile. But it is worthy of notice that the average cost of independent lines of railway authorized since 1848, and opened for traffic in the course of the ten following years, amounted to only L.11,823 per mile; namely, for England L.14,559; Scotland, L.7243; Ireland, L.7303 per mile. The difference in cost thus exhibited arises, among other causes, partly from the less costly character of the newer lines, and partly from the fact, that the existing lines, which have had no addition to their length for several years, have continually increased their capital. Thus, upon twenty-nine railways, having an aggregate length of 1200 miles, the capital increased from L.39,000,000 in 1853 to L.43,000,000 in 1857, or at the rate of above L.600 per mile per annum. But during the same period the nett receipts of these lines rose from 3·4 per cent. to 4·2 per cent. of the entire capital and loans. In 1849, when a total of 5996 miles had been opened, the total share capital and loans raised was L.229,747,778, or L.38,300 per mile; and as at that time a large proportion of capital was applied to lines in course of construction, this may be accepted as a full mileage cost; whereas, notwithstanding the additional construction of 3120 miles,—half as much again,—at much less mileage cost, the 9116 miles open in 1857 are found to average about L.35,000 per mile, not much less than in 1849, owing to the continual additions made to the capital of the older lines.

Money invested in Railways.

The number of railway companies, and the average length worked by them, was, for 1857, as follows:—

	Number of Companies.	Average Length of Lines in Miles.
England	52	123
Scotland	20	60
Ireland	21	51
Total	93	234

The London and Blackwall Railway, costing L.311,912 per mile, and the North London Railway, costing L.146,320 per mile, stand pre-eminently at the top of the list in capital expenditure per mile, for which their localization in and about London sufficiently accounts. But the third on the list, the Birkenhead, Lancashire, and Cheshire Junction, from Birkenhead to Chester and Warrington, costing upwards of L.75,000 per mile, stands, a beacon and an example to all railway companies, on the battle-ground of the London and North-Western and the Great Western companies. The exalted cost of that line was incurred partly by the protracted contests in which it has been involved with the neighbouring railways, and partly by the costly works of construction joining the railway to the docks at Birkenhead. The principal and older railways have been constructed at a heavy rate of cost per mile, compared generally with the more recent lines; the difference is attributable to the costly legislation and land charges they have incurred, as well as to the magnitude of the works of construction, involving deep cuttings, high embankments, long viaducts and tunnels, in order to obtain the most favourable gradients and curves, conforming, as nearly as possible, to a straight and level course. Of the railways in England, the Carlisle and Silloth Bay, one of the most recently opened, has the honour of standing at the foot of the list, 13 miles long, and costing L.6474 per mile, or little more for the whole line than the cost of a single mile of the Birkenhead, Lancashire, and Cheshire Junction.

Of the Scottish lines, the Caledonian stands at the head of the list, costing L.43,000 per mile; and the East of Fife, 7 miles long, at the foot, costing L.4351 per mile. But the cheapest lines of any length are the Forth and Clyde, costing L.5525 per mile; and the Peebles Railway, costing but L.20 more than that, L.5545 per mile.

Of the Irish lines, the Dublin and Kingston, a suburban line, 8 miles long, cost the highest amount per mile, about L.53,000. The next to it, of any considerable length, is the Ulster Railway, L.25,000 per mile. The cheapest line is the Limerick and Foynes, L.5282 per mile; and this appears to be the cheapest line of considerable length in the United Kingdom.

The proportions of expenditure on capital account cannot, from want of data, be exactly determined. The following may be accepted as an approximate analysis of average cost of the railways open in 1856–7:—

	Per mile.		Per cent.
Law and parliamentary expenses	L.2,000	or	6
Land and compensation	7,000	or	20
Works of construction and stations complete	17,500	or	50
Locomotive and carrying stock	3,000	or	9
Interest on stock, discounts, bonuses, dividends from capital, contingencies, &c.	5,500	or	15
	L.35,000		100

From this statement it would appear that the nett cost of construction and equipment is L.20,500 per mile, or above half of the entire cost; that the cost of land and compensation is L.7000 per mile, or one-fifth of the entire cost per mile. Out of 315 millions of capital, then, it would appear that above 60 millions have been absorbed in charges for land and compensation; of this sum, six-sevenths went intact into the pockets of the landowners, the remainder being dissipated in costs.

Passenger Traffic.

Passenger Traffic.

Statistics of Railways in Europe, America, India, and the Colonies.

Name of State, &c.	Year.	Length of Line Open.	Total Capital Expended.	Capital per Mile.	Traffic Receipts per Mile.	Working Expenses per Mile.	Nett Receipts per Mile.	Proportions of the Working Expenses to the Traffic Receipts.	Proportion of the Nett Receipts to the Capital.
		Miles.	L.	L.	L.	L.	L.	Per Cent.	Per Cent.
Austria	1856	1,586	25,876,786	16,378	2190	1150	1040	52·7	6·3
Belgium (government lines)	1856	445	7,294,783	16,391	2158	1260	898	58·2	5·5
France	1854	2,913	74,772,994	25,668	2706	1191	1515	44·0	6·6
Germany (exclusive of Austria and Prussia)	1855	2,226	29,185,250	13,111	1816	897	919	49·4	5·7
Great Britain — England and Wales	1857	6,706	263,145,238	39,275	3161	1564	1597	48·0	4·1
Great Britain — Scotland	1857	1,243	35,084,288	28,225	2107	941	1166	44·0	4·1
Great Britain — Ireland	1857	1,070	16,760,300	15,664	1091	465	626	38·0	4·0
Holland	1857	163	3,248,845	19,931	1709	1042	667	61·0	3·3
Prussia	1856	2,503	35,295,043	14,101	1877	968	909	51·6	6·2
Sardinia	1855	234	...	...	1447	744	703	51·4	...
Spain	1855	130	...	...	924	522	402	56·5	...
Switzerland	1856	203	4,037,427	19,888	636	341	295	54·3	1·5
Tuscany	1856	132	2,053,493	15,556	966	446	520	46·2	3·3
United States of America	1855	17,481	144,646,953	8,275	1234	666	568	54·0	6·7
India (capital estimated)	1857	290	2,982,000	10,280	729	308	421	42·2	4·1
Canada	1857	1,252	14,648,195	11,720	939	648	291	69·0	2·5
New South Wales	1857	38½	1,226,034	31,845	1166	840	326	72·0	1·0

PASSENGER TRAFFIC.

The returns forwarded to and printed by the Board of Trade, from which the statistics of traffic are derived, are neither uniform nor complete; and it is difficult to balance the various elements of such returns. The data in many cases can only be approximated to; and they are here presented as nearly correct as is permitted by the nature of the returns. In some instances data are simply reproduced as rendered in the Report of Captain Galton, the secretary to the railway department of the Board of Trade.

The total number of passengers of each class conveyed in 1857 was as follows:—

Countries.	First Class.	Second Class.	Third Class and Parliamentary.	Total, including Miscellaneous.
England	15,671,096	36,603,060	63,562,252	115,858,806
Scotland	1,823,542	2,180,284	10,723,694	14,733,503
Ireland	1,112,188	3,382,941	3,912,183	8,416,579
Total	18,606,826	42,166,285	78,198,129	139,008,888

Note.—There were about 11,000 season or periodical ticket-holders in England, 3000 in Scotland, 4500 in Ireland; in all 18,500, averaging the two half-years.

The proportions were as follows:—

Countries.	First Class.	Second Class.	Third Class.	Total.
	Per cent.	Per cent.	Per cent.	
England	13·5	31·6	54·9	100
Scotland	12·5	14·7	72·8	100
Ireland	13·3	40·2	46·5	100
	13·4	30·4	56·2	100

The numbers conveyed per mile of the mean length of railway open in 1857—namely, in England 6610, in Scotland 1226, in Ireland, 1064 miles—were as follows:—

Countries.	First Class.	Second Class.	Third Class.	Total, including Miscellaneous.
England	2371	5537	9616	17,527
Scotland	1148	1778	8749	12,017
Ireland	1045	3179	3676	7,909
Total	2090	4737	8786	15,617

The average distances travelled by passengers of each class in 1857 were as follows:—

Countries.	First Class.	Second Class.	Third Class.	Total.
	Miles.	Miles.	Miles.	Miles.
England	19·0	13·5	11·7	13·6
Scotland	17·0	9·3	10·7	11·3
Ireland	17·8	12·2	15·2	14·3
Total	18·8	13·8	11·7	13·3

The number and mileage of passenger trains in 1857 were as follows:—

	Total Number.	Total Mileage.	Average Mileage per Train.
England	1,612,357	37,601,375	23·3
Scotland	218,031	3,972,494	18·2
Ireland	135,315	3,263,367	24·1
Total	1,965,703	44,837,236	22·8

The average number of passengers per train in 1857 was as follows:—

	Average Passengers per Train.	Average Mileage travelled by Passengers.	Average Mileage run per Train.
		Miles.	Miles.
England	72	13·6	23·3
Scotland	68	11·3	18·2
Ireland	62	14·3	24·1
Total	71	13·3	22·8

The actual receipts from passengers of each class in 1857 were as follows:—

Countries.	First Class.	Second Class.	Third Class.	Total, including Miscellaneous.
	L.	L.	L.	L.
England	2,753,123	3,147,398	2,921,158	9,004,769
Scotland	251,184	178,778	471,432	916,697
Ireland	163,161	248,812	244,628	671,332
Total	3,167,468	3,574,988	3,637,218	10,592,798

The proportions of receipts were as follows:—

Countries.	First Class.	Second Class.	Third Class.	Total, including Miscellaneous.
England	30·5	34·9	32·5	100
Scotland	27·4	19·5	51·5	100
Ireland	24·3	37·0	36·4	100
Total	29·9	33·7	34·3	100

Passenger Traffic.

The average receipts in 1857, per mile open, were as follows:—

Countries.	First Class.	Second Class.	Third Class.	Total, including Miscellaneous.
	L.	L.	L.	L.
England.........	416	476	442	1362
Scotland.........	204	146	384	746
Ireland	154	234	230	631
Total..........	356	402	409	1191

The receipts per train-mile run are reported to have been as follows:—England, 64·8d.; Scotland, 62·6d.; Ireland, 54·5d.

The average receipts per passenger of each class in 1857 were as follows:—

Countries.	First Class.	Second Class.	Third Class.	Total.
	d.	*d.*	*d.*	*d.*
England.........	42·2	20·6	11·0	18·3
Scotland.........	33·1	19·7	10·6	14·7
Ireland..........	35·2	17·6	15·0	18·7
Total	35·5	20·3	11·2	17·9

The average fares per train-mile, of passengers of each class, in 1857, were as follows:—

Countries.	First Class.	Second Class.	Third Class.	Total.
	d.	*d.*	*d.*	*d.*
England.........	2·01	1·41	·87	1·26
Scotland.........	1·77	1·55	·87	1.13
Ireland	1·81	1·35	·90	1·20
Total	1·97	1·41	·87	1·25

From the foregoing statements it appears that the average distance travelled, in 1857, by passengers of all classes, was only 13·3 miles; the greatest average was 19 miles by first-class passengers in England. These figures are suggestive:—they demonstrate that the bulk of the passenger-traffic is local, confined mainly to short distances, and that long journeys, though important, are but secondary sources of income. In 1843, first-class travelling averaged 26 miles per passenger; second-class, 14·4; third-class, 12·5 total, 16·1 miles. The generally lower averages of 1857 are to be ascribed to the extension of short local lines and branches, and to the improved accommodation for second and third class travellers, by which these classes of traffic were promoted. As might be expected, however, on different lines and in different localities the average distances travelled by the different classes vary within considerably wide limits.

The total number of passengers conveyed in 1857 has been seen to be upwards of 139 millions, and the total receipts to be upwards of 10½ millions sterling. Of this large amount of receipts, the third-class traffic, at less than a penny per mile, contributes the most. The first-class receipts are the lowest, and are about 30 per cent. of the entire receipts; the second-class receipts are about 34 per cent., and the third-class about 36 per cent.; and second and third conjointly amount to 70 per cent. of the entire receipts from passengers. It is obvious from these comparative results, that the lower fares pay the best, even with inferior accommodation. The excessive preponderance of third-class receipts in Scotland results partially from the practice of running only first and third class on the Caledonian and the Great North of Scotland railways.

There is a decided preponderance of third-class traffic on the continental railways. In Holland and Prussia the third-class receipts amount to 50 per cent. of the whole; and in France to 43 per cent. On continental lines generally, three-fourths of the passengers are third-class.

Goods Traffic.

GOODS TRAFFIC.

The total quantity of merchandise, minerals, live stock, parcels, &c., conveyed in 1857 are as in the annexed table:—

Heavy Goods Traffic in 1857.

Goods.	England.	Scotland.	Ireland.	Total.
	Tons.	Tons.	Tons.	Tons.
General merchandise	21,138,732	2,909,139	980,056	25,027,927
Minerals—				
Coal	23,320,309	1,942,968	98,323	25,361,600
Unclassed minerals, coal, lime, &c.	14,318,994	6,584,925	28,465	20,932,384
Total Minerals...	37,639,303	8,527,893	126,788	46,293,984
Total..........	58,778,035	11,437,032	1,106,844	71,321,911

Live-Stock Traffic in 1857.

Stock.	England.	Scotland.	Ireland.	Total.
	Head.	Head.	Head.	Head.
Cattle	1,778,259	331,443	255,027	2,364,729
	No.	No.	No.	No.
Sheep	5,693,092	1,042,568	349,113	7,084,773
Pigs....................	1,112,346	37,973	442,907	1,593,226
Total with unclassed	8,588,129	1,411,984	1,047,047	11,047,160

Light-Goods Traffic in 1857 (*by Passenger-Trains*).

Goods.	England.	Scotland.	Ireland.	Total.
	Tons.	Tons.	Tons.	Tons.
Passengers' luggage	14,324	46	424	14,794
	No.	No.	No.	No.
Parcels	7,663,988	638,293	383,821	8,686,102
Carriages	48,056	5,244	3,503	56,803
Horses..................	186,779	25,946	19,726	232,451
Dogs....................	226,589	37,884	27,277	291,750

The proportions of merchandise and minerals carried in each country were as follows:—

Goods.	England.	Scotland.	Ireland.	Total.
	Per Cent.	Per Cent.	Per Cent.	Per Cent.
General merchandise	36	26	88·5	35
Coal	39	17	9	35
Unclassed minerals...	25	57	2·5	30
Total minerals...	64	74	11·5	65
Total	100	100	100	100

The weights carried per mile of the mean length of railway open in 1857 were as follows:—

	General Merchandise.	Total Minerals.	Total.
	Tons.	Tons.	Tons.
England (6610 miles).........	3198	5694	8892
Scotland (1226 miles).........	2373	6956	9329
Ireland (1064 miles)..........	920	120	1040
Total (8900 miles).........	2812	5202	8014

The number and mileage of goods trains in 1857 were as follows:—

Goods Traffic.

	Total Number.	Total Mileage.	Average Mileage per Train.
England.........	921,258	32,315,676	35·1
Scotland.........	197,461	5,249,496	26·6
Ireland...........	21,309	1,057,013	49·6
Total......	1,140,028	38,622,185	34·0

The actual receipts from goods-traffic in 1857 were as follows:—

By Goods-Trains.

Countries.	General Merchandise.	Minerals.	Live Stock.	Total.
England	L.6,728,667	L.3,313,256	L.410,267	L.10,452,190
Scotland......	767,297	657,592	47,912	1,472,801
Ireland	285,77[illegible]	16,444	59,177	361,400
Total	L.7,781,743	L.3,987,292	L.517,356	L.12,286,391

By Passenger-Trains.

Countries.	Parcels and Luggage.	Carriages, Horses, and Dogs.	Mails.	Total.
England	L.548,585	L.203,047	L.319,156	L.1,070,788
Scotland	38,128	17,570	56,283	111,981
Ireland.	28,216	16,807	67,628	112,651
Total.....	L.614,929	L.237,424	L.443,067	L.1,295,420

The proportions of the above receipts were as follows:—

By Goods-Trains.

Countries.	General Merchandise.	Minerals.	Live Stock.	Total.
	Per Cent.	Per Cent.	Per Cent.	
England	64	32	4	100
Scotland	52	45	3	100
Ireland	79	4·5	16·5	100
Total.........	63	33	4	100

By Passenger-Trains.

Countries.	Parcels, &c.	Carriages, &c.	Mails.	Total.
	Per Cent.	Per Cent.	Per Cent.	
England	51	19	30	100
Scotland.........	34	16	50	100
Ireland	25	15	60	100
Total.........	48	18	34	100

The average receipts from goods traffic in 1857, per mile open, were as follows:—

	By Goods Trains.	By Passenger Trains.	Total.
England..	L.1581	L.162	L.1743
Scotland	1201	91	1292
Ireland....................	340	106	446
Total...........	L.1380	L.144	L.1524

The receipts per goods train-mile are reported to have been as follows, though it appears from the foregoing figures they should be higher:—

	d.
England	76·6
Scotland	67·0
Ireland	82·6

These statistics of goods-traffic show that upwards of 71 million tons of heavy goods were transported in 1857 in the United Kingdom, two-thirds of which were minerals. But in Scotland the minerals constitute three-fourths of all the heavy goods carried; and the greatest tonnage of goods per mile open is carried in that country. There were upwards of 8½ millions parcels carried on all the railways; and 11 millions of live stock. The total receipts from goods-traffic exceeded 13½ millions sterling; and they stand highest per train-mile in Ireland, probably because the greater part of Irish goods-traffic consists of general merchandise and live stock, which pay better than minerals.

Passenger and Goods Traffic.

PASSENGER AND GOODS TRAFFIC.

The mileage of trains in 1857 was stated to be as follows:—

Countries.	Passengers.	Goods.	Total.
	Train-miles.	Train-miles.	Train-miles.
England	37,601,375	32,315,676	69,917,051
Scotland.............	3,972,494	5,249,496	9,221,990
Ireland	3,263,367	1,057,013	4,320,380
Total.........	44,837,236	38,622,185	83,459,421

The total receipts from all kinds of traffic in 1857 were as follows:—

	Passengers.	Goods.	Total.
England	L.9,004,769	L.11,522,978	L.20,527,747
Scotland............	916,697	1,584,782	2,501,479
Ireland..............	671,332	474,051	1,145,383
Total.........	L.10,592,798	L.13,581,811	L.24,174,609

The following is a general statement of the capital raised, and the gross receipts from passengers and from goods, in 1857, reduced to annual and weekly mileage rates:—

	England.	Scotland.	Ireland.	Total.
Mean length of railway open (miles)..........	6,610	1,226	1,064	8,900
Capital per mile open December 31	L.39,275	L.28,225	L.15,664	L.34,950
Receipts per mile per annum,—				
From passengers......	L.1,362	L.746	L.631	L.1,191
From goods...........	1,743	1,292	446	1,524
Total...............	L.3,105	L.2,038	L.1,077	L.2,715
Receipts per mile per week,—				
From passengers......	L.26	L.14	L.12	L.23
From goods	34	25	9	29
Total...............	L.60	L.39	L.21	L.52
Proportions of receipts—	Per Cent.	Per Cent.	Per Cent.	Per Cent.
From passengers.....	44	37	59	44
From goods	56	63	41	56
Total..............	100	100	100	100
Proportion of gross receipts to capital	7·9	7·2	6·9	7·8

The table shows that the goods is considerably greater than the passenger traffic, the former averaging 56 per cent., and the latter 44 per cent. of the whole receipts. These proportions are identical with those of England alone, whilst they differ widely from those of Scotland and Ireland individually. In Scotland there is much more goods than passenger traffic; in Ireland there is more passenger than goods traffic; whilst the proportions of traffic in England represent the average of Scotland and Ireland together. The gross receipts per mile for England, Scotland, and Ireland are in the ratio of 3, 2, 1; and the total average is L.2715 per mile per annum, or L.52 per mile per week. The goods-receipts are shown to be absolutely greater than the receipts from passengers. This preponderance of goods-receipts has been the growth of years, the increase of goods-traffic having from the first been greater than that

Passenger and Goods Traffic.

of the passenger-traffic. The proportional receipts in 1849 and 1857 may be thus contrasted:—

	1849. Per Cent.	1857. Per Cent.
Passenger receipts	53	44
Goods receipts	47	56
Total	100	100

Working Expenses.

WORKING EXPENSES.

The following table affords a summary of the expenditure of railways, as to the amount of working expenses per mile, per annum, and per train-mile run, as well as the proportion of working expenses, in Great Britain and Ireland, during 1857:—

Working Expenses for the Year 1857.

Countries.	Maintenance of Way.	Locomotive and Carrying Stock.	Traffic Charges.	Miscellaneous, including Police, Watchmen, Compensation, &c.	Rates and Government Duty.	Total.	Corresponding Receipts from Traffic.	Proportion of Expenditure to Receipts.
	L.	L.	L.	L.	L.	L.	L.	Per Cent.
England	1,533,259	3,701,238	2,563,837	1,191,971	717,193	9,707,498	20,195,460	48
Scotland	155,065	444,414	249,986	183,021	61,484	1,093,970	2,486,890	44
Ireland	63,998	190,172	110,381	54,124	20,096 (no duty)	438,771	1,139,296	38
Total	1,752,322	4,335,824	2,924,204	1,429,116	798,773	11,210,239	23,821,646	47
Working Expenses per Mile per Annum.								
	L.	L.	L.	L.	L.	L.		
England	247	597	413	192	115	1564		
Scotland	133	382	215	158	53	941		
Ireland	68	202	117	57	21	465		
Total	208	515	347	170	95	1335		
Working Expenses per Train-Mile Run.								
	d.	d.	d.	d.	d.	d.		
England	5·0	Locomot. 8·75 Car. st... 3·50 12·25	8·9	4·1	2·6	32·8		
Scotland	4·3	Locomot. 8·7 Car. st... 2·8 11·5	6·2	4·6	1·7	28·3		
Ireland	3·6	Locomot. 9·25 Car. st... 1·55 10·80	6·2	3·1	1·2	24·9		
Proportion of Working Expenses.								
	Per Cent.	Per Cent.	Per Cent.	Per Cent.	Per Cent.	Total.		
England	15·8	38·1	26·4	12·3	7·4	100		
Scotland	14·2	40·6	22·9	16·7	5·6	100		
Ireland	14 6	43·3	25·2	12·3	4·6	100		
Total	15·5	38·4	26·3	12·7	7·1	100		

Note.—The receipts of such railways as have not made public their working expenses are not included in this table.

The appropriation of the gross receipts to working expenses, interest, and dividend, would therefore be as follows:—

	Per Cent. of Gross Receipts.	
Maintenance of way	7·3	
Locomotive and carrying stock	18 0	
Traffic department	12·4	
Miscellaneous	6·0	
Rates, &c	3·3	
Total working expenses		47
Interest on preference stock and loans		27
Balance available as dividend on ordinary share capital		26
Gross receipts		100

The relative receipts and expenditure per train, as reported, are as follows:—

Receipts.

	Passengers.	Goods.	Total.
	d.	d.	d.
England	64·8	76·6	70·3
Scotland	62·6	67·0	65·0
Ireland	54·5	82·6	60·7

Expenditure.

		Per Cent. of Receipts.	Surplus Receipts.
	d.		d.
England	32·8	48	37·5
Scotland	28·3	44	36·7
Ireland	24·9	38	35·8

Analysis of Locomotive Expenses.—The average cost of locomotive power has been found to be approximately 8¾d. per train-mile, passengers and goods; it is greater for main lines and less for secondary lines. The following are the usual proportions of the locomotive expenditure on principal lines for working, repairs, and renewals:—

	Passenger-Engines per Train-mile.	Goods-Engines per Train-mile.
	d.	*d.*
Wages of enginemen and firemen, cleaning, oil, tallow, water, coking-wages	2·5	2·5
Coke, at 16s. per ton	2·0	4·0
Repairs and renewals, including general charges	4·0	4·5
	8·5	11·0

It will be observed that the element of coke for fuel is a very important item of expense; and as the average cost of coke fit for railway purposes is more than double that of coal, it has become a desideratum to substitute coal for coke, in order to reduce the working expenses of railways. The difficulty hitherto in effecting this desirable object has consisted in the smoke discharged from coal, which is forbidden to be emitted on railways by act of Parliament. There is no doubt of the nuisance of coal-smoke, and of the desirability of extinguishing it; and Mr Joseph Beattie of the London and South-Western Railway has laboured since 1853, with much success, at the problem of smoke prevention on railways. Mr Sylvester Lees and others have followed in his track; and more recently, in 1857, Mr D. K. Clark introduced a method of burning coal without smoke by means of steam-inducted air-currents, delivered into the fire-box above the fuel, and amongst the smoke; a plan which has operated successfully in consuming the smoke, and in promoting the efficiency of the engine. In the course of a few years longer there is no doubt that coke will be generally superseded by coal on railways. By the proper use of coal, half the cost of fuel will be saved, say an average of 1½d. per train-mile, which, upon 83,000,000 miles, would amount to a saving of L.700,000 per annum in the item of fuel alone, and would raise the available dividend on the original capital of railways nearly one-half per cent. (See STEAM-ENGINE.)

THE DEVELOPMENT AND DISTRIBUTION OF TRAFFIC.

The statistics of traffic returns of railways in the United Kingdom, since 1842, indicate a remarkably steady and rapid increase of traffic. In 1842 the total receipts amounted to upwards of L.4,250,000 sterling; in 1852 they were nearly L.16,000,000; and in the five years ending 1857 they were as follows:—

Year.	Average Miles Open.	Gross Receipts.	Receipts per Mile.	Receipts per Mile per Week.
		L.	L.	L.
1853......	7488	18,035,879	2408	46
1854......	7846	20,215,724	2577	49
1855......	8177	21,507,599	2630	51
1856......	8502	23,165,493	2725	52·4
1857.....	8901	24,174,616	2716	52·2

Showing an increase of one-third in the gross receipts since 1853, with an increase of one-fifth in the miles open. The receipts per mile increase, notwithstanding their continual dilution by the infusion of new lines. These results, taken together, indicate the inherent elasticity of the railway system, and its seemingly inexhaustible resources.

As the main trunk-lines constitute the foundation of the railway system, so also those which converge towards and terminate in London—the metropolitan lines—are more important than the provincial lines. The county of Middlesex contained, according to census, in 1851, a population of nearly 2,000,000, or fully one-tenth of the whole population of England and Wales. London is the great heart of the country, and is the chief centre of commerce; and as, moreover, the metropolitan railways, taken together, possess a greater variety of traffic than others, they will be selected as the basis of the subsequent discussions, illustrative of the growing magnitude and distribution of traffic. Now it appears that, on the metropolitan railways, nine in number, including the London and Blackwall and North London, the following were the receipts for the four years ending 1857:—

Year.	Average Miles Open.	Gross Receipts.	Receipts per Mile.	Receipts per Mile per Week.
		L.	L	L.
1854......	2579	9,354,425	3627	70
1855......	2664	9,920,609	3724	72
1856......	2778	10,559,658	3801	73
1857......	2834	10,743,118	3792	73

The metropolitan railway mileage, it may be noted, constitutes one-third of the total mileage, whilst it produces nearly half the whole traffic receipts in the country; insomuch that the receipts per metropolitan mile are two-fifths more than the gross average receipts per mile. Again, it appears that 35 per cent. of the total increase of receipts during the four years 1854–57 was acquired from only 32 per cent. of the average mileage; and but for the baleful competition during 1856–7 between the London and North-Western and Great Northern companies, the proportion of increase would have been more nearly 45 per cent. Whether the increase of receipts be compared with the total increase or with the mileage, the traffic of the metropolitan railways increases the most rapidly, as it is also of the greatest absolute magnitude.

Separating, further, what may be distinguished as the coast lines to the south and east (the Eastern Counties, South-Eastern, Brighton, and South-Western) from the interior lines to the north and west (the London and North-Western, the Great Western, Great Northern, Blackwall, and North London), the receipts of the metropolitan lines may be thus classified and compared with the receipts in other parts of the United Kingdom for 1857:—

	Average Miles Open.	Receipts per Mile per Week in 1857.
Metropolitan interior lines	1515	L.86·5
Metropolitan coast lines	1319	56·5
Other English lines not included in the above	3610	51·5
Scottish railways	1183	40·5
Irish railways	1044	21·0

This comparative statement shows that the densest traffic in England, averaging L.86, 10s. per mile over 1515 miles, lies to the north and west of the metropolis; that the railway traffic of the country is very partially distributed, and that, taking London as the great focus, the traffic radiates and converges in all directions with generally decreasing intensity as the distance from London increases. The northern and western districts, it is true, were in 1857 more freely supplied with railway communication than the southern and eastern districts. But the chief concern of the railway economist is to equalize the flow of the traffic, and, with this design, to provide a sufficiency and suitable localization of converging lines. It is easy to foresee that a third line between London and Oxford, on the narrow guage, occupying the territory between the London and North-Western and Great Western railways, shall be one day constructed as a direct outlet for the densely-crowded

Development and Distribution of Traffic.

traffic of the north-western districts. A railway was in fact projected with this object, and a bill applied for in 1853; but the bill was thrown out under the combined opposition of the neighbouring railway companies,—the opposition of party, with the bugbear cry of injurious competition.

The capacity of a railway for traffic is regulated by the number and weight of the trains, by the speed at which they can be run, by the degree of punctuality of their arrivals and departures at all the stations, and by the length of the line. The number of trains must be limited ultimately by the contingencies of the traffic, and the regularity with which they can be propelled; for the same conditions of safety and expedition which require the use of distinct up and down lines, operate also in limiting the number of trains per day moving in the same direction. A margin must be allowed for unforeseen delays and the want of absolute punctuality; and therefore some fixed intervals must be adopted as the minimum period of time which can be interposed between the starting of successive trains from a terminus.

The weight of the trains is another important element, and it is one which has been overlooked in the economy of railways. Heavy trains demand heavy engines, capable of drawing heavy loads and of keeping time. Now heavy engines at high speeds operate most injuriously upon the road, and so seriously as to have made it a matter of certain experience that the economical limits of engine-weight has on some lines been exceeded. The more nearly the speeds of trains can be approximated, the higher may the speeds be, and the greater the number which may be run, though of course the probability of accidents by collision or otherwise, at the higher speeds, is increased by unforeseen causes of irregularity. The reason is obvious; fast trains are not so shortly brought up as slow trains, and collisions are greatly more disastrous. The length of line also affects the capacity for traffic, as the contingencies of transit increase in proportion with the length; and the daily number of through trains should be less. The shorter the lines in general, the more frequent are the trains. Great and continuous length of line is then, so far, an element of weakness, as much of the traffic on every section of a long line depends upon the arrivals from other parts; and its safe and beneficial working must depend all the more upon the aid of the telegraph.

The traffic of the London and North-Western Railway affords ample illustration of the foregoing doctrine. The main line was partially opened in 1837, and in 1838 it was opened through. The traffic of this line sprang up from very small dimensions in 1837, and rapidly developed, as may be observed in the following historical summaries of the traffic. The daily numbers of trains to and from the principal termini or stations of different sections of the line, at successive intervals of years, were as follows:—

Railways.	1837.	1848.	1852.	1857.
	No.	No.	No.	No.
London (Euston)	19	44	86	109 trains.
Stafford	14	38	104	... „
Manchester	(1831.) 26	90	102	... „
Total...............	59	172	292	109 „

The average weight of engines working these trains varied from 7 tons in 1831, to 18 or 19 tons in 1848. In 1852 the weight of engines, with tenders, averaged 36 tons at Euston, 28 tons at Stafford, and 32 tons at Manchester; and in 1857 the average of engine and tender rose to about 40 tons at Euston. The running speed of goods trains averaged from 10 miles per hour in 1831 to 20 miles per hour in 1848–57. The average weight of trains, without engine and tender, was as follows:—

Development and Distribution of Traffic.

Railways.	Trains.	1837.	1848.		1852.	1857.
		Tons.	Tons.		Tons.	Tons.
London	Passenger.........	46	57	72	87	140
	Goods	112	141			
Stafford	Passenger.........	45	53	66	75	...
	Goods	118	159			
Manchester...	Passenger.........	(1831.) 11	55	58	64	...
	Goods...............	45	111			

These data show a great increase both in number and in weight of trains at all the stations;—from 172 trains per day in 1848, to 292 trains per day in 1852. Taking London trains for special analysis, there went into and out of Euston station 44 trains daily, averaging 72 tons weight, in 1848; 109 trains daily, averaging 140 tons weight, in 1857;—showing an increase to two and a half times the number, and to double the weight; or, upon the whole, to five times the magnitude of the London traffic, as it was in 1848, during the subsequent period of nine years. This appears an overwhelming rate of progress; and it looks still more formidable when it is considered that, into and out of London, during the period from 1848 to 1852, the daily number of trains increased 10·5 per cent. per annum; 1852–57, 4·6: the weight per train increased, 1848–52, 4 tons; 1852–57, 11 tons: the whole train weight increased, 1848–52, about 1000 tons; 1852–57, 1500 tons per annum.

This statement plainly indicates that in the earlier stages of development, whilst yet the line was free and unburdened with business, the number of trains was freely increased to conduct the growing traffic, with a small increase in their weight; but that subsequently, as the line became crowded with trains, and the circulation of traffic embarrassed, the number of trains was much more slowly increased, whilst considerable additions were made to their weight; so much so, that the whole train-weight, indicating the general magnitude of the traffic, has increased in an accelerating ratio since 1848.

So early as 1849 the question of heavy engines and high speeds, incidental to the crowded traffic of the London and North-Western Railway, was one of considerable embarrassment in its engineering aspects. The effects on the rails and other parts of the permanent way, produced by the increased weight and speed of the engines and trains, had become very marked, and the deterioration of the road had increased very rapidly under the heavy engines introduced; and further, the immediate damage to both the road and the rolling stock, from high speed, outweighed, in positive loss to the company, the additional fare received. To remedy this state of affairs, it was proposed to reduce the number of passenger-trains, augmenting their weight and diminishing their speed, in order to give more scope for the working of the heavy goods-trains, which were often obliged, even at that time, to be taken at speeds of 25 to 30 miles per hour, though timed for 20 miles an hour. In dealing with the passenger traffic, it was proposed by the general manager to use the lighter class of engines for short local trains, and on branch lines to run fewer carriages with trains, by causing passengers to change their seats at junction instead of attaching the carriage itself; in connection with which it was found that the average capacity and actual number of passengers in the carriages, in 1848–9, were as follow:—

	Capacity for Passengers.	Average Number of Passengers per Carriage.
First class....................................	18	7
Second class	25	13
Third class	32	21

Development and Distribution of Traffic.

It was obviously considered in 1849, that at that time the natural limits of the traffic of the London and North-Western Railway were, if not exceeded, at least, under the circumstances, fully attained.

Nevertheless, in 1853, as compared with 1849, the engine-mileage increased 16 per cent., merchandise and mineral tonnage 56 per cent., train-weight 33 per cent., and engine-weight practically 10 per cent., on the lines open in 1848. To provide for the working of this largely-increased traffic, many of the lighter engines were condemned as unfit for the purpose, and were replaced by heavier engines. *Secondly*, The road was made much stronger, with heavier rails and chairs, larger sleepers, deeper ballast, and better drainage. But the damage to the road, and cost of maintenance, notwithstanding its greater strength, has unavoidably increased; and it was estimated that in 1853 the "life" of the rails was reduced from 20 years to 15 years. *Thirdly*, The electric telegraph was extensively introduced over the line, the use of which greatly facilitated and economized the working of the traffic, and practically doubled the capacity of the railway for traffic.

In 1856 an extension of the system of telegraphic signalling, by detail sections, was applied and in operation over the entire distance from London to Rugby, 83 miles,—the section of greatest traffic,—upon a plan which was considered by Captain Huish in 1858, after two years' experience of its working, to be the nearest to perfection that could be arranged. A signal apparatus was stationed every 2½ miles on the whole distance; and every train as it comes upon a fresh length of 2½ miles is telegraphed forward to the next station in the series, and when it leaves that length its passage forward is telegraphed back to the station behind. By this means they have the power of preventing trains being within 2½ miles of each other, be their speed or irregularity what it may. This system of communication has conduced very materially to the safety of the line, and it inspires great confidence into the men whose duty it is to work the traffic. During fog, the telegraph apparatus is of inestimable utility, in conjunction with the use of fog-signals, which are fixed to the rails, and discharged with a loud report by the engine in passing over them. Captain Huish mentions that, during two days of such intense fog that a train could not be seen at the distance of its own length, 400 trains were run, without diminishing the speed, by the aid of the signals, and without accident. It was like a discharge of platoon firing from one end of the line to the other. In view of the formidable and increasing traffic, a third line of rails was in 1858 commenced to be laid down from London, for a distance of 54 miles, for the running of the goods and mineral trains, at slower and more economical speeds, without interfering with the rapid trains of the main line; and it was anticipated that the saving of tear and wear, by diminished speed, and the saving of shunting and delaying slow trains to let the fast trains pass, would pay the interest of the cost of the third line. There can be no doubt of the sound policy of this course.

Meantime, the pressure exerted upon the resources of the railway by the mixing of slow with fast trains, has driven the London and North-Western Railway Company to the expedient of working the majority of their slow or goods trains during the night, when the road is comparatively clear. Thus, the average number of passenger and of goods trains on the southern division, that passed Tring station, 32 miles from London, during the twenty-four hours, in April 1857, was as follows:—

	Passenger Trains. No.	Goods Trains. No.	Total Trains. No.
6 A.M. to 12 noon	16·2	7	23·2
12 noon to 6 P.M.	18·4	10·4	28·8
6 P.M. to 12 midnight	11	13·4	24·4
12 midnight to 6 A.M.	2	26·2	28·2
Day's total (specials extra)	47·6	57·0	104·6

Showing that the greater number are goods trains; that 26 goods trains, or nearly half their whole number, were run after midnight; and that the busiest periods of the 24 hours were after mid-day and after midnight, so equally and unavoidably was the traffic distributed over the day and night: the stupendous machine being in ceaseless operation, working double turns. The greatest average number of passing trains, about five per hour, indicates an arrival at average intervals of 12 minutes, or 24 minutes interval each way, up and down. This appears a fair allowance of time, but it conceals the inequalities of speed and the unpunctualities of slow and fast trains. It was found, in the course of one week's observation at Tring station, that there were, in the arrivals of passenger-trains alone:—*Up-trains*, 18 arrivals behind time 5 minutes and upwards,—maximum lateness 34 minutes; *down-trains*, 29 arrivals behind time 5 minutes and upwards,—maximum lateness 16 minutes; in all, 47 late arrivals, or 8 per day;—being at the rate of one late arrival in six passenger trains, independently of the irregularities of goods trains. It is superfluous to dwell on the highly-disciplined organization which is demanded to insure the safe working of traffic so complicated and of such magnitude.

Such is, in brief, the material history of the most hardly-worked line in the kingdom,—a "representative" line—developing the successive stages of a growing traffic, and the successive contrivances and organizations to provide for it.

RAILWAY SPEEDS AND LOCOMOTIVE PERFORMANCES.

Railway Speeds and Locomotive Performances.

"Railway speed" is a variable quantity, varying in the same country, and different in different countries, according to the amount of business done and the relative value of time. The cost of transport is affected by the element of speed more, perhaps, than by any other condition:—the actual tractive force of engine necessary to draw a given train increases much faster than the ratio of the speed simply. At the higher speeds it increases nearly as the square of the speed. Thus, if an engine and tender, weighing together 32 tons, and exerting a given tractive force, takes, say, forty loaded carriages, weighing 290 tons, at 20 miles per hour on a level, the loads which it could take if it exerted the same tractive force at higher speeds, would be only as follows:—

On a Level.

At 20 miles per hour,	40 carriages,	weighing 290 tons.
„ 30 „ „	30 „	„ 220 „
„ 40 „ „	21 „	„ 160 „
„ 50 „ „	15 „	„ 115 „
„ 60 „ „	11 „	„ 85 „
„ 70 „ „	8 „	„ 60 „

The influence of gradients, also, is very important. If an engine and tender, weighing together 32 tons, be capable of drawing a maximum train of, say, 56 loaded carriages, weighing 420 tons, at 20 miles per hour on a level, it would only draw the following loads, at the same speed, on the following inclines:—

At 20 Miles per Hour.

Level..............	56 carriages,	weighing 420 tons.
Incline 1 in 600,	45 „	„ 340 „
„ 1 in 300,	36 „	„ 270 „
„ 1 in 150,	27 „	„ 200 „
„ 1 in 100,	20 „	„ 150 „
„ 1 in 75,	16 „	„ 120 „
„ 1 in 50,	12 „	„ 90 „
„ 1 in 40,	9 „	„ 65 „
„ 1 in 30,	6 „	„ 45 „
„ 1 in 20,	3 „	„ 24 „
„ 1 in 10,	*nil* „	„ *nil* „

It is here shown that, on an incline of 1 in 20, the engine would only be capable of taking up three loaded carriages, about 24 tons weight, and that on 1 in 10 its whole power

Railway Speeds and Locomotive Performances.

in this particular case would be absorbed in pulling up its own weight. Hence the prime importance, in the early stages of railway experience, of constructing the gradients as nearly level as was practicable, as they absorbed, according to their steepness, large proportions of the power of the light engines of the time, in ascending hills; and that which would otherwise appear unwarrantable—the costly construction of the early railways by expensive tunnelling, viaducts, bridges, and cuttings, to approximate to the desiderated horizontal standard—is abundantly explained by the paramount necessity of usefully employing the limited power of the engines then constructed. This was the stand-point of the elder Stephenson; he maintained the superiority of "flat" gradients, and the sound policy of incurring a large expenditure in construction in order to avoid otherwise heavy inclines and heavy expenses. The ruling gradient of the Liverpool and Manchester Railway was fixed at 1 in 900, excepting of course the inevitable inclines at Rainhill summit, for working which special provision was made; that of the next great line, the London and Birmingham, was fixed at 1 in 330; and it is well known at what cost even this gradient, though considerably steeper than the Liverpool and Manchester, was obtained. It was the object of Mr Stephenson to make this railway as mechanically perfect as possible, reducing the gradients to the minimum consistent with the conformation of the country. On the Great Western Railway, one of the earliest made lines, the ruling inclination is 1 in 1320 for the greater part of the way. Mr Joseph Locke initiated the system of cheaply-constructed railways, as the facilities for increasing the power of locomotives became better understood; he constructed lines with long steep gradients, some of them 1 in 70, 1 in 75, 1 in 80. The Great Northern Railway, of comparatively recent origin, is constructed on a ruling gradient of 1 in 200; and in general the more recently made lines have the steepest gradients. Following thus the variable surface of the country, this system became known as the "undulating system," and it has even been deemed preferable to the system of perfect or approximate levels, being supposed to afford breathing intervals, as was thoroughly understood in coach-driving, when the horses were eased by "getting the shoulder off the collar" going down-hill. The analogy is not sound; an engine never tires, and its power does not necessarily fluctuate like horses' power. The question of levels *versus* gradients appears to involve the question of straight lines *versus* curves; for, inasmuch as steep railways are generally also lines of frequent curves, which by common consent operate very prejudicially in absorbing locomotive power, the question is rather as between gradients and curves on the one part, and levels and straight lines on the other part. Moreover, the ruling speeds, as they may be called, have in the course of years increased. The question is not susceptible of a comprehensive and satisfactory solution otherwise than by means of a comparative analysis of all the elements of working expenses during a series of years.

Working Speeds of Passenger-Trains.—The average speed of express trains, including stoppages, varies from 36 to 42 miles per hour; and of parliamentary trains, stopping at all the stations, the average speed, including stoppages, varies from 17 to 21 miles per hour. The speeds of ordinary trains are intermediate between those of express and parliamentary trains, dependent on the frequency of the stoppages.

If the delays incurred by stoppages be allowed for in bringing up express trains, and in getting up the speed, for which four minutes per stoppage may be allowed, and also the time standing at stations, the average speed while running with steam on, would vary from 42 to 48 miles per hour. The following are the comparative speeds of express trains on the broad and narrow guages in 1859:—

Railway Speeds and Locomotive Performances.

	Average Speed, including Stoppages.	Average full Speed while Running.	Maximum Speed in Practice.
	Miles per Hour.	Miles per Hour.	Miles per Hour.
BROAD GUAGE—			
London and Birmingham	42	...	...
Average	37	45	About 60
NARROW GUAGE—			
London and Brighton	40·4	...	...
Average	38·5	45	About 60

The average full speed on the Great Northern Railway (narrow guage) is 47 miles per hour, and a speed of 62 miles per hour is frequently run. During periods of active competition the trains on the Great Western Railway (broad guage) have been run at a speed of 65 miles per hour. But, such a high speed can only be run, with any pretension to safety, on the best parts of the lines, free of curves, and with the road in first-rate order. The average practice in speeds of passenger-trains appears to be the same on the broad and the narrow guages.

Working Speeds of Goods Trains.—The ordinary average progress of goods-trains, including all detentions, varies from 10 to 18 miles per hour over long distances. The ordinary actual speed while running varies from 15 to 25 miles per hour; 20 miles per hour is a common running speed. The very large goods-traffic of the London and North-Western and Great Northern Railways is conducted at higher than average speeds, in order to clear the passenger traffic—15 to 20 miles per hour, including stoppages, and frequently at a running speed of 30 to 35 miles per hour, or occasionally 40 miles per hour when the stoppages are long.

Locomotive Performances.—The duty and performance of locomotive engines vary materially, as may be supposed, on different lines, according to the nature and extent of the traffic. The following are a few characteristic performances on different railways.

London and North-Western Railway, southern division. The principal passenger trains have been classified thus:—

Description of Train.	Number of Carriages.	Train Weight.	Running Speed.	Number of Stoppages.
		Tons.	Miles per Hour.	
1. Express	9	46	42	3
2. Day mail	13	66	38	5
3. Night mail	17	86	34	7
4. Stopping train	21	106	31	9
5. Heavy stopping train	25	126	28	11
6. Extra train	34	171	36	5

The average speed, including stoppages, and the consumption of coke per mile run, are as follows:—

	Average Speed.	Consumption of Coke per Mile run.
	Miles per Hour.	lb.
1. Express	39	21
2. Day mail	33	30·6
3. Night mail	31	26·6
4. Stopping train	27	30·6
5. Heavy stopping train	26	29·2
6. Extra train	33	42·3

Goods-trains have been run from Rugby to London (81½ miles) with the following results:—

	1st Goods Train.	2d Goods Train.
Number of waggons	53	45
Train weight (tons)	450	402
Running speed (miles per hour)	17	17
Number of stoppages	10	10

The average speeds, including stoppages, and the consumption of coke, were as follows:—

Accidents on Railways.

	Average Speed. Miles per Hour.	Consumption of Coke. lb.
1st goods train	12	71·4
2d ,, ,,	14	54·2

The coal-trains on the London and North-Western, Midland, and Great Northern railways, are generally made up of 30 to 35 waggons, carrying each 6 or 7 tons of coal, or a total load of 200 to 240 tons coal, amounting to a total train-weight of 400 tons. This train is taken by a six-wheel coupled goods-engine, with two steam-cylinders, 16 inches diameter, and 24 inches stroke, and 5 feet wheels, weighing 30 to 32 tons, with a tender 13 to 15 tons. The gross weight of engine, tender, and train, is therefore about 445 tons, which ascends inclines of 1 in 200 at a speed of 10 to 15 miles per hour, and travels the entire route to the metropolis, including stoppages, at a speed of 18 miles per hour. The steam-pressure in the boiler is usually 120 lb. per square inch; but on the Great Northern Railway 140 lb. steam is employed in the goods-engines, and they can take a train of 40 loaded waggons, carrying 290 tons of coal, weighing altogether 455 tons, or, with engine and tender, 500 tons gross, up an incline of 1 in 178 at 10 miles per hour, and otherwise perform the whole journey in good time.

The Lickey incline of the Birmingham and Gloucester line is 2⅛ miles in length; gradient, 1 in 37. A tank-engine, with cylinders 17 inches diameter and 24 inches stroke, with 4 feet 4 inch coupled wheels, can take a train-weight of 134 tons, or a total gross weight, including the engine, of 168 tons, at 8 miles per hour. The exertion of engine-power to perform this duty would be equal to the traction of a gross weight of seven times the amount, or nearly 1200 tons, on a level.

The Kittybrewster incline, on the Great North of Scotland Railway at Aberdeen, is made on a gradient of 1 in 59, with quick curves, and about 2 miles long. A tank-engine, with cylinders 15 inches diameter and 24 inches stroke, and four 4½-feet coupled wheels, weighing 25 tons, can take up a train-weight of 200 tons at 10 miles per hour, equivalent to a gross weight of 900 tons on a level.

But perhaps the most extraordinary example of a dead pull by one engine is to be seen on the Vale of Neath Railway, broad guage, with a gradient of 1 in 90, worked by a six-wheel coupled tank-engine weighing 40 tons, with cylinders 17 inches diameter and 24 inches stroke, wheels 4 feet 9 inches diameter. This engine can take up the incline, 1 in 90, a train of 25 loaded waggons, 15 tons each, or 375 tons total, and, with the engine, 415 tons gross,—equivalent to a gross weight of 1245 tons on a level.

A goods-engine, working at full power, exerts a tractive force of 10,000 to 12,000 lb., or about 5 tons pull on the train; so that a pull of 5 tons from the engine suffices to draw behind it 1000 tons on a level.

A tractive force of 10 or 12 lb. is capable of drawing 1 ton on a level at 10 miles per hour. At 60 miles per hour the required tractive force is about 45 lb. for 1 ton of gross weight.

ACCIDENTS ON RAILWAYS.

The question of railway accidents involves the whole question of railway management in detail. Accidents may be called the weak points of the system, where imperfection is manifested, where failure crops out, and where the line of demarcation may be drawn between the practicable and the impracticable. "If the road is perfect," says Captain Huish, "if the engine is perfect, if the carriages are perfect, and I will go on to say, if the signalman is perfect, and if everything about the railway is perfect, almost any amount of speed that can be got out of an engine may be done with safety. But we deal not with theoretical excellence, but with practical facts, and none of these things are perfect; and in a large machine like a railway they cannot always be kept perfect." "The question of railway communication," he adds, "divides itself into two great parts:—there is the great commercial principle involved, there is the great public principle of safety and convenience." The adjustment of the claims of the proprietors, who look for a return for their money on the one part, and the claims of the public looking for increased accommodation on the other part,—this is an expression of the whole question, and involves of course the consideration of railway accidents.

Accidents on Railways.

Safety to life and limb is of course the most important consideration in the working of railway traffic. Yet the problem is substantially this:—there are upwards of 140 millions of passengers and 70 million tons of goods per annum conveyed over our railways; assumed that all these must be transported by railway, what is the best way to do it? It must at the best be by a species of compromise; there must be a limit to tentative measures, there must be a risk. "If you do not go at all," says Mr Seymour Clarke, "there is no risk of an accident; if you go one mile an hour it is more risky than if you stand still; it is a natural attendant upon all travelling that there is a liability to accident of some sort." And, again, Mr Locke thinks "that where you have the certainty of inflicting an inconvenience on the public by a prospective advantage in the saving of an accident, you should be very careful how you entail a perpetually recurring inconvenience for the sake of preventing an accident which may never arise."

The evidence adduced before the select committee of the House of Commons on railway accidents in 1858, from which the foregoing extracts have been made, has led the committee to the conclusion, that accidents on railways arise from three causes:—inattention of servants; defective material, either in the works or the rolling stock; and excessive speed. Of the accidents reported to the Board of Trade that happened in 1857, there appears to have been twice as many by collision between trains as by running off the rails; and of the accidents by collision, five-sixths took place between passenger-trains and goods-trains; and only about one-sixth between passenger-trains, one against another. It further appears that a very small proportion, not above one in twenty, of the accidents reported, have directly arisen from excessive speed, but in every case in conjunction with imperfections in the permanent way. It may be observed that the greater proportion, if not all of these accidents, may be traced primarily to the crowding of trains, timed for unequal speeds, and the want of punctuality, which involve the risk of every kind of accident as a consequence:—by a want of perfect manifestation or apprehension of signals, or by excessive speeds. As tentative measures, the free use of the electric telegraph for giving intelligence of the exact relative positions and circumstances of trains on the line, and the use of the most powerful brakes for bringing up the trains in the shortest practicable distance, are probably of the most urgent necessity. The admirable utility of the road-telegraph is undisputed; and Captain Galton adduces some remarkable illustrations of its beneficial operation in the entire prevention of accidents by collision on lines where it is thoroughly enforced, and where previously to its use such accidents were incurred. Perfect brakes are also indisputably promotive of safety in working traffic and in compensating for unavoidable irregularities. With the usual amount of braking power, a train at 50 miles per hour may not be stopped within 900 or 1200 yards. An instantaneous brake is not of course what is wanted; on the contrary, a length of 200 yards appears to be the shortest desirable space within which a train at 50 or 60 miles per hour should be stopped, so that the process of retardation should not be accompanied by the risk of carriages over-riding each other, or of violence to the passengers; and this appears to have been accomplished on the Lancashire lines by Newall's and by Fay's brake; Chambers' and Champion's brake, applied to a series of carriages in a train, has been proved to be serviceable and efficient on the North London Railway, where it is employed in working the traffic of that line, than which there is not a more hardly-wrought line in the kingdom, in its special character of an omnibus line, with stations averaging a mile apart, at which all the trains are stopped, the journey being run at an average speed of 16¼ miles per hour, including stoppages. There are other very powerful systems of train-brakes in operation. Steam-brakes applied to the locomotives and extended to the tenders, and even to the brake-vans, have been found beneficial, and capable of stopping a train within half the usual distance.

The general adoption of a simple method of communication between the guard and the driver of a train in motion is a desideratum. There are various plans obvious and sufficient enough, but it would appear that, to insure their adoption by all railway companies, legislative interference must be invoked.

RAILWAY LEGISLATION.

Since Parliament began to legislate for railways, a multitude of laws have been placed upon the statute-book, which will certainly excite the wonder, if they fail to be the admiration, of future generations. The London and North-Western Railway alone is regulated by nearly two hundred different acts! Not only are the statutes numerous; they are irreconcileable in principle and detail. Several different select committees have, at various times, deliberately reported against the possibility of maintaining competition between railways, and to this principle Parliament has as often assented. Yet, the practical operation of the laws which have received legislative sanction has been throughout, and at the same time, to negative this principle, by almost invariably allowing competition to be obtained wherever it has been sought. Whatever may have been the effect for the time, the competition which Parliament permitted has generally been terminated by combination. As Mr Stephenson puts it:—"Where combination is possible, competition is impossible."

The expenses, direct and incidental, of obtaining an act of Parliament have been in many cases enormous, and generally are excessive. There are three parties responsible for such extravagance,—Parliament itself, the railway companies, and the landowners. In 1855, it was shown, by a return of Mr Hadfield, which was, however, far from complete, that the amount expended by existing railway companies in obtaining the acts of Parliament by which they are incorporated was no less, in parliamentary, legal, and engineering costs, than fourteen millions sterling! The adherence to useless and expensive forms by parliamentary committees, in what are called the standing orders, or general regulations for the observance of promoters of railway bills, on the one part, and the itching for opposition of railway companies, to resist fancied inroads on vested rights, and supposed injurious competition, on the other part, have been amongst the chief sources of excessive expenditure. By a return of Colonel Wilson Patten, in 1859, it was shown that the parliamentary expenses alone, incurred by railway companies owning L.263,000,000 capital, amounted to about 8½ millions sterling, or 3·2 per cent. Mr Stephenson mentions an instance showing how Parliament has entailed expense upon railway companies by the system complained of. The Trent Valley Railway was, under other titles, originally proposed in 1836. It was, however, thrown out by the standing orders committee, in consequence of a barn, of the value of L.10, which was shown upon the general plan, not having been exhibited upon an enlarged sheet. In 1840, the line again went before Parliament. It was opposed by the Grand Junction Railway Company, now part of the London and North-Western. No less than 450 allegations were made against it before the standing orders sub-committee, which was engaged twenty-two days in considering those objections. They ultimately reported that four or five of the allegations were proved, but the committee nevertheless allowed the bill to proceed. It was read a second time and then went into committee, by whom it was under consideration for sixty-three days; and ultimately Parliament was prorogued before the report could be made. Such were the delays and consequent expenses which the forms of the House occasioned in this case, that it may be doubted if the ultimate cost of constructing the whole line was very much more than the amount expended in obtaining permission from Parliament to make it. This example serves to show the expensive formalities, the delays, and difficulties, with which Parliament surround railway legislation. Another instance, quoted by the same authority, will show not only the absurdity of the system of legislation, but also the afflicting spirit of competition and opposition with which railway bills are canvassed in Parliament, and the expensive outlay incurred by companies themselves.

In 1845, a bill for a line now existing went before Parliament, with eighteen competitors, each party relying on the wisdom of Parliament to allow their bill at least to pass a second reading! Nineteen different parties condemned to one scene of contentious litigation! They each and all had to pay not only the costs of promoting their own line, but also the costs of opposing eighteen other bills. And yet, conscious as government must have been of this fact, Parliament deliberately abandoned the only step it ever took on any occasion of subjecting railway projects to investigation by a preliminary tribunal. Parliamentary committees generally satisfied themselves with looking on and watching the ruinous game of competition for which the public are ultimately to pay. In fact, railway legislation became a mere scramble, conducted on no system or principle. Schemes of sound character were allowed to be defeated on merely technical grounds, and others of very inferior character were sanctioned by public act, after enormous parliamentary expenses had been incurred. Competing lines were granted,—sometimes parallel lines through the same district, and between the same towns.

The following are the costs incurred in obtaining the original acts of some of the older railway companies:—

Great Western Railway act	L.88,710
London and Birmingham act	72,868
Eastern Counties act	45,190

It is not, of course, to be ignored that the parliamentary agents and the general body of lawyers—solicitors, conveyancers, and council—concerned in railway enterprise, get up and carry out new lines and branches as a matter of business, and that they necessarily profit by the complications and delays incidental to parliamentary routine. It has been found that in past years legal and parliamentary expenses have varied from L.650 to L.3000 per mile. In one contest, L.57,000 was spent amongst six counsel and twenty solicitors. The sum expended by one company alone in nine years, in legal and parliamentary expenses, had reached L.480,000, averaging L.53,300 a year. Notwithstanding the greatly diminished cost of railway-making in more recent times, the average capital expenditure on railways has, as formerly observed, been nearly maintained, by otherwise excessive expenses, at the same high rate,—having amounted in the end of 1857 to L.35,000 per mile.

But the expenses incurred through the opposition of railway companies amongst themselves, influenced by the bugbear competition, are indeed secondary to the charges for land and compensation. Parliament affords extraordinary facilities to landowners to make extraordinary demands for compensation. Having given them these facilities, it then makes the legal steps by which such demands can be resisted so expensive that it is frequently difficult to decide whether, if all the desired reductions can be made, the cost of obtaining the saving will not exceed the whole amount that can be saved. And yet it is well known that, except in regard to houses actually demolished, nearly every piece of property which is intersected undergoes improvement in value, in consequence of the construction of the lines. In towns and villages the land abutting on railways becomes valuable as frontage; and at country stations the land becomes desirable for building purposes. The millions which have been paid by railway companies to landowners may be fairly said to be so much put into their pockets as an inducement to allow their property to be increased in value. "Once the greatest obstacles to railway enterprise," says a writer in the *Edinburgh Review*, "owners of estates have of late years been amongst its chief promoters. Since the Liverpool and Manchester line was first defeated by landed opposition, and succeeded with its second bill only by keeping out of sight of all mansions, and avoiding the game-preserves,—since the time when the London and Birmingham Company, after seeing their project thrown out by a committee of peers who ignored the evidence, had to conciliate their antagonists by raising the estimate for land from L.250,000 to L.750,000,—since the time when parliamentary counsel bolstered up a groundless resistance by the flimsiest and absurdest excuses, even reproaching engineers with having trodden down the corn of widows, and destroyed the strawberry-beds of gardeners;—since then a marked change of policy has taken place. Nor was it in human nature that it should be otherwise. When it became known that railway companies commonly paid for land and compensation sums varying from L.4000 to L.8000 per mile,—that men were indemnified for supposed injury to their property by sums so inordinate that the greater part has been known to be returned by the heir as conscience-money,—that in one case L.120,000 was given for land said to be worth but L.5000,—when it was bruited abroad that large bonuses in the shape of preference shares and the like were granted to buy off opposition,—when it came to be an established fact that estates are greatly enhanced in value by the proximity of railways, it is not surprising that country gentlemen should have become active supporters of schemes to which they were once the bitterest enemies." The Eastern Counties Railway Company had, up to 1846, paid not less than L.809,950 for land and compensation, equal to about L.12,000 per mile. The cost of the land purchased by the original London and Birmingham and Great Western railway companies averaged not less than L.6300 per mile.

But the most conspicuous example, in recent times, which overshadows all others, of excessive expenditure in parliamentary litigation, as well as in land and compensation, is supplied in the history of the Great Northern Railway Company. The preliminary expenses of surveys, notices to landowners, &c., commenced in 1854, and the bill was introduced into the House of Commons in 1855, when it was opposed by the London and North-Western, the Eastern Counties, and the Midland railways. It was further opposed successively by two other schemes called the London and York and the Direct Northern. The contest lasted eighty-two days before the House of Commons, more than half the time having been consumed by opposition to the bill. The bill was allowed to stand over till next year (1846), when it began before the committee of the House of Lords where it left off in the Lower House in the year 1845, on account of the magnitude of the case. The bill was before the Upper House between three and four weeks; and in the same year (1846) it was granted. The promoters of the rival projects were bought off, and all their expenses paid, including the costs of the opposition of the neighbouring lines already named, before the Great Northern bill was passed; and the "preliminary expenses," comprising the whole expenditure of every kind up to the passing of the bill, was L.590,355, or more than half a million sterling, incurred at the end of two years of litigation. Since the passing of the act an additional sum of L.172,722 has been expended for "law and engineering expenses in Parliament" to 31st December 1857, which has been spent almost wholly in obtaining leave from Parliament to make various alterations. Thus it would appear that a sum total of L.763,077 was spent as parliamentary charges for obtaining leave to construct 245 miles, being at a rate of L.3115 per mile.

During the same period, the payments made by the Great Northern Railway Company for "land and compensation" amounted to L.1,901,371, or nearly two millions sterling, at the rate of L.7760 per mile. The parliamentary and land and compensation charges together make a sum of L.2,664,448, or L.10,875 per mile of the original line. The total payments on capital account were L.11,299,300; and of this amount, those items constitute the formidable proportion of 23½ per cent., being nearly one-fourth of the capital forestalled before the ground was broken.

The particulars of the Peebles Railway may next be quoted in contrast to those of other lines, as a perfect example of economical construction and legitimate expenditure. The railway is a single line, 18¾ miles in length, from Peebles station to the point of junction with the North British Railway at Eskbank station, 8 miles from Edinburgh. There was no opposition to the project in any quarter, and the landowners agreed to give the lands required at thirty-five years' purchase of the agricultural value,—the value and severance damage being fixed by arbitration. Nor did the turnpike-road trustees make any claim for damages. The act was passed in July 1853, and the actual cost of obtaining it was only L.650, no fees to counsel having been found necessary. The total parliamentary expenses, up to the obtaining of the act, was L.1569; but further expenses were incurred in 1857 in applying for power to raise new capital. The charges for land and compensation amounted to L.21,222, or L.1131 per mile. Seven stations, with approaches, including Peebles station, averaging one for every 2¾ miles, were built at an average cost of about L.1200 each. The works were constructed for about L.3600 per mile, and the locomotive and carrying stock cost about L.1000 per mile. The railway was opened in July 1855, two years after the passing of the act. The total cost at the end of 1858 amounted to L.6688 per mile, of which the following is an analysis:—

	Total.	Per Mile.
Preliminary and parliamentary expenses	L.2,753	L.147
Engineering and surveying	2,400	128
Land and compensation	21,222	1131
Works	67,157	3582
Stations, sheds, &c.	8,352	445
Interest	543	29
General charges	1,424	76
Electric telegraph	710	38
Machinery	259	14
Locomotive and carrying stock	20,590	1098
Total capital cost in 1858	L.125,410	L.6688

Reform in Railway Legislation.—In 1858 a select committee of the House of Commons was appointed to consider the best means of amending the tribunal for the examination of railway bills. One object was to diminish the time and labour of the members of committees on railway bills; the other was to diminish the cost of the pro-

Railway Legislation

ceedings. From the evidence taken it appeared generally that there was a want of consistency and uniformity of principle in the modes of dealing with railway bills by committees of the House, and also a needless expenditure of time and money, in consequence of the changing elements of committees, and their want of experience; that the permanent appointment of paid chairmen of character and experience would considerably expedite the business of committees, and diminish expenses, principally from their being able to direct the inquiry, to conduct deliberations, to prevent irrelevancy, to restrain superfluous evidence, and to keep counsel in check. It was also suggested, that all parties should be allowed to appear in opposition before committees, and that the check upon the abuse of that privilege should be the power of examining witnesses on oath, as is done before committees of the Upper House, and of awarding costs in cases of vexatious or unnecessary proceedings. It appeared in evidence that during the eleven years 1847-57 the number of railway bills introduced was 913, or 83 per annum, on which the committees sat 1676 days, or 152 days per annum. The committee reported in favour of a few obvious expedients suggested by the evidence, but did not deal with the essential elements of reform,—namely, the recognition of a permanent tribunal or, at all events, of permanent chairmen or judges, and the power of awarding costs.

Mr Stephenson, in 1856, suggested that, instead of leaving the treatment of railway bills to inexperienced tribunals,—the ordinary parliamentary committees,—a mixed commission should be organized of practical men of acknowledged legal, commercial, and mechanical ability, willing to devote its attention to railway subjects only. "Give us," he said "a tribunal competent to form a sound opinion. Commit to that tribunal, with any restrictions you think necessary, the whole of the great questions appertaining to our system. Let it protect private interests, apart from railways; let it judge of the desirability of all initiatory measures, of all proposals for purchases, amalgamations, or other railway arrangements; delegate to it the power of enforcing such regulations and restrictions as may be thought needful to secure the rights of private persons, or of the public; devolve on it the duty of consolidating, if possible, the railway laws, and of making such amendments thereon as the public interests and the property now depending upon the system may require; give it full delegated authority over us in any way you please; all we ask is, that it shall be a tribunal that is impartial, and that is thoroughly informed; and if impartiality and intelligence are secured, we do not fear the results." Mr Stephenson, apprehends, nevertheless, that any such tribunal appointed by government would fail to give adequate security for the proper fulfilment of the high duties which they would have to perform. Probably such an intermediate course as that suggested in the evidence, already alluded to, before the committee on railway legislation, would be advisable, as a preliminary step to a more perfect institution. No one will doubt, after the experience of the last 30 years, that it would have been better for the railways had they never appeared against each other at all; for it is clear that the money which has been spent unproductively, in opposition before committees, would have been economized. It is obvious that the reduction of dividends to less than one-half of their former amount by a course of fruitless litigation and profitless accumulation of capital, which has nothing to show for it, had better have been effected by doubling the extent of railway communication and subdividing the traffic, even supposing such a declension of dividend to follow of necessity the extension of railways. The fact is, however, that the dividends would have continued undiminished under liberal management, even with all the additional new lines, because the business of the old-established lines really has not declined, but, on the contrary, has wonderfully and unexpectedly augmented.

Railway Management.

MANAGEMENT OF RAILWAYS.

Railways, as a system, have been upwards of twenty years in operation, and have been wrought with various degrees of success. In all that appeals directly to common-sense, common feeling, discretion, judgment, and reputation, railways have upon the whole been successfully and creditably managed. They have, however, been afflicted with the worst evils characteristic of joint-stock management, of which the central vice and weakness may be expressed in a few words,—namely, that the interests of the managing class are different and distinct from those of the proprietary body. Mr Stephenson, sensible of the defects of the prevailing system of management, promulgated in 1856 a plan of working railways on lease, which appears to provide for the real necessities of the situation. "Looking at the question in a broad point of view," he says, "the consideration occurs, whether it might not be possible, by some operation analogous to that of a trading company under the Limited Liability Act, to give an entirely new and greatly improved character to the relations between shareholders and managers? Suppose a limited number of men of business, varying say from ten to twenty, and capable of giving good security, agreed together to take a line from the shareholders at a fixed rental. They might depute their management to two or three of their own body; or even, if the line was short, to one *gérant*. Under such circumstances there would be no clamour from shareholders at half-yearly meetings—no sudden changes of directorates, involving ruinous alterations of policy,—no cabals between one set of directors and another,—and no mischievous interferences with the development of the system. The manager, free from the apprehension of being saddled personally with all the responsibility and liability, would be able to embark in enterprises not comprehended in the terms of the act of Parliament, but essential to the prosperity of their line." "They would be free from apprehensions as to the liabilities they incurred; and whilst they would not be turned from their course of policy by the outcry of any discontented individual able to make his voice heard through any public channel, they would give practical security that the public interests would be consulted, because the interests of the public and those of the managers would be in every respect identical." These important observations point precisely to the general principle essential to permanent success; and it may be added that they are confirmed by the great authority of Mr Bidder, who has frequently directed his large capacity and pure analytical mind to the most complicated and most delicate questions of railway policy. (D. K. C.)

(The following authorities have been consulted in the preparation of this article:—*Report of the Railway Department of the Board of Trade*, 1857; *Report of the Select Committee of Parliament on Railway and Canal Legislation*, 1858; *Report of the Select Committee of Parliament on Accidents on Railways*, 1858; *Minutes of Proceedings of the Institution of Civil Engineers*, 1850–1858: "Permanent Way," "Railway Stations," "Railway Accidents," Address of Mr Stephenson as president, Address of Mr Locke as president; *Minutes of Proceedings of the Institution of Mechanical Engineers*, 1851–58: "Railway Carrying Stock," "Locomotive Workshops;" *Railway Machinery*, by D. K. Clark, 1855; *Statistics of Metropolitan Railways*, by D. K. Clark, 1853; *European Railways*, by Holley and Colburn, 1857; *On Deterioration of Railway Plant and Road*, by Mark Huish, 1849; *Railways, their Capital and Dividends*, by E. D. Chattaway, 1856.)

RAIMBACH, ABRAHAM, a distinguished line-engraver, was a Swiss by descent, and was born in London in 1776. His eminence in art was attained by assiduous industry. Becoming an apprentice to Hall the engraver in 1789, he continued in that capacity till 1796, engraving under his master's eye all day, and training his hand in sketching at night. He then had recourse to various means of improvement. Part of his working-time was devoted to the study of drawing in the Royal Academy; another part was occupied in executing occasional engravings for the booksellers; his leisure hours were employed in eking out his scanty income by painting portraits in miniature. It was not until he had laboured in this manner for about nine years, that he received a sufficient number of commissions in engraving to engage all his efforts. Raimbach had not been long established in his profession when he formed an intimacy with Sir David Wilkie, and the result was, that in 1812 he began to engrave some of that master's best pictures. With such great originals as models, his prints attained the highest excellence. "The Village Politicians," "The Rent-Day," "The Cut Finger," "Blind-Man's Buff," "The Errand-Boy," "Distraining for Rent," "The Parish Beadle," and "The Spanish Mother and Child," although at first they did not sell so well as was expected, raised him in the estimation of connoisseurs. The French especially held him in great honour. At the time of his death, in 1843, he held a gold medal which had been awarded to him for his "Village Politicians," at the Paris Exhibition of 1814, and the title of Corresponding Member of the Institute of France, which had been bestowed upon him in 1835. The autobiography of Raimbach was edited by his son, for private circulation, under the title of *Memoirs and Recollections of the late Abraham Raimbach, including a Memoir of Sir D. Wilkie, R.A.*

RAINBOW. See METEOROLOGY, and OPTICS.

RAISINS are the dried fruit of the grape-vine (*Vitis vinifera*, Linn.; Nat. Ord. *Vitaceæ*, Lind.; the *Ampelideæ* of Decandolle). The grape, which is the most extensively useful of all known fruits, is, according to its varieties, and the methods used in preparing them, converted into various kinds of raisins, some of which form very important articles of commerce. The finest are those which are dried on the vine, and retain the beautiful bloom which covers the ripe grape. They are called *Muscatel* raisins, and are imported to this country chiefly from Malaga, whence they come in boxes, in which the bunches are entire, and are carefully packed in layers, with white paper between them. To prepare Muscatel raisins, the grapes, when ripe, are allowed to remain on the vines, but the main stalk of each bunch is partially severed, enough only being left uncut to prevent the weight of the cluster from breaking. The leaves which shade the grapes are cut off, and the bunches fully exposed to the sun, which makes them shrivel, and loose much of their original watery fluid. The pulp remaining becomes by concentration very sweet. Thus prepared, they are often called "raisins of the sun," but are generally termed Malaga or Muscatel raisins.

The more common sorts of raisins are gathered when ripe, and are either laid in the sun, or are dried in heated rooms; they are sprinkled whilst drying with an alkaline lye, which is generally made by burning the prunings of the vines, and filtering water through the ashes. The water dissolves the potash in the ashes, and becomes strongly alkaline. This part of the process causes the saccharine matter of the grape, which is a peculiar variety of sugar imperfectly crystallizable, to form rounded concretions, and also partially to exude and cover the skin of the raisin with a thin saccharine varnish. A lye made of water, ashes, and oil, is sometimes used, and the raisins prepared with it are in consequence named *Lexias*. The *black Smyrna* raisins are small, dry, and black, without the white concretions of grape-sugar, which are so abundant in the Sultana, Valentia, and Denia raisins, or Lexias, as the two latter varieties are sometimes called. The best kinds of Lexia, or lye-prepared raisins, are gathered with the bunches entire, and are hung on lines in the sun; when they begin to shrivel they are dipped in the lye once or twice, and again hung up to complete the curing; they are then carefully packed in boxes (containing about 56 lb.), half-boxes, and quarter-boxes. The fine Turkish raisins, called *Sultanas*, are always packed in cylindrical boxes, technically called *drums*. The grape from which this most delicious of all raisins is prepared is remarkable for being seedless and small; whereas the only other Turkish raisin known in commerce, the black Smyrna, has very large seeds, although it is a small fruit.

Another instance of a seedless variety of the grape is found in the common *currant* of the grocers, the Corinth or Corinthian grape of old writers. This is the smallest of all the varieties of the grape; it is only cultivated in the Greek islands, where it forms a most important crop. It is most extensively grown in Patras, Zante, Ithaca, and Cephalonia, comparatively few coming from Corinth, whence its commercial name was derived. The clusters of the Corinth grape are remarkably small, generally about 3 inches in length, the grapes being only the size of peas; they are gathered from the vines when ripe, and are laid up in heaps, called *couches*, exposed to the sun. When dry, they are cleaned from the stalks and deposited in rooms called *seraglios*, where, owing to the exudation of grape-sugar on their surface, the berries become sticky, and they adhere firmly together, so as to require digging out. When required for use, they are trodden into large casks called *butts*, averaging about 18 cwt.; *caroteels* or *tierces*, averaging about 7 cwt.; and *barrels*, of from 2 to 3 cwt. each. They are also now very frequently packed in boxes of from 1 to 1½ cwt. Although these different kinds of dried grapes are only used in cooking and confectionary, the trade done in them is enormous, and, as far as this country is alone concerned, employs a very large amount of shipping. The imports in 1858 were:—

	Cwt.
Of Raisins,—	
From Spain	243,147
,, Italy and Sicily	4,701
,, Turkey	57,309
,, Other countries (into which they have been imported)	5,263
Of Currants,—	
From Greece	308,763
,, Ionian Islands	63,270
,, Other countries (into which they have been imported)	32,820

Wine is often made from raisins, and that of Malaga is chiefly manufactured from the dried grape. The luscious Hungarian wine, Tokay, is made from grapes partially converted into raisins on the vine. Raisin wine was made by the ancient Romans, and other nations of antiquity. The raisin wines of Crete, Cilicia, and Africa, were highly prized by the epicures of Rome. (T. C. A.)

RAJAH, a hereditary prince among the Hindus belonging to the warrior caste, or the Cshatriya. (See CASTE.)

RAJAHMUNDRY, a district of British India, in the presidency of Madras, lying between N. Lat. 16. 18. and 17. 38., E. Long. 81. 7. and 82. 40., bounded on the N. by Orisa, N.E. by the district of Vizagapatam, S.E. and S. by the Bay of Bengal, W. by the district of Masulipatam, and N.W. by the Nizam's territories; area, 4501 square miles. The northern and north-western portions of the district are occupied with hills, which resemble in character the eastern ghats farther to the west, and are of a granitic structure, mixed with gneiss, trap, and calcareous tufa. The centre of the country contains some lower hills of alluvial formation, and the ground along the coast is low and flat. The only large river is the Godavery, which enters the district from the north, and flows through it in a southerly direction for 49 miles. It then divides into two branches, that to the right flowing S. and S.W. for 45 miles, and the other S.E. and E. for 52 miles. In the delta thus formed lie some of the richest and most fertile tracts in the whole of India. The soil of the level ground is generally alluvial and fertile, especially along the banks of the river, where there is a rich dark mould suitable for the growth of cotton. Besides this plant, tobacco, indigo, sugar, rice, maize, millet, pulse, and other crops, are raised in the district. The Godavery is navigable for boats, and much teak wood is floated down by it. The water is used for the purposes of irrigation. In the bed of the river are many small islands of rich soil, some formed naturally by the deposit of silt, and others by artificial means. The climate is warm, and generally healthy, except in the valleys and jungles towards the north-west, where a deadly malaria prevails. Rajahmundry, the principal town of the district, stands on a rising ground on the left bank of the Godavery, 285 miles N.E. of Madras, and 580 S.W. of Calcutta. It has one main street, lined with low mud houses roofed with tiles. This street contains the chief bazaar, and runs along the river's bank; and several smaller streets branch off from it on either side. To the north of the town stands a square fort surrounded with mud walls, and containing barracks, hospital, jail, and magazine. There are many mosques in the town, but the Mohammedans are few and poor. Pop. of the town, 15,000 or 20,000; of the district, 1,012,036.

RAJESHAYE, a district of British India, in the presidency of Bengal, bounded on the N. by the district of Dinajepore, N.E. by that of Bogra, E. and S.E. by that of Pubna, S. by that of Nuddea, W. and N.W. by those of Moorshedabad and Malda; length, from E. to W., about 62 miles; breadth, 50; area, 2084 square miles. It is a very moist region, being traversed by numerous rivers from the Himalayas in the north. The largest of these is the Ganges, which washes the S.W. border of the district. There are also many swampy lakes, some of them of large size; and in the periodical inundations to which the country is subject, many channels, generally dry, are filled with water. Rice is the chief crop raised here, but corn and pulse of various kinds are also grown. Indigo and silk are the most important commercial products of the country. Pop. 671,000.

RAJMAHAL, a town of British India, in the district of Bhangulpore, presidency of Bengal, and 196 miles N.W. of Calcutta, on a steep bank on the right side of the Ganges, which sweeps past with a broad, impetuous current, sometimes washing away large portions of the land. It contains the ruins of two palaces and two mosques, one of which is a large imposing building, though of rude execution. The houses are generally mean and ruinous, clustered round twelve separate market-places; and the appearance of the town is wretched. Rajmahal is a place of very great antiquity; according to one account, having been founded more than 3000 years B.C. It was ceded to the British in 1765. Pop. estimated at 30,000.

RAJPEEPLA, a petty state of India, in the province of Guzerat, presidency of Bombay, lying between N. Lat. 21. 23. and 21. 59., E. Long. 73. 5. and 74; area, 1650 square miles. It is partly mountainous, and occupied by wild tribes of Rajpoots and Bheels; but the peasants of the plains are an industrious, peaceful class, devoted to agricultural pursuits. The most important products of the country are cornelians, which are obtained from mines, and conveyed to Cambay, where they are cut and polished. The profits derived from this source have recently fallen off to a considerable extent. The chief river in Rajpeepla is the Kurgun, on which Nandode, the capital, stands. The state was at first independent; then for a time it became tributary to the sovereigns of Delhi; and finally to the Guicowar state, to which it still pays tribute. The British government has, however, a certain authority over Rajpeepla. Pop. 122,100.

RAJPOOTANA, an extensive region of India, lying between N. Lat. 23. 35. and 29. 57., E. Long. 70. 5. and 77. 40.; bounded on the N. by the British district of Butteeana; N.E. and E. by those of Kurreeana and Goorgaon, and by the states of Jhujhur, Bhurtpore, Dholpore, and Gwalior; S. by the territories of Scindia, Holkar, and the Guicowar, by Jabbooa and Myhee Caunta; and W. by Scinde and Bhawulpore. Length, from E. to W., 420 miles; breadth, about 400. It is divided into the following distinct states:—

	Area in Sq. miles.	Population.
Beekaneer	17,676	539,250
Shekawuttee	3,895	...
Alwur	3,573	280,000
Jessulmere	12,252	74,400
Joudpore	35,672	1,783,600
Jeypore	15,251	1,891,124
Serohee	3,024	...
Mairwarra (British)	282	37,715
Ajmere (British)	2,029	224,891
Kishengurh	724	70,000
Tonk	1,864	18,672
Oodeypore	11,614	1,161,400
Bhoondee	2,291	229,100
Kotah	4,339	433,900
Jhallawar	2,200	...
Doongerpore	1,000	100,000
Banswarra	1,440	144,000
Pertabgurh	1,457	145,700
Kerowlee	1,878	187,800
Total	122,461	

The country derives its name from the Rajpoots, a peculiar race of men who inhabit it. They are believed to be descended from the *Kshestriyas*, or warriors, one of the four original castes of the Hindus. It is not known at what period they first appeared as a distinct nation, but they attained a high degree of power and renown just before the Mohammedan conquests in the twelfth century. At that time they possessed an extensive dominion, including Delhi, Kunnouj, and Guzerat. In 1193 and 1194 the Rajpoot chiefs sustained more than one defeat at the hands of the Mohammedans, and were deprived of all their possessions except the regions they now occupy. In many other parts of India, however, scattered members of the Rajpoot race are to be met with. The character of this people is remarkable, and exhibits many traces of their military origin. A sort of feudal system is the polity of the nation; the various clans into which the people are divided form societies of men, closely connected one to another, and devoted to their chieftains; and these chieftains, again, are similarly related to each other and to the rajah. Many of the peculiar features of the mediæval chivalry are or were discernible among the Rajpoots, though perhaps after a ruder and less elevated pattern. Among these are the deference paid to women, the code of honour towards their enemies, the pride of birth, and the delight in warlike exploits which mark this warrior tribe of Hindus. These good qualities are not unmixed with the greatest vices. Suttee and infanticide are the most atrocious of these; treachery and cruelty are by no means unknown among them; and even their courage, so far from being a cool and steady determination, is avowedly stimulated by the intoxication of opium. Improvements are now being introduced gradually into the country, under the protection of the British, which is proving very beneficial. It is exercised through an agent for the states of Rajpootana. This connection with the British originated about the beginning of this century, when the Rajpoots proved unable to defend their country against the Mahrattas.

RAKE OF A SHIP is that part of the hull which hangs over both ends of the keel. That which is before is called the *fore-rake* or *rake forward*, and that which is behind is called the *rake-aft* or *afterward*.

RAKKA, a town of Asiatic Turkey, capital of a pashalic of the same name, on the left bank of the Euphrates, 92 miles S.E. of Birr. It contains the ruins of a palace of the Caliph Haroun-al-Raschid. The ancient *Nicephorium*, a town founded by the Macedonians, occupied this site; a fortress was erected by Justinian; and new defences were added by the Emperor Leo, from whom it got the name of *Leontopolis*. Pop. 8000.

RALEIGH, SIR WALTER, fourth son of Mr Walter Raleigh of Fardel, in the parish of Cornwood in Devonshire, was born in 1552 at Hayes, in the parish of East Badley, a farm belonging to his father. About the year 1568 he was sent to Oriel College, Oxford, where he continued but a short time. He became one of the hundred volunteers, commanded by Henry Champernon, who, with other English troops, were sent by Queen Elizabeth to assist the Queen of Navarre in defending the Protestants. He has described some of the great battles in which he was engaged in his *History of the World*. In 1577 or 1578 he proceeded to the Low Countries with the troops sent by the queen to assist the Dutch against the Spaniards, and probably shared the glory of the decisive victory obtained over Don John of Austria in 1578. On his return to England, a new enterprise engaged his attention. His half-brother, Sir Humphrey Gilbert, having obtained a patent to plant and inhabit some parts of North America, Raleigh embarked in this adventure; but meeting with a Spanish fleet, after a smart engagement, they returned without success in 1579.

The following year the King of Spain, in conjunction with the Pope, having projected a total conquest of the English dominions, sent troops to Ireland to assist the Desmonds in the Munster rebellion. Raleigh obtained a captain's commission under Lord Grey of Wilton, then deputy of Ireland, and embarked for that kingdom, where he greatly distinguished himself both for bravery and for skill. He returned to England, and attracted the notice of Queen Elizabeth, owing, as we are told in Naunton's *Fragmenta Regalia*, to the following accidental piece of gallantry:—The queen, as she was one day taking a walk, being stopped by a soft place in the road, Raleigh immediately took off his new plush mantle, and spread it on the ground. Her majesty trod gently over the soft foot-cloth. Surprised and pleased with the adventure, and much struck by the noble appearance of the young soldier, she admitted him to her court, and employed him first as an attendant on the French ambassador Simier, upon his return home, and afterwards to escort the Duke of Anjou to Antwerp. During this excursion he became personally known to the Prince of Orange, from whom, at his return, he brought especial acknowledgments to the queen, who now frequently conversed with him. But the inactive life of a courtier did not suit the enterprising spirit of Raleigh. He took advantage of his favour with the queen to obtain in 1584 a patent empowering him to possess such countries as he should discover on the continent of North America. Accordingly he fitted out at his own expense two ships, which sailed in the month of April, and returned to England about the middle of September, reporting that they had discovered and taken possession of a fine country, to which the queen gave the name of *Virginia*. About this time he was elected knight of the shire for the county of Devon, and soon afterwards received the honour of knighthood. To enable him to carry on his designs abroad, the queen granted him a patent for licensing the venders of wine throughout the kingdom. In 1585 he sent a new expedition to Virginia, commanded by his relation Sir Richard Greenville, who left a colony at Roanoak of 107 persons, under the government of Lane; and by the establishment of this colony he was enabled to import tobacco into England. In the same year Sir Walter Raleigh obtained a grant of 12,000 acres of the forfeited lands in the county of Cork in Ireland, which, instead of yielding him any profit, cost the proprietor L.200 a year to keep them from invasion and havoc. This consideration induced Raleigh to sell his lands to Boyle, afterwards Earl of Cork. About the same time he was made seneschal of the duchy of Cornwall, and warden of the stanneries.

In the year 1587 he sent another colony to Virginia; but his various undertakings and offices obliged him to assign his patent to a company, and the plan of colonizing was by them speedily relinquished; so that the unfortunate colonists were left to their fate. About this time we find Raleigh distinguished by the titles of "Captain of the Queen's Guards," and "Lieutenant-General of Cornwall." From this period to the year 1594 he was continually engaged in projecting new expeditions, defending the kingdom from the insults of the Spaniards, and transacting parliamentary business, with equal ability and resolution. Sir Walter fell under the queen's displeasure on account of an alleged intrigue with the daughter of Sir Nicholas Throgmorton, one of the maids of honour; however, he married the lady, and lived with her in great conjugal harmony. During his disgrace at court he projected the conquest of Guiana in South America, and in 1595 sailed for that country, in the vain hope of discovering the golden region of El Dorado, supposed to be situated in the depths of Guiana. He returned to England the same year, and soon afterwards published an account of his expedition. In the following year he was one of the admirals in the successful expedition against Cadiz, gained mainly by his skill and valour, under the command of Howard and the Earl of Essex; and in 1597 he sailed with the same commanders against the Azores. Soon after these expeditions we find him assiduously engaged in parliamentary business. His speeches evince a knowledge of political economy far superior to any man of his time. He had so far regained the royal favour as to obtain a grant of the manor of Sherborne in Dorsetshire, which he magnificently embellished. Fuller mentions a tradition that the first orange-trees that ever grew in England were planted by his hand. This tradition is rendered the more likely by his recorded fondness for horticulture. In truth his genius was as varied and discursive as it was powerful. He could turn himself with surprising facility from mathematics to poetry, from the profoundest cosmographical speculations or metaphysical disquisitions to the lighter subjects of music, from ornamental gardening or painting to historical or antiquarian researches; and all the while kept up his intercourse with the world and the court, and was ready to avail himself of any new avenue which might open up to his ambition or his love of glory. In 1600 he was sent on a joint embassy with Lord Cobham to Flanders, and on his return made governor of Jersey.

Queen Elizabeth died in the beginning of the year 1603; and with her Raleigh's glory and felicity sunk, never to rise again. Upon the accession of James, Sir Walter lost his interest at court, was stripped of his preferments, and foully accused of a plot against the king. He was arraigned at Winchester, and, on his trial, was insulted with the most shocking brutality by the famous Coke, attorney-general, who influenced the jury to convict him without any legal proof of his guilt. After a month's imprisonment, however, in daily expectation of his execution, he was reprieved and sent to the Tower, and his estates were given to Car, Earl of Somerset, the king's favourite. During this confinement he wrote many of his most valuable pieces, particularly his *History of the World*. In March 1615, after sixteen years' imprisonment, he obtained his liberty, and immediately began to prepare for another voyage to Guiana, which proved equally abortive and ruinous. His eldest son, who bore his father's name, and a lad of infinite spirit, was slain by the Spaniards, and Captain Keymis, the head of the expedition, committed suicide. In the year 1618 he returned to England, where he was soon afterwards seized, imprisoned, and beheaded. He was sacrificed by the pusillanimous monarch to appease the Spaniards, who, whilst Raleigh lived, thought every part of their dominions in danger. He was executed in Old Palace Yard, and buried in St Margaret's adjoining, in the sixty-sixth year of his age. His behaviour on the scaffold was manly, unaffected, cheerful, and easy. Being asked by the executioner which way he would lay his head, he answered, "So the heart be right, it is no matter which way the head lies." He was a man of admirable parts, extensive knowledge, undaunted resolution, and perhaps the best prose writer of his age. He was upwards of six feet in height; and in his demeanour, says Aubrey, "he presented an awfulness above other mortals." His great work, the *History of the World*, is a truly remarkable performance, both for matter and style. It has often been reprinted. His Life has frequently been written, and once exceedingly well by Patrick Fraser Tytler for the "Edinburgh Cabinet Library," 1833. An edition of his whole works was published at Oxford in 1829, in 8 vols. 8vo.

RAMADAN. See Bairam.

RAMBERVILLERS, a town of France, in the department of Vosges, on the right bank of the Mortagne, here crossed by a stone bridge leading to a suburb on the opposite side, 16 miles N.E. of Epinal. It is in general well built, but contains no conspicuous public edifices. There are a public library of 10,000 volumes, forges, tanneries, manufactories of woollen cloth, linen, pottery, &c.; and some trade in corn, hemp, hops, cutlery, and other articles. Pop. 4841.

RAMBLA, a town of Spain, Andalucia province, and 17 miles south of Cordova. It has straight and well-paved streets, good houses, and several squares; but few of the public buildings are particularly deserving of notice. There are several convents and churches, and the people are mostly employed in farming, but also in the manufacture of earthenware, linen, and woollen fabrics, &c. Pop. 9040.

RAMBOUILLET, a town of France, in the department of Seine-et-Oise, 17 miles S.W. of Versailles. The dull place is remarkable for nothing but the ugly, gloomy, red brick castle, with five flanking stone towers, surrounded by a large park and forest. In the great tower is the room where Francis I. died in 1547. Here, too, another monarch took his leave of the French throne,—Charles X., under the terror of the fate of Louis XVI., signed his abdication August 2, 1830. Since then the building has not again been the residence of royalty; but the present emperor made it, in 1852, a seminary for officers' daughters. Pop. (1856) 4363.

RAMESES. See Egypt.

RAMGURH, a district of British India, presidency of Bengal, bounded on the N. by the district of Behar, N.E. by that of Mongheer, E. by that of Beerbhoom, S. by that of Chota Nagpore, and W. by that of Palamow; lying between N. Lat. 23. 20. and 24. 50., E. Long. 83. 30. and 81. 38: length, from E. to W., 675 miles; breadth, 90; area, 8524 square miles. Much of the surface is gently undulating, with groups of hills here and there, and in some places extensive table-lands. Granite, quartz, and other primitive rocks are the components of some of the hills; and the country is rich in ores of coal, iron, lead, antimony, and probably also silver. Numerous rivers, but none of large size, water the country. They flow generally to the S.E., discharging their waters into the estuary of the Ganges; but some take a northern course, and join that river at a higher point. Vast, dense, and impenetrable are the forests with which a great part of the district is covered, haunted by many kinds of wild beasts and poisonous serpents, the dread of the inhabitants, who are thinly scattered over the country, dwelling in mud villages, and engaged chiefly in tilling the soil. Nothing that deserves the name of a town is to be seen. Pop. 372,216.

RAMMOHUN ROY, Rajah, a Hindu of wonderful talents and enlightenment, was born at Burdwan in the province of Bengal, about 1774. His parents, descended from Brahmins who had held high offices, both secular and sacred, resolved to make their boy worthy of his distinguished ancestry. The greatest care was taken in fitting his mind for his high prospects. The Persian and Arabic tongues were taught him, that he might attach himself to the court of Mohammedan princes. Sanscrit also was added to his education, that he might be competent to hold a sacerdotal office among the Hindus. Yet the young lad had not reached his sixteenth year before circumstances occurred to turn his thoughts in a direction different from that which had been marked out for him. His intercourse with the Moslems made him acquainted with the doctrine of the unity of the Godhead. The dogma recommended itself to his understanding, and shook his faith in the idolatrous system of worship which his fellow-Brahmins were observing. This feeling of doubt drove him to the ancient Hindu scriptures for further enlightenment. Finding that they distinctly taught the existence of one Supreme Being, he became from that time an advocate of monotheism. Boy though he was, he lost no time in composing a manuscript to show how the Hindus had corrupted the primitive simplicity of their faith. Frowns and rebukes from the entire circle of his acquaintance immediately assailed him; but they were only the means of making him pursue the investigations which he had already begun. Driven from home by the coolness of his father, and induced to sojourn for a time in Thibet, he studied all the forms of religion that came under his view. Then, after a lapse of two or three years, he returned to his paternal abode, confirmed in his aversion towards idolatry, and bent upon seeking additional enlightenment both in the oracles of his own caste and in other religious creeds.

About 1814 Rammohun Roy, living in a house in the Circular Road, Calcutta, began to be known as the most extraordinary man among the Brahmins. There were many qualifications which combined to give him this position. His patrimony was handsome. His bearing was pleasing, courtly, and imposing. His moral character was pure, earnest, and philanthropic. Still more striking were the intellectual attainments which he possessed. A more richly endowed, active, and far-searching mind could scarcely be found. The weapons of logic were thoroughly at his command. He could also range through the provinces of Sanscrit, Persian, and Arabic literature. Especially was he at home in English politics and letters. In fact, wherever in the entire region of learning truth seemed to point the way, thither did he strive with a European daring and invincibility.

This energetic and gifted native could not long remain inactive, and Rammohun Roy soon appeared in the character of a reformer of Brahminism. The plan he employed was, to seek out and lay before the Hindus those simple precepts of religion and morality which he might find within the range of his reading. He began his endeavours by translating into Bengali, Hindustani, and English the *Vedant*, "the most celebrated and revered work of Brahminical theology." He then published in English and Bengali some of the principal chapters of the *Veda*, the body of Hindu divinity. His next attempt was to draw up a compendium of the morality of the Christian religion. Greek and Hebrew were accordingly acquired, that he might examine and prove the Scriptures in the original. The result was a book, produced in 1820, in English, Sanscrit, and Bengali, and entitled *The Precepts of Jesus the Guide to Peace and Happiness.* More selections would also have been prepared by him had he not been engaged for three years in defending his last publication against the animadversions of Dr Marshman and other Christian writers.

Rammohun Roy's labours for the enlightenment of his countrymen ended with 1830. A visit to England had long been one of the cherished enterprises of his mind. Taking advantage of his appointment as ambassador from the King of Delhi to the British government, he now set sail, and arrived at Liverpool in 1831. He was just beginning to form a large circle of friends throughout the country when he died at Stapleton Grove, near Bristol, on the 27th of September 1833. (See *A Review of the Labours, Opinions, and Character of Rammohun Roy*, by Lant Carpenter, LL.D., London, 1833.)

RAMNAD, a town of British India, presidency of Madras, in the district of Madura, capital of a zemindary of the same name, stands near the coast of Palk's Bay, 60 miles S.E. of Madura. It is inclosed by a wall and ditch about 2½ miles in circuit; but the former is now in a ruinous condition, and the latter nearly filled up. Viewed from the flat country around, the town presents a conspicuous appearance, with its massive triangular fort, its ancient and richly-adorned palace, and its pagodas rising to the sky. The streets are narrow and ill kept, but the houses are pretty good. A Protestant church, Roman Catholic church, several inconspicuous but elegant mosques, and two bazaars, are among the other buildings. The only manufacture is that of coarse cloth. Pop. 13,000, of whom about 6000 live in the fort.

RAMPANT. See HERALDRY.

RAMPART. See FORTIFICATION.

RAMPOOR, a jaghire or fief of British India, in the division of Rohilcund, bounded on the N. by the district of Pilleebheet, E. and S. by that of Bareilly, and W. by that of Meradabad, lying between N. Lat. 28. 30. and 29. 11., E. Long. 78. 55. and 79. 30. A level, fertile country, watered by the Kosila and Nahul, flowing southwards, it is partially occupied in the north by marshy forests and jungle, where the climate is exceedingly unhealthy; but in the south it presents a wide expanse of waving corn-fields, broken only by small villages or groups of mangoes and bamboos. It is occupied by an industrious and intelligent people, who are chiefly employed in farming. The capital is a large and populous town of the same name, on the left bank of the Kosila, 789 miles N.W. of Calcutta. It is built chiefly of mud, but contains a lofty mosque. Pop. estimated at more than 320,000.

RAMSAY, ALLAN, a Scottish poet, was born at Leadhills in Lanarkshire on the 15th October 1686. His father was employed in the management of Lord Hopetoun's mines at that place, but died whilst the poet was yet in his infancy. He remained at the parish school of Leadhills with tolerable regularity till he reached his fifteenth year, and was employed in washing, preparing the lead ore for smelting, and other operations about the works. In 1701, when in his fifteenth year, he was bound apprentice to a wigmaker in Edinburgh, an occupation at which he continued till 1716. One of the earliest of Ramsay's productions now known, an address to the members of the Easy Club, appeared in 1712, when he was twenty-six years of age; and three years afterwards he was humorously appointed their poet-laureate. Many of his poems written about this time were published in the form of separate pamphlets. After having followed the occupation of wigmaker for a considerable time, he finally abandoned it for that of bookseller, as being more congenial to the literary turn of his mind. His detached pamphlets were afterwards published by him in the year 1721, in one volume 4to, which was encouraged by a very liberal subscription. The first volume of his well-known collection, the *Tea-table Miscellany*, was published in 1724, and ran through twelve editions in a very few years. He soon afterwards published what is called the *Evergreen*, being a collection of Scotch poems written by ingenious poets prior to the year 1600. In 1725 appeared his *Gentle Shepherd*, part of which, called *Patie and Roger*, was printed in 1721, and *Jenny and Maggy* in 1723, the great success of which induced him to form them afterwards into a regular drama.

In the year 1728 he published a second volume of his poems, which was afterwards reprinted in 8vo. These performances so rapidly enlarged the circle of his fame and reputation that in 1731 an edition of his poetical works was published by the booksellers of London, and two years afterwards they appeared at Dublin. From his shop opposite to Niddry Street he removed to one at the east end of the Luckenbooths. In this shop he continued to sell and lend out books until he was far advanced in years; and we have reason to believe that he was the first person who established a circulating-library in Scotland. His collection of *Fables* appeared in 1730, after which period he may be said to have almost discontinued the occupation of author. Such, however, was his enterprising spirit that he built, at his own expense, the first theatre for dramatical performances ever known in Edinburgh, which took place in what is called Carrubber's Close, in the year 1736; but he did not long enjoy his character of manager, for the magistrates of Edinburgh required him to shut it up, as an act of Parliament prohibited all such amusements without a special license and his Majesty's letters-patent. It is generally understood that he relinquished the trade of bookseller about the year 1755, being then sixty-nine years of age, and lived the remainder of his days in a small house erected by himself on the north side of the Castlehill. A scorbutic complaint, attended with excruciating pain, deprived him of his teeth, and, after corroding one of his jawbones, put a period to his existence on the 7th of January 1758, in the seventy-third year of his age. He was buried in the Greyfriars Churchyard, Edinburgh.

Ramsay possessed a very considerable share of poetical genius. Of this, his *Gentle Shepherd*, which will continue to be admired as long as the language in which it is written shall be understood, and especially by the natives of North Britain, to whom only the peculiarities of dialect by which it is distinguished can be familiar, affords the best proof. Some of his songs may contain far-fetched allusions and childish conceits; but many of them are equal, if not superior, in their pastoral simplicity, to productions of a similar nature in any other language. Some of the imitations of the ancients by this poet are extremely happy; and several of his tales have all the excellences that belong to that species of composition. But of a great proportion of his other productions it may be pronounced with truth that they are mere prosaic compositions, filled with the most commonplace observations, and destitute even of the ornament of smooth versification and correct rhymes. A complete edition of his works, with a *Life* written by the late George Chalmers, was published in 2 vols. 8vo, 1800. A reprint of *The Gentle Shepherd*, with some account of the author's life, has recently been brought out in Edinburgh, in 1856.

The poet's son Allan attained to considerable eminence as a portrait-painter. (See Chambers's *Biographical Dictionary of Distinguished Scotsmen.*)

RAMSAY, *Andrew Michael*, generally known by the name of the *Chevalier Ramsay*, a polite Scottish writer, was descended of a respectable family, and was born at Ayr in 1686.

He studied at the Edinburgh university, where he was distinguished for his industry and abilities. His talents and learning recommended him as a tutor to the son of the Earl of Wemyss; after which, conceiving a disgust for the religion in which he had been educated, he in the same humour reviewed other Christian churches, and, finding none to his liking, rested for a time in Deism. Whilst he was in this uncertain state of mind he went to Leyden, where, falling into the company of Poiret, a mystical divine, he received the infection of mysticism, which prompted him to consult Fénélon, the celebrated archbishop of Cambray, who had imbibed principles of the same nature, and who in 1709 gained him over to the Catholic religion. The subsequent course of his life received its direction from his friendship and connection with this illustrious prelate; and being appointed governor to the Duke de Chateau-Thierry and the Prince de Turenne, he was made a knight of the Order of St Lazarus. Ramsay was sent for to Rome by the Chevalier de St George to undertake the education of his children; but on his arrival there in 1724 he found so many intrigues and dissensions astir, that he obtained the chevalier's leave to return to Paris. He died in 1743, in the office of intendant to the Duke of Bouillon, Prince de Turenne. His works are,—*History of the Life and Works of M. Fénélon, Archbishop of Cambray*, in French and English, 1723; *A Philosophical Essay upon Civil Government*, London, 1721, afterwards republished under the title of *An Essay on Politics; The Psychometre, or Reflections upon the Different Characters of the Mind; The Travels of Cyrus*, in French and English, 1727, 2 vols., and 4to, 1730, written with much elegance, but too much overloaded with erudition and reflection; *The History of Viscount Turenne, Marshal of France*, in French and English; *The Philosophical Principles of Natural and Revealed Religion*, 2 vols. 1749, printed at Glasgow after the author's death.

RAMSDEN, Jesse, a distinguished optician, was the son of an innkeeper, and was born near Halifax in Yorkshire in 1735. His love for mathematical studies began to appear while he was attending a school in his native county. A period of apprenticeship to a cloth-worker in Halifax did not extinguish it. At the age of twenty-four he was found in London, a mathematical and philosophical instrument-maker, skilful in hand and intelligent in head. His growing excellence soon enabled him to open a shop for himself, and to commence a successful business. A sextant invented shortly before 1766 was the first of a series of improved mathematical instruments which issued from his establishment. There followed at intervals a dividing-machine, a theodolite, an equatorial, a telescope, a mural quadrant, a micrometer, and several minor inventions. On account of these services to science, Ramsden was held in high estimation towards the close of his life. At his death in 1800 he was a member of the Royal Society, a fellow of the Imperial Academy of St Petersburg, and the wearer of a Copley medal.

RAMSEY or Ramsay, a market-town of England, county of Huntingdon, on a tongue of high land stretching into the fens near Ramsey Mere, a lake now partially drained, 12 miles N.N.E. of Huntingdon and 69 N. of London. It consists of two streets crossing at right angles, and has a small stream running through the middle of it. Most of the houses are old and built of brick, but many elegant ones have recently been erected. A fine old church, partially exhibiting the transition from the Norman to the early English architecture, is the chief ornament of the town, and is conspicuous for its embattled tower. A ruinous but richly-sculptured gateway is the only remnant of a once famous and wealthy abbey. Places of worship for various denominations, several schools, and a literary institution, are to be found here. The people are mostly engaged in farming. Pop. 4645.

Ramsey or *Ramsay*, a seaport on the N.E. coast of the Isle of Man, 17 miles N.N.E. of Douglas. It is irregularly built; but has wide streets, and contains several churches, a grammar school, and a court-house, where most of the law courts for the north of the island are held. The anchorage in the bay is good, and there is a pier and lighthouse. Herring fishery is a productive source of profit, and corn and provisions are exported. Pop. 2701.

RAMSGATE, a seaport and market town of England, in the county of Kent, at the S.E. corner of the Isle of Thanet, 15 miles E.N.E. of Canterbury, and 73 E. by S. of London. Its older portion lies in a narrow valley, opening out to the sea, between the chalk cliffs that line the coast, and on which many fine new streets and villas have been erected, commanding a beautiful view. In the older portion, where the streets are narrow and the houses mean, there is a market-house, bank, public library, and other edifices. A large and elegant parish church in the Gothic style, with a lofty tower, a chapel of ease, district church, and places of worship for Baptists, Methodists, Independents, Roman Catholics, and Jews are the chief ecclesiastical buildings in Ramsgate. Education is afforded by various schools; the places of amusement include a theatre, assembly-rooms, and baths; and for charitable purposes there are an hospital and a dispensary. Ramsgate has for a long time been resorted to as a sea-bathing place, and indeed its prosperity is chiefly owing to this circumstance. The harbour, which is formed by two piers, and has an area of 48 acres, is the most important feature of the place, and one of the finest works of the kind in the country. It is formed by two piers, built of Portland and Purbeck stone and Cornish granite. The eastern pier is nearly 3000 feet long, the western about half that length, having on it a lighthouse. For repairing ships there are here a dry dock and a slip. The number of sailing-vessels registered at the port, December 31, 1857, was 103, tonnage 5115; of steamers 1, tonnage 10. In the year 1857 there entered coastwise at Ramsgate 388 sailing-vessels, tonnage 30,998; and there cleared 95, tonnage 6118. From foreign ports there entered 29 sailing-vessels, tonnage 3456; and for foreign ports, cleared 16, tonnage 982. In all, there entered 417 vessels, tonnage 34,454; and there cleared 111, tonnage 7100. The trade of the port is very considerable; coal, timber, eggs, and other articles are imported. Ship-building and rope-making are the chief manufactures. Fishing is also an employment to many of the inhabitants. Ramsgate is a member of the Cinque port of Sandwich, and is governed by a deputy appointed by the mayor of that town, and by commissioners under a local act. It was originally a mere fishing-village, with a few mean houses and a wooden pier; but after the Revolution of 1688 some of its inhabitants acquired wealth in the Baltic trade. This business is not, indeed, now carried on here, but it was the first circumstance that led to the prosperity and improvement of the town. The harbour was constructed in 1780–95 by Smeaton, Rennie, and others; and the town was one of the earliest popular watering-places for the Londoners, though at first not so much frequented as Margate. Pop. (1851) 11,838.

RAMUS, Petrus, the Latinized form of the name Pierre de la Ramée, a man celebrated alike by the persecutions of which he was made the object, and by the reforms which he endeavoured to introduce into philosophy, science, and public instruction, was born at the little village of Cuth in Picardy in 1515. His father, Jacques de la Ramée, pursued the humble occupation of a field labourer, but could date back his descent in a few removes to nobility. The boy lost his father at a very early age, and it was reserved for his mother, Jeanne Charpentier, to nurse him in poverty, and teach his young hands early to handle the instrument of toil. Thrift and want combined early to develop his mind; and when only eight years old, we are told of his visiting Paris all alone in pursuit of food and knowledge. Misery pursued the poor child there also, and he was compelled to retrace his steps. Again and again he visited the capital at short intervals, when his maternal uncle, struck with his great perseverance, afforded him temporary shelter. Honoré Charpentier, who pursued the carpenter's craft, could not do more than allow him fairly to commence his studies. Ramus, who had now reached his twelfth year, was endowed by nature with a singularly robust constitution, and entered the college of Navarre in the quality of a domestic. In this position he spent the day in his masters' service, and the night was devoted to study and sleep. He attended the public course given by the Faculty of Arts in 1527, when he left it greatly in love with logic, and with a profound aversion for the manner in which it was taught. The first occasion on which Ramus expressed publicly his dissent from the logic of Aristotle was at his examination for his master's degree. This occurred in 1536, when Ramus had reached his twenty-first year. He chose for his thesis the startling paradox, *Quæcumque ab Aristotele dicta esse, commenticia esse* (All that has been affirmed by Aristotle is a fabrication). A subject so novel placed the judges in the very greatest embarrassment. "The master said it," was no guarantee to Ramus of the truth of a single proposition; and it was entirely in vain that all the peripatetics which Paris contained, united their influence to crush him. The young candidate urged his replies with so much spirit and vivacity, he managed his objections with so much subtlety, and sent them home with so much address, that all Paris was filled with astonishment and admiration. His admission to the rank of Master of Arts was a real triumph.

Having thus emphatically won the right of instructing in the liberal arts, Ramus, in conjunction with Omer Talon, an able professor of rhetoric, and Barthélemy Alexandre, a distinguished Greek scholar, established themselves in the little college of Ave-Maria. When in his twenty-eighth year Ramus published two books in Latin, of which even Joseph Scaliger condescended to extol the style. The title of the one was *Dialecticæ partitiones ad Academiam parisiensem;* of the other, *Aristotelicæ Animadversiones,*—the latter of which in particular subjected its author to incredible persecutions. Hardly had these two books seen the light when the university, by its rector, Pierre Galland, solicited and obtained from the magistrates an arrest for their immediate suppression. Their author was represented as an enemy to religion and to the public peace. After endless jargoning, François I. resolved to bring this quarrel to a close. A chairman and four judges, two of them selected by each party, were to sit in judgment between Ramus and his opponents. The upshot of it was, that Ramus was condemned, on the 1st March 1544, as having "acted rashly, arrogantly, and impudently." He was compelled to leave Paris, and he took up his residence at the college of Presles, where a number of students had taken refuge from the plague, and commenced a course of lectures on rhetoric. He returned to Paris in 1545, the royal decree having been cancelled through the influence of the cardinal of Lorraine. He began a course of mathematics, which he continued till 1551, when Henry II. appointed him professor of philosophy and eloquence in the College of France. The years which followed were the most tranquil of Ramus's life. He wrote a Greek, a Latin, and a French grammar, several treatises on mathematics, logic, and rhetoric. In 1561 Ramus embraced Protestantism, and his logical ardour, as it was said, compelled him to make an invasion into the domain of theology. "Dès ce moment," adds a French biographer, "il fut perdu." Lost or not, Ramus had to flee the halter in the month of July 1562, and found an asylum at the palace of Fontainebleau, the property of Charles IX. The royal protection was not sufficient for his defence, for while absent his house was pillaged and his library destroyed. After the treaty of Amboise in 1563 he resumed his chair in the capital, but did not long enjoy it. Civil troubles in Paris induced him in 1568 to ask permission to travel. He visited a great many towns in Germany and Switzerland, where "the French Plato" (*Gallicus Plato*) was received with much honour. He resided for some time in Bâle, in Heidelberg, in Geneva, and in Lausanne, and taught his logic to the citizens of the three last-mentioned towns. Ramus had found it necessary, during his residence in Paris, strongly to oppose the appointment of one Jacques Charpentier to the mathematical chair of the university, from his profound, yea his avowed, ignorance of the subject. This person never forgave him. On his return to Paris, Ramus fell a victim to Charpentier's revenge during the massacre of St Bartholomew in 1572.

Although Ramus had talent sufficient to overthrow the logic of Aristotle as it was then understood and interpreted, he was unfortunately incapable of raising anything better in its stead. He freed logic from the scholastic subtleties to which it was then applied, but forgot, in re-applying it, to settle its natural limits once and for all. He was not, in short, a profound thinker; he dealt more in rhetoric than in logic. Yet in freeing men's minds from the tyranny of a system he took a decided step in advance of his age, and deserves the gratitude of humanity for so doing. The system of Ramus speedily extended from France to Switzerland, Spain, Germany, Holland, Denmark, and Scotland, and was publicly taught in each of those countries. He left a great number of works, of which a detailed catalogue will be found in *De Petri Rami Vita, Scriptis, Philosophia,* by Waddington Kastus, 8vo, Paris, 1848. Many of the author's works were translated into English and other foreign languages. The partizans of this philosopher are known by the name of Ramists or Rameans.

RAMUSIO, Giambattista, an Italian who was born at Treviso in the Venetian State in 1485, began in the former half of the sixteenth century to edit a collection of the most notable voyages both ancient and modern. The circumstances of his life peculiarly qualified him for such a task. He had travelled in the character of an ambassador through France, Switzerland, and Italy. His acquaintance with history, geography, and languages was great. Many learned foreigners likewise were his friends and correspondents, and could communicate any information he might require. Thus aided, he carried on the work with success. Those parts of his collection which were written in foreign languages he translated into Italian. To those parts which were obscure or incorrect he added explanations and comments from the stock of his own knowledge. The first volume was published at Venice in 1550, under the title of *Raccolta di Navigazioni e Viaggi;* a second followed in 1556; and a third appeared in 1559, two years after the author's death.

RANDERS, a town of Denmark, province of Jutland, on the navigable river Guden or Gudenal, at the head of Rander's Fiord, 22 miles N.N.W. of Aarhuus, and 111 W.N.W. of Copenhagen. It occupies a position that is both very picturesque and strong in a military point of view; and it contains an arsenal, a grammar school, and a large hospital. Much industry is carried on here, especially in the manufacture of hosiery and brandy. The trade is also considerable; and the fishing of salmon is pursued by many of the inhabitants. Pop. (1851) 7738.

RANDOLPH, Thomas, an English poet, was born in Northamptonshire in 1605. He was educated at Westminster and Cambridge, and was very early distinguished by his excellent genius. He gained the esteem and friendship of some of the greatest men of that age, particularly of Ben Jonson, who adopted him as one of his "sons."

He has a good deal of fancy, and he writes melodious verse; but his poetry is bookish, and his love and gallantry is that of a college fellow and a reader of Ovid. He died under thirty in 1634.

His principal works are,—*The Muses' Looking-Glass, a Comedy; Amyntas, or the Impossible Dowry,* a pastoral acted before the king and queen; *Aristippus, or the Jovial Philosopher; The Conceited Pedlar; The Jealous Lovers, a Comedy; Hey for Honesty, down with Knavery, a Comedy;* and several other poems.

RANDOM SHOT, is a shot made when the muzzle of a gun is raised above the horizontal line, and is not designed to shoot directly or point blank. The utmost random of any piece is about ten times as far as the bullet will go point blank. The bullet will go farthest when the piece is mounted at an angle of about 45° above the level range.

RANGE, the path of a bullet, or the line it describes from the mouth of the piece to the point where it lodges. If the piece lie in a line parallel to the horizon, it is called the *right* or *level range;* if it be mounted to 45°, it is said to have the *utmost range;* and all others between 0° and 45° are called the *intermediate ranges.* (See GUNNERY.)

RANGER, a sworn officer of a forest, appointed by the king's letters-patent, and whose proper business is to walk daily through his bailiwick, to drive back the deer out of the purlieus, and to present all trespasses within his jurisdiction at the next forest court.

RANGOON, a seaport-town of British India, in the province of Pegu, on the left bank of the Rangoon arm of the Irrawaddy, about 20 miles from its mouth, and 62 S. of Pegu. Previous to the great fire which consumed the whole of the town in 1850, it occupied an oblong area along the river's bank, about one mile in length and three-quarters in breadth; but after that catastrophe it was rebuilt on a different site, about a mile from the river, in the form of a square. It was built of bamboos for the most part, and defended by a pagoda on the north side, which formed a sort of citadel. In 1853 and 1855 fresh conflagrations took place; and from the nature of the buildings they proved very destructive. In the re-building of the town, since its last destruction, arrangements have been made by the British authorities for securing not only a proper protection against the recurrence of such devastations by fire, but for providing, by drainage and other measures, for the health and cleanliness of the town. The situation of Rangoon is very favourable to trade; and ship-building is actively carried on. Timber is floated down from the teak forests in the interior, and many vessels of large size have been built here. The town was first built in 1753, by Alompra, the founder of the Burmese monarchy, and from him it derived its name, signifying the "City of Victory." It was taken by the British in the first Burmese war in 1824; but subsequently restored to the native power. In the second war the capture of the pagoda or citadel by General Godwin in 1852 led to the fall of the town; and it passed, along with the province of Pegu, into the hands of the British. Pop. about 20,000.

RANK. See NAVY, § *Personnel.*

RANK AND FILE, the horizontal and vertical lines of soldiers when drawn up for service.

RANTERS. See METHODISTS.

RANZ DES VACHES (Germ. *Kuhreigen*), a simple and beautiful melody which the Swiss herdsmen play on the Alpine horn when driving out and in their herds to the pasture. Consisting, as it does, of a few simple intervals, the effect of it is quite enrapturing when heard among the echoes of the Swiss mountains. The native Swiss are said to be seized with inexpressible longings to return to their native country when they hear it played in a foreign land. This nostalgia or homesickness, as experienced by the Swiss soldier abroad, is elegantly alluded to by Rogers in his *Pleasures of Memory,* part i., p. 19:—

> "The intrepid Swiss, who guards a foreign shore,
> Condemned to climb his mountain-cliffs no more,
> If chance he hears the song so sweet, so wild,
> His heart would spring to hear it when a child,
> Melts at the long-lost scenes that round him rise,
> And sinks a martyr to repentant sighs."

(See *Recherches sur les Ranz des Vaches,* by Tarenne, Paris, 1813: *Sammlung von Schweizer Kuhreigen und Volksliedern,* Berne, 1818; also a *Dissertatio de Nostalgia,* by Th. Zwinger, Basle, 1710.)

RAOUL ROCHETTE, DÉSIRÉ, an eminent French archæologist, was born about 1789 at St Amand, in the department of Cher, and received his education at Bourges. His quick and facile talents soon began to lead him to a high place in the world of letters. At the age of twenty-two he was called to the chair of history in the lyceum at Paris. About four years afterwards he was translated to the same chair in the university of that city. Meanwhile he was commencing to prosecute the science of archæology with great success. The first result of his labours, published in 1815 under the title of *Histoire Critique de l'Establissement des Colonies Grecques,* in 4 vols. 8vo, was favourably received by the public. This achievement stimulated him in his favourite investigations. It is true that a part of his attention was for a while directed to the topography and history of modern Switzerland. But he was soon found making frequent tours of discovery into different European countries, and perfecting his archæological knowledge by the examination of museums and ruined buildings. A part of his researches appeared in 1822 under the title of *Antiquités Grecques du Bosphore Cimmèrien,* and established his fame. So eminent, in fact, did he become, that he was appointed in 1826 to the chair of archæology. The remainder of Raoul Rochette's life was occupied in maintaining that reputation which he had so laboriously gained. He continued to make frequent incursions into the scenes of classical history, and to embody his discoveries in a series of works. His principal publications were,—*Monuments Inédits d'Antiquité figurée Grecque, Etrusque, et Romaine,* in folio, 1828; *Pompei: Choix d'Edifices Inédits,* in folio, 1828; *Peintures Antiques Inédites,* in 4to, 1836; *Mémoires de Numismatique et d'Antiquité,* in 4to, 1840; and *Mémoires d'Archéologie Comparée Asiatique, Grecque et Etrusque,* in 4to, 1848. At his death in 1854, Raoul Rochette was perpetual secretary of the Academy of Fine Arts, and a corresponding member of most of the learned societies in Europe.

RAPE, in law, the carnal knowledge of a woman forcibly and against her will. This, by the Jewish law, was punished with death, in case the damsel was betrothed to another man; and in case she was not betrothed, then a heavy fine of fifty shekels was to be paid to the damsel's father, and she was to be the wife of the ravisher all the days of his life, without the power of divorce which was in general permitted by the Mosaic law.

The Roman law punishes with death and confiscation of goods the crime of ravishment, under which it includes both the offence of forcible abduction, or taking away a woman from her friends, and also the present one of forcibly dishonouring her; either of which, without the other, is in that law sufficient to constitute a capital crime. The stealing away a woman from her parents or guardians, and debauching her, is equally penal by the emperor's edict, whether she consent or be forced; and this in order to take away every opportunity of offending in this from women, whom the Roman law supposes never to go astray without the seduction and arts of the other sex; and therefore, by restraining and making so highly penal the solicitations of the men, they meant to secure effectually the honour of the women. But our English law does not entertain quite such sublime ideas of the honour of either sex as to lay the blame of a mutual fault upon one of the transgressors only; and therefore it is a necessary ingredient in the crime of rape that it must be against the woman's will.

Rape was punished by the Saxon laws, particularly those of Athelstane, with death; which was also agreeable to the old Gothic or Scandinavian constitution. But this was afterwards thought too hard; and in its stead another severe but not capital punishment was inflicted by William the Conqueror, namely, castration and loss of eyes, which continued till after Bracton wrote, in the reign of Henry III. But in order to prevent malicious accusations, it was then the law that the woman should, immediately afterwards, go to the next town, and there make discovery to some credible persons, of the injury she had suffered, and afterwards should acquaint the high constable of the hundred, the coroners, and the sheriffs, with the outrage. This seems to correspond in some degree with the laws of Scotland and Aragon, which require that complaint must be made within twenty-four hours; though afterwards by statute Westm. i., c. 13, the time of limitation in England was extended to forty days. At present there is no time of limitation fixed; for, as it is usually now punished by indictment at the suit of the king, the maxim of law takes place, that *nullum tempus occurrit regi;* but the jury will rarely give credit to a stale complaint. During the former period also it was held for law, that the woman, by consent of the judge and her parents, might redeem the offender from the execution of his sentence by accepting him for her husband, if he also was willing to agree to the exchange, but not otherwise. In the 3d Edward I., by the statute Westm. i., c. 13, the punishment of rape was much mitigated; the offence itself, of ravishing a damsel within age, that is, twelve years old, either with or without her consent, or of any other woman against her will, being reduced to trespass, if not prosecuted by appeal within forty days, and subjecting the offender only to two years' imprisonment, and a fine at the king's will. But this lenity being productive of the worst consequences, it was, in ten years afterwards, 13 Edward I., found necessary to make the offence of forcible rape felony by statute Westm. ii., cap. 34. And by statute 18 Elizabeth, c. vii, it is made felony without benefit of clergy; as is also the abominable wickedness of carnally knowing or abusing any woman-child under the age of ten years, in which case the consent or non-consent is immaterial, as by reason of her tender years she is incapable of judgment and discretion. Sir Matthew Hale is indeed of opinion that such profligate actions committed on an infant under the age of twelve years, the age of female discretion by the common law, either with or without consent, amount to rape and felony, as well since as before the statute of Queen Elizabeth. But that law has in general been held only to extend to infants under ten; though it should seem that damsels between ten and twelve are still under the protection of the statute Westm. i., the law with respect to their seduction not having been altered by either of the subsequent statutes. A male infant, under the age of fourteen years, is presumed by law to be incapable of committing a rape, and therefore, it seems, cannot be found guilty of it. For though in other felonies *malitia supplet ætatem;* yet, as to this particular species of felony, the law supposes an imbecility of body as well as mind. The civil law seems to suppose a prostitute or common harlot incapable of any injuries of this kind; not allowing any punishment for violating the chastity of her who has indeed no chastity at all, or at least has no regard to it. But the law of England does not judge so hardly of offenders as to cut off all opportunity of retreat even from common strumpets, and to treat them as incapable of amendment. It therefore holds it to be felony to force even a concubine or harlot, because the woman may have forsaken that unlawful course of life; for, as Bracton well observes, *licet meretrix fuerit antea, certe tunc temporis non fuit, cum reclamando nequitiæ ejus consentire noluit.* Capital punishment for this offence was abolished by 4 Vict. 1841, and transportation substituted.

RAPHOE, a market-town of Ireland, county of Donegal, in a beautiful situation, amid a rich and well-cultivated country, 3 miles N.W. of Lifford, and 136 N.N.W. of Dublin. It contains a plain cruciform church, formerly the cathedral of the diocese of Raphoe, which is now united with that of Derry. There are also various dissenting places of worship, a free school, national school, and others; a neat market-house, library, dispensary, &c. In the vicinity are the deanery, and a large handsome edifice formerly the episcopal palace. Pop. (1851) 1492.

RAPIN, Paul de, Sieur of Thoyras, an eminent historian, was the son of Jacques de Rapin, and was born at Castres in 1661. He was first educated under a tutor in his father's house, and was afterwards sent to Samur. In 1679 he returned to his father, with a design to apply himself to the study of the law, and was admitted an advocate; but reflecting that his being a Protestant would prevent his advancement at the bar, he soon after resolved to quit the profession of the law, and to apply himself to that of the sword. His father, however, would not consent to the change. The revocation of the Edict of Nantes in 1685, and the death of his father, which happened two months afterwards, made him resolve to come to England; but as he had no hopes of any settlement there, his stay was but short. He therefore went to Holland, and enlisted himself in the company of French volunteers at Utrecht, commanded by M. Rapin, his cousin-german. He attended the Prince of Orange into England in 1688; and the following year Lord Kingston made him an ensign in his regiment, with which he proceeded to Ireland, where he gained the esteem of his officers at the siege of Carrickfergus, and soon received a lieutenant's commission. He was present at the battle of the Boyne, and was shot through the shoulder at the battle of Limerick. He was soon afterwards made captain of the company in which he had been ensign; but in 1693 he resigned his company to one of his brothers, in order to become tutor to the Earl of Portland's son. Having finished this employment, he returned to his family, which he had settled at the Hague, where he continued some years. But as he found his family increase, he resolved to retire to some cheap country; and accordingly removed in 1707 to Wesel, where he commenced his great work the *History of England.* Though he was of a strong constitution, yet seventeen years' application entirely ruined his health. He died in 1725. Rapin wrote in French a *Dissertation sur les Whigs et les Torys.* His *Histoire d'Angleterre* was printed at the Hague in 1726 and 1727, in 9 vols. 4to, and reprinted at Trevoux in 1728, in 10 vols. 4to. This last edition is more complete than that of the Hague. It has been translated into English, and improved, with notes by Tindal, in 2 vols. folio, 1757–59. This performance, although the work of a foreigner, is deservedly esteemed as one of the fullest and most impartial collections of English political transactions extant.

RASGRAD, or Hesarorad, a town of European Turkey, in Bulgaria, in a lofty position overlooking a ravine, on the Ak or White Lern, an affluent of the Danube, 215 miles N.W. of Constantinople. It is a place of considerable trade, standing at the junction of four main roads. Strong in its natural position, it is further defended by a dry ditch and palisade. The Turks were defeated here by the Russians in 1810. Pop. 16,000.

RASK, Rasmus Christian, an eminent scholar and philologist, was born at Brendekilde, in the Island of Fyen or Funen in Denmark, in 1787. He studied at the university of Copenhagen, and early distinguished himself by singular talent for the acquisition of languages. In the year 1808 he was appointed assistant-keeper of the university library, and some years afterwards made professor of literary history. In 1811 he published, in the Danish language, his *Introduction to the Grammar of the Icelandic and other Ancient Northern Languages*, the materials of which were entirely derived from the immense mass of manuscript and printed works which had been accumulated by his predecessors in the same field of research. This grammar appears to have given a fresh impulse to the study of the ancient northern languages, even in Germany. The reputation which Rask acquired by it recommended him to the Arna-Magnæan Institution, by which he was employed as editor of the Icelandic *Lexicon* of Bjorn Haldorsen, which had long remained in manuscript. To this work, which appeared in 1814, Bishop Müller contributed a preface, in which he pronounces a just eulogium on the talents and the spirit of research displayed by the youthful editor. About the same time, Rask who had never been in Iceland, paid a visit to that country, where he remained from 1813 to 1815, during which time he made himself completely master of the language, and familiarized himself with the literature, manners, and customs of the natives. To the interest with which they inspired him may probably be attributed the establishment at Copenhagen, early in 1816, of the Icelandic Literary Society, which was mainly instituted by his exertions, and of which he had the honour to be the first president.

Whilst thus employed, however, he was about to enter upon a more ample field of enterprise. In October 1816 he left Denmark on a literary expedition, which had been fitted out for the double purpose of prosecuting inquiries into the languages of the East, and collecting manuscripts for the University Library at Copenhagen. The King of Denmark having liberally provided him with the requisite means, he proceeded first to Sweden, where he remained two years, in the course of which he made an excursion into Finland, for the purpose of studying the language of that country. Here he published, in Swedish, his *Anglo-Saxon Grammar* in 1817; and during the same year there appeared at Copenhagen, in Danish, an *Essay on the Origin of the Ancient Scandinavian or Icelandic Tongue*, in which he traced the affinity of that remarkable idiom to the other European languages, particularly to the Latin and the Greek. In 1818 he published a second edition, very much improved, of his *Icelandic Grammar*, translated by himself into Swedish; and in the course of the same year he also brought out the first complete editions of Snorrow's *Edda*, and Sæmund's *Edda*, in the original text, along with Swedish translations of both *Eddas*, the originals and the versions occupying each two volumes. From Stockholm he proceeded in 1819 to St Petersburg, where he wrote in German an interesting paper on "The Languages and Literature of Norway, Iceland, Sweden, and Finland," which was published in the sixth number of the Vienna *Jahrbucher*. From Russia, which he traversed, he proceeded through Tartary into Persia, and resided for some time at Tauris, Teheran, Persepolis, and Shiraz. It may be mentioned here, as an instance of his remarkable facility in acquiring languages, that in about six weeks he made himself sufficiently master of the Persian to be able to converse freely in that language with the natives. In 1820 he embarked at Abuschekr, in the Persian Gulf, for Bombay, which he reached in safety; and during his residence there he wrote in English "a Dissertation on the Authenticity of the Zend Language," which he addressed to the governor, the Hon. Mountstuart Elphinstone, and which was afterwards published in the third volume of the *Transactions of the Literary Society of Bombay*. The same production, with corrections and additions, was afterwards deemed worthy of insertion in the *Transactions of the Royal Asiatic Society*. From Bombay he proceeded through India to Ceylon, where he arrived in 1822, and soon afterwards wrote, in English, "A Dissertation respecting the best Method of expressing the Sounds of the Indian Languages in European Characters," which was printed in the *Transactions of the Literary and Agricultural Society of Colombo*. Professor Rask, having at length completed his researches on the scale prescribed, set out for Europe, and reached Copenhagen in the beginning of May 1823, after an absence of nearly seven years. He brought home with him a considerable collection of rare and curious oriental manuscripts, Persian, Zend, Pali, Cingalese, and others, which now enrich the university and royal libraries of the Danish capital.

Notwithstanding all his labours and exertions, this indefatigable scholar scarcely allowed himself an interval of repose. Between the period of his return from the East and that of his death, which occurred far too soon for the interests of philology, Professor Rask published in his native language a *Spanish Grammar* in 1824, an *Italian Grammar* and a *Frisic Grammar* in 1825, a *Treatise respecting the Ancient Egyptian Chronology* in 1827, *the Ancient Jewish Chronology previous to Moses* in 1828, and an *Essay on Danish Orthography* in the same year. He likewise edited an edition of Schneider's *Danish Grammar for the use of Englishmen* in 1829, and superintended the English translation of his *Anglo-Saxon Grammar* by Thorpe in 1830. This last work supplies what had long been a desideratum in English literature. Before its appearance persons whose taste might dispose them to investigate our early vernacular remains had no guides to direct them, and each had to form for himself a grammar and a dictionary of the Saxon. Hickes' was full of blunders, and in these Elstob, Lye, Manning, and others had religiously followed him, superadding their own contingents respectively. Rask's services to comparative philology were very great. He was the first to point out the connection between the ancient Northern and Gothic on the one hand, and of the Lithuanian, Sclavonic, Greek, and Latin on the other. In private life the character of Professor Rask was such as to command admiration and respect. His manners, though somewhat retiring, were mild and gentle, and his morals unimpeachable. His mode of living was simple in the extreme, and his temperance almost that of an anchoret. The habits of study and application which he had acquired in his youth were never laid aside. In company he was diffident, and always expressed himself with modesty; but when the subject involved anything relative to his own history or pursuits, he evinced a reluctance to converse which seemed to grow upon him with years, and almost amounted to a morbid sensibility. His facility in the acquisition of languages was extraordinary; he appeared to gain a knowledge of them by a sort of intuition, and his mind seemed to recollect rather than to learn. In 1822 he was master of no less than twenty-five languages and dialects. His knowledge of English was extensive and correct. He spoke and wrote it with such fluency and precision that Englishmen to whom he was introduced were accustomed to ask him how long he had been in England, considering that such an acquaintance could only be gained by a residence in the country where it was spoken. Rask, in his personal appearance, was thin and spare, but well made; his habits of temperance, regularity, and exercise, had contributed to give him all the appearance of a healthy man, and he seemed destined to attain a ripe old age. He was capable of enduring much fatigue, and even the privation of necessary rest; changes of climate seemed to produce no impression upon his constitution; the scorching sun of India, and the biting frosts of Iceland, were equally braved and disregarded. But, with all this apparent superiority to ordinary infirmities, he fell a victim to consumption, and died at Copenhagen on the 14th of November 1832, in the forty-fifth year of his age. His numerous philological manuscripts were given over to the king's library at Copenhagen. Rask's *Anglo-Saxon, Danish*, and *Icelandic Grammars* have been given to the English public by Thorpe, Repp, and Dasent respectively.

RASSOVA, a fortified town of European Turkey, on the right bank of the Danube, at the place where that river turns suddenly to the north, 38 miles E. by N. of Silistria. Near this begins the line of earth-works called Trajan's Wall, stretching across the isthmus of the Dobrudscha to the Black Sea. Rassova was occupied by the Russians for a short time in 1854. Pop. 8000.

RASTADT, or RASTALL, a fortified town of the grand duchy of Baden, circle of Middle Rhine, on the Murg, not far from its confluence with the Rhine, 14 miles S. of Carlsruhe, and 30 N.E. of Strasburg. The palace, formerly occupied by the margraves of Baden-Baden, a building four storeys high, after the model of the palace at Versailles, is the most conspicuous edifice. It stands on a height, and has a tower surmounted with a gilt statue of Jupiter, and commanding an extensive view. The town is regularly built, and has several churches, a lyceum, and a normal school. Manufactures of tobacco, snuff, cutlery, mathematical and musical instruments are carried on here; and there is a considerable trade. Rastadt was first brought into importance by the Margrave Louis William, who had fixed his residence here in the end of the seventeenth century, it having previously been but a small village. The peace of 1714, which put an end to the war of the Spanish succession, was signed in the palace by Prince Eugene and Marshal Villars. A congress was held here in 1797–9, to negotiate a peace between France and the empire, after which the French ambassadors, Roberjot and Bonnier, were murdered on their return, only a short distance from the town, but by whom it was never ascertained. A monument now marks the place. At Rastadt the insurrection in Baden in 1849 first broke out; and the insurgents, after a three weeks' siege, were obliged to surrender at discretion to the Prussians. Pop. 7284.

RASTALL, JOHN, a printer and miscellaneous writer, was born in London probably about the end of the fifteenth century, and educated at Oxford. Returning from the university, he settled in the metropolis and commenced printer, "then esteemed," says Wood, "a profession fit for any scholar or ingenious man." He married the sister of Sir Thomas More, with whom, we are told, he was very intimate, and whose writings he strenuously defended. From the title-page of one of his books, he appears to have lived in Cheapside, at the sign of the Mermaid. He died in the year 1536; and left two sons, William and John; the first of whom became a judge in Queen Mary's reign, and the other a justice of peace. The subject of the present article was a zealous Papist; but Bale says that he changed his religion before his death. He wrote *Natura naturata*, which Pits calls a copious and ingenious comedy, describing Europe, Asia, and Africa. *The Pastyme of the People; the cronycles of diverse realmys, and most especially of the realm of England, brevely compiled and emprinted in Cheapesyde, at the sign of the Mermaid, next Pollysgate, cum privilegio*, folio. It was reprinted in 1811 in the *Collection of English Chronicles*. *Ecclesia Johannis Rastall*, 1542, was one of the prohibited books in the reign of Henry VIII. He also wrote *Legum Anglicanarum vocabula explicata*, French and Latin, London, 1567, 8vo.

RASTENBURG, a town of Prussia, in the province of Prussia, and circle of Königsberg, on the Guber, 55 miles S.E. of Königsberg. It is distinguished by the high, red roofs of the houses; and contains a castle, several churches, a gymnasium, &c. Linen is woven here, and forms the principal article of trade. Pop. 4805.

RAT. See MAMMALIA.

RATAFIA, a fine spirituous liquor prepared from the kernels and other parts of several kinds of fruits, particularly cherries and apricots. Ratafia of cherries is prepared by bruising the cherries, and putting them into a vessel wherein brandy has long been kept; then adding to them the kernels of cherries, with strawberries, sugar, cinnamon, white pepper, nutmeg, cloves, and to twenty pounds of cherries ten quarts of brandy. The vessel is left open ten or twelve days, and then stopped close for two months before it is tapped. Ratafia of apricots is prepared in two ways,—namely, either by boiling the apricots in white wine, adding to the liquor an equal quantity of brandy, with sugar, cinnamon, mace, and the kernels of apricots, infusing the whole for eight or ten days, then straining the liquor, and putting it up for use; or by infusing the apricots, cut in pieces, in brandy for a day or two, passing it through a straining-bag, and then putting in the usual ingredients. The French excel in this species of distillation.

RATCHET. See CLOCK AND WATCH WORK, § *Going Barrels*.

RATES. See NAVY, § *Matériel*.

RATHANGAN, a market-town of Ireland, county of Kildare, on the Little Barrow, 5 miles N. by W. of Kildare, and 31 W.S.W. of Dublin. It is pretty well built, and contains a handsome parish church; various other places of worship, two schools, a dispensary, and several large flour-mills. There are hardly any manufactures or trade here. Pop. (1851) 1004.

RATHDOWNEY, a market-town of Ireland, Queen's County, on an affluent of the Nore, 19 miles S.W. of Maryborough. It has a good parish church, Methodist and Roman Catholic chapels, two schools, a barrack, and a dispensary. In the parish there are, besides other remains, those of an abbey and of three castles. A brewery and a boulting-mill are the only manufactories. Pop. (1851) 1192.

RATHENOW, or RATHENAU, a town of Prussia, in the province of Brandenburg and circle of Potsdam, on the Havel, 45 miles W. of Berlin. It contains a church with a newly-erected Gothic tower, a gymnasium, and a girls' school. There is also a monument and a statue of the elector Frederick-William. Among the manufactures, the most important is that of optical instruments; fishing, brewing, distilling, and navigation, give employment to many of the people. A victory was gained here in 1675 by the troops of Brandenburg over the Swedes. Pop. 6432.

RATHKEALE, a market-town of Ireland, county of Limerick, on the Deel, 16 miles S.W. of Limerick, and 136 S.W. by W. of Dublin. Many of the houses are well built; and there are a parish church, Roman Catholic and other places of worship, a court-house, jail, several schools, hospital, dispensary, and workhouse. The inhabitants are mostly employed in farming, and there is a considerable retail trade. The ruins of an old priory and of two castles are to be seen here. Rathkeale derived much advantage from a colony of German Protestants who settled here in the beginning of the eighteenth century. Pop. (1851) 3029.

RATIBOR, a town of Prussia, in the province of Silesia and government of Oppeln, on the left bank of the Oder, 40 miles S.S.E. of Oppeln. It is walled, entered by four gates, and defended by a castle. There are here a court of appeal for Upper Silesia, several churches, a gymnasium, and other schools, several hospitals, &c. Manufactures and trade are actively carried on; and much-frequented markets are held for corn, cattle, wool, flax, and hemp. Pop. 9691.

RATIO. See GEOMETRY, § on *Proportion*.

RATION, a portion of ammunition, bread, drink, and forage, distributed to each soldier in an army for his daily subsistence. The horse have rations of hay and oats when they cannot go out to forage.

RATIONALISM, in its widest acceptation, is applicable to all who follow the dictates of reason, whether in their speculative or practical life. In its more restricted signification it is applied specially to that system of religious opinion whose final test of truth is placed in the direct assent of the human consciousness, whether in the form of logical deduction, moral judgment or religious intuition, by whatever previous process these faculties may have been raised to their assumed dignity as arbitrators. The rationalist, as such, is not bound to maintain that a divine revelation of religious truth is impossible, nor even to deny that it has actually been given. He may admit the fact of a revelation, and may accept certain portions of it as of permanent authority; but he assigns to the higher tribunal of his consciousness the right of determining what is essential to religion and what is not.

RATISBON (Germ. *Regensburg*, Fr. *Ratisbonne*), a town of Bavaria, in the upper palatinate, on the right bank of the Danube, here crossed by an ancient stone bridge, at its confluence with the Regen, 65 miles N.N.E. of Munich. It has an antique and somewhat dull appearance, as it has greatly fallen off from its former size and splendour. The old walls which surround it are in a dilapidated condition, and the ditches filled up. Entrance is obtained by six gates into the town, where the streets, narrow and crooked, though clean, are lined with old-fashioned stone buildings. Several loop-holed embattled towers rise from the houses to remind the spectators of the ancient turbulent times; and in the street of the ambassadors there are many memorials of the days when its splendid mansions were occupied by the representatives of great monarchs and nations. The arms of various countries decorate many of the houses, among which are the eagle of Austria and the lion of St Mark. The Gothic cathedral of St Peter, though both of its towers are unfinished, is one of the masterpieces of German architecture. It was begun in 1275, and left off in 1634. The ground plan is peculiar, as the lower storey has no transepts, but only the upper. The western front is extremely beautiful, and richly adorned. In the interior are many fine statues and works of art; among the rest, the high altar of solid silver. From the summit of the building a beautiful and extensive view is obtained over the course of the Danube, with the chain of the Alps in the distance. Within the cathedral inclosure are the remains of two more ancient churches, curious and interesting to the antiquarian. There are numerous other churches in the town, but few of them possess much interest. A gloomy and irregular old building near the cathedral is the town-hall, the meeting-place of the German Diets from 1663 till 1806. In the assembly-hall are still to be seen the seats and benches which are said to have been used. The building also contains dungeons and a torture chamber; in the latter, directly below the hall of the Diet, is the most perfectly preserved collection of instruments of cruelty that exists in Europe. A large building, formerly the Benedictine convent of St Emmeran, is now the residence of the Count of Thurn and Taxis. In the garden belonging to it stands a monument to Kepler, who died at Ratisbon in 1630, and is buried in the adjacent churchyard. The town contains, besides the buildings already mentioned, a theatre, public library, picture gallery, collection of antiquities; lyceum, gymnasium, and other schools; hospital, infirmary, orphan and blind asylums, &c. The manufactures include beer, brandy, tobacco, leather, wax-candles, porcelain, earthenware, paper, cotton, steel, brass, &c. Ship-building is actively carried on, and there is a considerable trade and navigation on the Danube; salt, timber, and corn, being the chief articles of commerce. In the vicinity of Ratisbon stands the Walhalla, a building after the model of the Parthenon at Athens, containing busts and monuments of celebrated Germans from the earliest period. It was founded by King Lewis of Bavaria in 1830, and completed in 1842; a magnificently-adorned building, but, as a temple of Fame, not by any means so impressive as the time-hallowed fanes of other countries. It stands on a hill commanding towards the east, a view of the dark slopes of the Bavarian Forest on the north of the Danube, and the rich plain of Straubing on the south, with the ruin-crowned heights of Donaustauf, and the towers of Ratisbon to the west, and in clear weather the distant Alps to the south. Ratisbon is a town of great antiquity, and was a place of some importance under the Romans. With the exception of one square tower, said to be of Roman origin, there are no remains of this period. The first German emperor, Louis the German, fixed his residence here; and the town was afterwards the seat of the dukes of Bavaria, and the capital of that country. Frederick Barbarossa, in the twelfth century, made Ratisbon immediately dependent on the empire, and as such it remained till 1803, when it was given to the Archbishop of Mentz. The town enjoyed great prosperity during the middle ages; but, like Augsburg and Nuremberg, it fell into decay after the discovery of the Cape of Good Hope. In 1809 it passed again into the possession of Bavaria. Pop. 25,000.

RATLINES, or, as the sailors call them, *ratlins*, those lines which form the ladder-steps to the shrouds of a ship.

RATTANS, commercially *rattan-canes*, are the whip-like prolongations (*flagelli*) of the petioles of *Calamus Roxburghii*, Griffiths, the *C. Rotang* of Roxburgh and other species (Nat. Ord. *Palmaceæ*). These *flagelli* are often of very great length, and as they are armed at their extremities with long sharp prickles, when pushed amongst the foliage of other trees they serve as tendrils to these climbing palms. The greater portion of the *flagellum* is smooth and glossy, with a thick silicious coating having the appearance of varnish, and being very indestructible. They are collected in Bengal, along the Coromandel coast, in Java, and in China, in vast quantities, and are used very extensively for a great variety of purposes in all parts of the peninsula of India, from which they are largely exported to all parts of the world. Their great strength and flexibility, their cylindrical form, the ease with which they split, &c., render them applicable to a variety of purposes. The Hindus and Chinese make hats, shoes, chairs, bedsteads, baskets, sieves, and other useful articles of them. They likewise use them as ropes for binding their wooden houses together, and form a great variety of mats from them. The Chinese use them to a great extent instead of cord for tying round their tea-chests. In Europe they are chiefly used in forming the bottoms of chairs and stools, and as a cheap substitute for whalebone. The imports in 1858 were 8,901,600 rattans. They usually come in bundles of about fifty in each, the canes being about 16 feet in length, and once bent in the bundle. (T. C. A.)

RAUCH, CHRISTIAN, one of the greatest sculptors of modern times, was born at Arolsen, in the principality of Waldeck, on the 2d of January 1777. The opening career of the young artist was attended with considerable difficulty. His parents were poor, and could not afford to place him under efficient masters. His first instructor, Valentin of Arolsen, taught him little else than the art of sculpturing grave-stones. Professor Ruhl of Cassel could not give him much more. A wider field of improvement opened up before him when he removed to Berlin in 1797; but poverty still hampered all his efforts. He was obliged to earn a livelihood by becoming a royal lacquey, and to reserve the prosecution of his favourite art for his spare hours. The genius of Rauch, however, soon forced itself into notice, and recommended him to several influential individuals who were able to give him assistance. Queen Louisa surprising him one day in the act of modelling her fair features in wax, sent him to study at the Academy of

Art. Not long afterwards, in 1804, Count Sandrecky gave him the means to go and complete his education at Rome. There also he found both aid and encouragement. William Von Humboldt directed his attention to the antique. Canova and Thorwaldsen advised and stimulated him in that study. Under such propitious patronage the young sculptor made rapid progress. Among other works, he executed bas-reliefs of "Hippolytus and Phædra;" "Mars and Venus wounded by Diomede," and a "Child Praying."

It was in 1811 that Rauch entered upon the eminent part of his career. Commissioned in that year to execute a monument for Queen Louisa of Prussia, he summoned up all his strength and industry for the arduous task. It is said that he shut himself up from all intercourse with the world until, by unwearied meditation and experiment, he had caught and embodied the features of his departed patroness. The statue, representing the queen in a sleeping posture, was placed in a mausoleum in the grounds of Charlottenburg, and procured great fame for the artist. Commissions for portraits came pouring in upon him. The consummate tact with which he seized individual characteristics, and the artistic manner in which he treated them, established at once his reputation. The erection of all public statues came to be entrusted to him. He began to execute that long series of representations of great Germans in which his genius is exhibited to full advantage. As years passed by, statesmen, patriots, and men of genius, some colossal and others of the ordinary size, continued to come forth from his studio. In course of time almost every important town throughout the country possessed a bust of some worthy fresh and vigorous from his matchless chisel. There were, among others, Blucher at Breslau, King Maximilian at Munich, Pastor Franke at Halle, Albert Dürer at Nürenberg, Luther at Wittenberg, and the Grand Duke Paul Frederick at Schwerin. At length he reached the climax of his efforts, by commencing in 1840 a colossal monument at Berlin to Frederick the Great. This work was inaugurated with great pomp, and in the presence of a vast assemblage, in May 1851, and has ever since been regarded as one of the grandest masterpieces of modern sculpture. On a granite pedestal 25 feet in height stands the colossal equestrian statue of the king. His plain, pinched features, and his grotesque costume, are given with historical exactness, without impairing the artistic effect. An air of resistless majesty ennobles the mean countenance, and a bold and skilful treatment hides the absurdity of the garb. Nor are the representations on the pedestal less correct or less successful. On each of the four faces designs in high relief, of the size of life, and executed after authentic portraits, busts, or medals, appear lively groups of the generals, statesmen, and great men of the reign. Beneath these figures are tablets bearing the names of other noted Prussian contemporaries. Above are female forms of Justice, Strength, Wisdom, and Moderation, interspersed with emblematic bas-reliefs of the principal periods of the monarch's career. In fact, the entire monument is a vivid history in stone of the life and reign of Frederick the Great.

These numerous labours of Rauch were rewarded by a happy old age. The matchless excellence of his masterpiece had been recognised throughout the world. Princes decorated him with honours. All the academies of Europe enrolled him among their members. Especially did his own sovereign and countrymen regard him with proud affection and respect. Of late years his fine form, the very embodiment of elevated and venerable genius, was an object of interest at the court-balls of Berlin. Nor did he take less pleasure than he had ever done in the prosecution of his art. As he said himself, "his working-room was his home." A statue of Kant for Königsberg, and a statue of Thaer for Berlin, occupied his attention during some of his last years; and he had just finished a model of "Moses praying between Aaron and Hur," when the illness attacked him which eventually carried him off on the 3d December 1857.

RAVAILLIAC, or RAVAILLAC, FRANÇOIS, the assassin of Henri IV. of France, was born at Angoulême, about 1578, and was at the time of his execution about thirty-two years of age. Ravaillac was the son of humble parents, his father being one of those inferior retainers of the law to whom the vulgar give the name of pettifoggers, a profession to which his son had also been bred. He taught a school for some time, and seems to have been imprisoned for debt, which greatly affected his mind. His distress was so great that he had much ado to live. When he was seized for the murder of the king, he was very loosely guarded, and all were permitted to speak with him who pleased. He was removed next day from the house of Espernon to the Conciergerie, the proper prison of the Parliament of Paris. When he was first interrogated, he answered with great boldness, that he had done it, and would do it if it were to be done again. When he was told that the king, though dangerously wounded, was living, and might recover, he said that he had struck him home, and that he was sure he was dead. He persisted in the most solemn asseverations that he had no accomplices, and that nobody had persuaded him to the fact. He appeared surprised at nothing so much as at the universal abhorrence of the people, which, it seems, he did not expect. When he was put to the torture, he broke out into horrid execrations, and always insisted that he did the act from his own motive, and that he could accuse nobody. On the day of his execution, after he had made the *amende* before the church of Nôtre Dame, he was carried to the Grève; and, being placed upon a scaffold, was tied to a wooden engine in the shape of a St Andrew's cross. The knife with which he did the murder being fastened in his right hand, it was first burned in a slow fire; then the fleshy parts of his body were torn with red-hot pincers, and melted lead, oil, pitch, and rosin poured into the wounds. The people refused to pray for him; and when, according to the sentence that had been pronounced upon him, he came to be dragged to pieces by four horses, one of those that were brought appearing to be but weak, a spectator offered his own, with which the criminal was much moved. He was very earnest for absolution, which his confessor refused, unless he would reveal his accomplices. "Give it me," said he, "upon condition that I have told the truth;" which the priest eventually did. His body resisted the force of the horses; and the executioner cut him into quarters, which the people dragged through the streets. There has just been published *Le Proces du tres Meschant et Detestable Parricide François Ravaillac*, by Auguste Aubry, Paris, 1859, compiled from the original MSS. of the trial.

RAVELIN. See FORTIFICATION.

RAVENGLASS, a seaport and market town of England, in the county of Cumberland, 42 miles S.S.W. of Carlisle. It stands on an inlet of the sea, where the Esk, Irt, and Mite unite, and commands a view of the Welsh mountains and the Isle of Man. Oysters are obtained along the coast, and there is a considerable coasting trade in coal, timber, and corn. Pop. (1851) of the parish of Muncaster, in which it is included, 623.

RAVENNA, a town of the Papal States, capital of a delegation of the same name, on the left bank of the Montone, 43 miles E. by S. of Bologna. It stood originally on the coast; but as early as the fifth century the alluvial deposits brought down by the Po had begun to encroach upon the sea, from which it is now about 4 miles distant. This space is now occupied by a portion of that celebrated pine forest, perhaps the most ancient in Italy, which covers the flat sandy ground along the Adriatic for about 25 miles. It furnished timber for the Roman fleets, and afterwards for those of Venice; and it has been rendered classic ground by the genius of Dante, Boccaccio, Dryden, and Byron. The town is inclosed by earthen ramparts about 3 miles in circuit, but it has miserably shrunk from its former dimensions; its palaces are deserted of their greatness, and grass grows in its broad and once busy streets. The cathedral, built by Orso, Archbishop of Ravenna, in the fourth century, has been rebuilt in modern times; so that the only relic of the original edifice is the cylindrical campanile, which resembles the Constantinopolitan minarets. In the interior there are, among other works of art, two of the finest of Guido's paintings. The baptistery, of an octagonal form, is of nearly the same date as the church, and is detached from it. It contains many well-preserved treasures of early Christian art. The basilica of San Vitale is a splendid octagonal building in the pure Byzantine style, after the model of St Sophia at Constantinople. It was consecrated in 547, and was imitated in the church of Charlemagne at Aix-la-Chapelle. Of the other churches in the town, many possess much interest from their antiquity, their architecture, or the paintings and sculptures which they contain. Indeed, it is at Ravenna that the early Christian monuments are to be seen in the greatest perfection; they are not, as in Rome, mixed with the remains of an earlier paganism; nor as in Constantinople, which in architecture this city much resembles, altered by the introduction of the Moslem religion and rule. Of the once splendid palace of Theodoric nothing now remains but a single wall, adorned with marble pillars. The mausoleum of the Gothic monarch, about a mile outside of the town, is a round marble edifice, with a solid dome weighing more than 200 tons. On its flat summit the urn with the royal ashes is said to have lain. The building, now a church, has been split by lightning, and sunk some feet in the earth. But the most celebrated tomb in Ravenna is that of Dante, whose ashes, inclosed in a marble sarcophagus, lie in a small square building surmounted by a cupola, and ornamented not with very good taste. Near this spot is the house where Byron lived for more than two years. Among the palaces of the town, the most interesting is that of the archbishop, the chapel of which has been preserved untouched from the fifth century. The public library contains upwards of 40,000 volumes and 700 MSS.; among the latter, is a celebrated one of Aristophanes, and an illuminated one of Dante on vellum. The museum and the academy of fine arts are both rich in their respective objects. There are also various private collections of paintings, a theatre, and other establishments. The only manufacture carried on here is that of silk, and this only to a very small extent. The trade too is almost extinct. The origin of Ravenna is lost in obscurity; it is said to have been a Thessalian colony, but was afterwards given over to the Umbrians, who retained possession of it till it was conquered by the Romans. What time this took place does not appear; the name is not mentioned till the time of the civil wars, when it seems to have been a place of much importance. In the time of Augustus it stood on the coast, in the midst of marshes, and was built on piles, intersected by canals; so that it must then have resembled the modern Venice. That monarch, making Ravenna the station of his Adriatic fleet, formed a harbour called Portus Classis, about 3 miles to the south, and connected it with the Po by a canal which passed through the town. From this epoch the station of the Roman fleet continued to be here, and the city rose to a great degree of prosperity, especially as a military post. In 404 Honorius established his residence here, and it was under him and his successors the imperial city of the West. Besides its strong position, the fortifications with which it was defended secured Ravenna against the attacks of the Goths for a considerable time. Theodoric, king of the East Goths, overthrew in 489 Odoacer, who had established himself there after the fall of the Western Empire, and made Ravenna the capital of a new kingdom. Fifty years later, Belisarius compelled the surrender of the city; and his successor Narses obtained the government of Italy, under the title of Exarch of Ravenna. This exarchate lasted for 185 years, till in 754 the Lombards, under Astolphus, driving out Eutichius, the last exarch, made Ravenna the metropolis of their kingdom. But their designs against Rome brought upon them the armies of Pepin and Charlemagne, who re-conquered Ravenna, and gave it as a temporal possession to the Papal See. Many civil wars and tumults took place in the subsequent ages; and in 1441 the people placed themselves under the protection of Venice. In 1509 Ravenna was restored to the Pope, and made the capital of the Romagna, governed by his legates. Shortly after, a French army under Gaston de Foix invaded Italy, and encountered the Spanish and Papal troops near Ravenna. One of the most bloody engagements recorded in history took place; the French were victorious, but their brave commander fell in a desperate assault on the retreating foe. Ravenna was once more taken from the Pope by the French in 1790, but afterwards restored. Pop. about 18,000.

The delegation, bounded on the N. by that of Ferrara, E. by the Adriatic, S. by the delegation of Forli, and W. by that of Bologna and by Tuscany, has an area of 674 square miles. The country slopes towards the N. and E. from the Apennines and their branches in the interior; and along the coast is marshy and unhealthy, though the inland portions are fertile and salubrious. Salt, corn, hemp, flax, wine, and cattle are the chief products of the country. Pop. (1853) 175,994.

RAVENSBURG, a town of Wurtemberg, circle of the Danube, in the midst of vine-clad hills, on the Schussen, 22 miles E.N.E. of Constance. It has an antique appearance, and is encircled with embattled walls and towers of various form. From the Veitsburg, a height once occupied by a castle of the Guelph family, a magnificent view is obtained of the Lake of Constance and the Swiss Alps. The town contains a town-hall, many churches, convents, hospitals, &c. Manufactures of beer, silk, flax, worsted, paper, and other articles are carried on. The trade too is very extensive. Pop. 5500.

RAWITSCH, or RAWICZ, a town of Prussia, province and 55 miles S. of Posen. It is well built, and encircled with walls and ditches, and contains a handsome town-hall, Protestant and Roman Catholic churches, a gymnasium and other schools, a jail, &c. The manufactures consist of woollen and cotton cloth, leather, hats, and tobacco; and there are also spinning-mills. Some trade is carried on in corn and wool. Charles XII. of Sweden had his winter quarters here in 1704. Pop. 9532.

RAY, JOHN, a celebrated naturalist, was the son of Roger Ray, a blacksmith, and was born at Black Notley in Essex in 1628. He received the rudiments of learning at the grammar school of Braintree; and in 1644 was admitted into Catharine Hall, Cambridge, whence he afterwards removed to Trinity College in that university. He took the degree of Master of Arts, and became at length a senior fellow of the college. He was chosen Greek lecturer at the age of twenty-three, and two years later mathematical tutor to his college. His intense application to his studies having injured his health, he was obliged at his leisure hours to exercise himself by riding or walking in the fields, which led him to the study of plants. He noted from Johnson, Parkinson, and the *Phytologia Britannica*, the places where curious plants grew; and in 1658 he rode from Cambridge to the city of Chester, whence he proceeded to North Wales, visiting many places, and amongst others the famous hill of Snowdon, and returning by Shrewsbury and Gloucester. In 1660 he published his *Catalogus Plantarum circa Cantabrigiam nascentium*, and the same year he was ordained deacon and priest. In 1661 he accompanied Francis Willughby and others, in search of plants and other natural curiosities, to the north of England, and Scotland; and the next year he made a western tour from Chester, through Wales, to Cornwall, Devonshire, Dorsetshire, Hampshire, Wiltshire, and other counties. He afterwards travelled with Willughby and other gentlemen through Holland, Germany, Italy, France, and made several tours in England, and was admitted fellow of the Royal Society. In 1672 his friend Willughby died, in the thirty-seventh year of his age, at Middleton Hall, his seat in Warwickshire, to the great loss and grief of Ray himself, his friends, and all good men who knew him. As there existed the closest and most sincere friendship between Willughby and Ray from the time of their being fellow-students, Willughby not only confided in Ray in his lifetime, but also at his death; for he made him one of the executors of his will, and charged him with the education of his sons, Francis and Thomas, leaving him at the same time an annuity of L.60 per annum. The elder being not quite four years of age, Ray, as a faithful trustee, undertook their instruction, and for their use compiled his *Nomenclator Classicus*, which was published the same year. Francis, the elder, dying before he became of age, the younger became Lord Middleton. Not many months after the death of Willughby, Ray lost another of his best friends, Bishop Wilkins, whom he visited in London on the 18th of November 1672. In June 1673 Ray married a daughter of Mr Oakley of Launton in Oxfordshire. Towards the end of this year came forth his *Observations made in Foreign Countries*, to which was added his *Catalogus Stirpium in exteris Regionibus observatarum;* and about the same time appeared his *Collection of Unusual or Local English Words*, which he had made in his travels through the counties of England. After having published many books upon subjects foreign to his profession, and among which was his *Collection of Proverbs*, published in 1672, he at length resolved to appear in the character of divine. He published his excellent demonstration of the being and attributes of God, entitled *The Wisdom of God manifested in the Works of the Creation*, 1697, 8vo. The rudiments of this work were read in some college lectures; and another collection of the same kind he enlarged, and published under the title of *Three Physio-theological Discourses concerning the Chaos, Deluge, and Dissolution of the World*, 1692, in 8vo. Ray died in 1705. He was modest, affable, and communicative, and distinguished by his probity, charity, sobriety, and piety. He wrote a great number of works, the principal of which, besides those already mentioned, are:—

Catalogus Plantarum Angliæ; Dictionariolum Trilingue secundum locos communes; Historia Plantarum Species hactenus editas, aliasque insuper multus noviter inventas et descriptas complectens, 3 vols.; *Methodus Plantarum nova, cum Tabulis*, 8vo, and several other works on plants; *Synopsis Methodica Animalium Quadrupedum et Serpentini generis*, 8vo; *Synopsis Methodica Avium et Piscium; Historia Insectorum, opus posthumum; Methodus Insectarum; Philosophical Letters.*

Memorials of John Ray have been written by Dr Derham, by Sir J. E. Smith for Rees' *Cyclopædia*, and by Cuvier and Dupetit Thouars for the *Biog. Univ.* (See those biographies, collected and published for the "Ray Society" by Dr Edwin Lankester.)

RAYMOND of Sebonde (written also *Sabonde, Sabunde, Sebon, Sebond, Sebeyde, Sabiende*, and *Sebeide*), was born at Barcelona towards the close of the fourteenth century, professed philosophy, theology, and medicine, from 1430 to 1432, in the university of Toulouse, where he died in 1432. Dr C. L. Kleiber, who has recently examined the oldest MS. relating to Raymond at Paris, conjectures that it is Sabaedo in Spain that must be meant by the place so variously spelt in the different accounts given of him. There are a number of works ascribed to him; but the only one known in our day is the *Theologia Naturalis sive liber creaturarum*, written, according to some, in Spanish, but translated into French by Montaigne in 1569: into Latin at different times—Deventer, 1487; Strasburg, 1496; Nürnberg, 1502; Paris, 1509; Venice, 1581; Lyon, 1648. The author, who was the first to use the expression *Theologia Naturalis*, spent upwards of thirty years in the composition of this work. It was began in 1404, and finished 1436. (See *De Raimundi quem vocant Raymond Sabunde vita et scriptis*, by Dr C. L. Kleiber, 1856.)

RAYNAL, Guillaume Thomas François, better known as the *Abbé Raynal*, was born in the year 1711, and having received his education from the Jesuits, became one of their number. Amongst them Raynal acquired a taste for literature and science; but he was afterwards expelled on account of his impiety. Soon after this event he justified his expulsion by associating with Voltaire, D'Alembert, and Diderot, who employed him to furnish the articles on theology for the *Encyclopédie;* but having no relish, and probably as little qualification, for such work, he devolved it on the Abbé Yvon, whom Barruel allows to have been an inoffensive and upright man. The first work of Raynal is his *Political and Philosophical History of the European Settlements in the East and West Indies.* The style of this work is rambling but animated; it contains many just reflections both of a political and philosophical nature, intermixed, however, with much vague and declamatory speculation. It has been translated into every European language. This performance was followed by a small tract in the year 1780, entitled the *Revolution of America*, in which he pleaded the cause of the colonists with much zeal, censured the conduct of the British government, and discovered some acquaintance with the principles of the different factions; circumstances which induced a belief that he had been furnished with materials by those who knew the merits of the dispute much better than any foreigner could reasonably be supposed to do. The French government instituted a prosecution against him on account of his History of the East and West Indies; but with so little severity was it conducted, that sufficient time was allowed him to retire to the dominions of his Prussian majesty, by whom he was protected, notwithstanding he had treated the character of that sovereign with very little ceremony. At one period the British House of Commons showed him a very singular mark of respect. The speaker having been informed that Raynal was a spectator in the gallery, public business was instantly suspended, and the stranger was conducted to a more honourable situation. But when a friend of Dr Johnson's asked him, "Will you give me leave, doctor, to introduce to you the Abbé Raynal?" the stanch Tory turned on his heel, and said, "No, sir." A love of liberty was the principal trait in Raynal's character. In the month of May 1791 he addressed to the Constituent Assembly an eloquent and impressive letter, in which he proved that it was not the business of the assembly to abolish every ancient institution; that the genius of the French people is such that they never can be happy or prosperous except under a well-regulated monarchical government; and that, if they wished not the nation to fall under the worst kind of despotism, they would increase the power of the king.

Besides the works already mentioned, he was the author of a *Histoire du Staadthouderat*, Paris, 1784; *Histoire du Parlement d'Angleterre de Catherine d'Arragon*, 2 vols., 1750; *Histoire du Divorce Henri VIII.*, 1763; *Anecdotes littéraires, historiques, militaires, et politiques*, 3 vols., 1753. He was deprived of all his property during the Revolution, and died in poverty in the month of March 1796, in the eighty-fourth year of his age.

RAZZI, Giovanni Antonio, surnamed *Il Sodoma*, an eminent Italian painter, was born at Vercelli in Piedmont about 1474. He first became notable at Sieña as an artist of very eccentric conduct. Much of his attention was directed to horse-racing and other frivolous amusements. His house was turned into a menagerie for all sorts of animals. He prided himself in his whimsicalities, and gloried in the nickname of *mattaccio* (buffoon.) He even could not refrain from leaving traces of levity in some of his serious paintings. Yet Razzi had a fine genius, which in his calmer and more collected moods rose to some of the highest excellences in art. Speaking of some of his select works at Sieña, Annibale Caracci declared that "few such works were to be seen." There were "The Epiphany" in the church of S. Agostino, rivalling the style of Leonardo da Vinci; "The Scourging of Christ," in the cloister of S. Francesco, noted for the surpassing excellence of its figures; and "The Swoon of St Catherine of Sieña," in a chapel of S. Domenica, enthusiastically admired by Peruzzi. Razzi died in the great hospital at Sieña in 1554.

READING, a market-town, parliamentary and municipal borough of England, capital of Berkshire, on the Kennet, just above its confluence with the Thames, 36 miles W. by S. of London. It is irregularly built, but has been recently very much improved. The greater part of the town lies in the parish of St Lawrence, on the angle of land formed by the Kennet and Thames, and the principal business streets are in this quarter. To the west lies the parish of St Mary, occupied by many of the poorer people; and to the south that of St Giles, containing most of the best and newest streets. The houses are for the most part substantial, many of them handsome, and the streets broad and well paved. The church of St Lawrence is an edifice mostly in the later English style; but has some portions in the Norman style, in which it was originally built. In 1434 it seems to have been considerably repaired and altered. The tower at the west end is of chequered flint work, and has a peal of ten bells. A similar but not so handsome tower belongs to St Mary's church, which was built in 1550 out of the remains of a more ancient abbey. Besides the church of St Giles, two district churches, and a chapel of ease, there are Independent, Methodist, Quaker, and Roman Catholic churches in the town. The town-hall is a commodious modern structure, having in the lower part accommodation for the grammar school. The county jail and house of correction, after the model of that of Pentonville, occupies a costly edifice of a castellated form. A building, known by the name of the Oracle, for the employment of the poor in ribbon and silk weaving, erected in the seventeenth century by John Kendrick, exhibits a combination of the Grecian and Gothic architecture. Reading has also various almshouses, a dispensary, and an eye-infirmary. The educational establishments include a free grammar school, founded in 1556, and containing in 1851 thirty-five scholars; a blue-coat school, for forty boys; a green-coat school, for twenty-one girls; national, British, and infant schools, &c. A fine public hall affords accommodation to the literary society and mechanics' institute of Reading. For public amusement and recreation there is a theatre, a news-room, and baths. The town was formerly remarkable for its extensive manufactures of woollen goods. This branch of employment has, however, been abandoned, although there is still some industry in various other departments. Silk, ribbons, coarse linen, and sail-cloth are made; and there are also iron foundries, breweries, large building-yards, and establishments for making biscuits. The trade is considerable, and is facilitated by various means of communication with different parts of the country. The Kennet is navigable up to the town for vessels of 120 tons; the Kennet and Avon Canal opens up an intercourse with the large seaports, and the Great Western Railway passes close to the town, and has a station here. Corn, flour, hops, timber, seeds, wool, cheese, and beer are among the articles of trade. Markets are held on Wednesdays and Saturdays, and there are four yearly fairs. The borough is governed by a mayor, five other aldermen, and eighteen councillors; and it returns two members to the House of Commons. Assizes, quarter-sessions, and a county court are held here. The earliest historical notice of the place informs us that in 871 it was in the possession of the Danes, who, after resisting an assault of the West Saxons, were in the following year obliged to evacuate it. In 1006 they again made their appearance, and burned the town. During the civil war between Stephen and Maud, Reading and its castle were of some importance; but the castle seems to have been destroyed not long after. Several of the subsequent monarchs resided and held Parliaments in the town. In the civil war of the seventeenth century Reading was at different times in the possession of both parties, and suffered much during that contest. Among the celebrated men who have been natives of Reading are Archbishop Laud and Sir John Soane. Pop. (1851) 21,456.

Reading, a city in the United States of North America, capital of Berks county, Pennsylvania, on the left or east bank of the Schuylkill River, here crossed by two bridges, 52 miles E. from Harrisburg, and about the same distance N.W. from Philadelphia. It is a handsome town, compactly built, and intersected by straight, clean streets, crossing each other at right angles. It stands on a plain rising gradually from the river, and is inclosed on the east by an eminence called Penn's Mount. Among the most conspicuous public buildings are the court-house; the German Lutheran church, surmounted by a handsome steeple about 200 feet in height; and the German Reformed church, which has also a steeple 150 feet high. In addition to these, it has about twelve churches, an academy, two market houses, two banks, and several public libraries. Reading is a flourishing town, and carries on an active trade, being in point of population and manufactures the third in the state. It is connected with Philadelphia, Pottsville, and other places by railway, and is the centre of a rich and populous agricultural district. It is also largely engaged in the manufacture of iron, hats, shoes, and other articles. It was laid out by William and Richard Penn in 1748; incorporated as a borough in 1783, and as a city in 1847. Pop. (1840) 8410; (1850) 15,743; (1853) about 17,000.

REAL (*realis*), though always importing the existing, is used in various significations and oppositions:—1. As denoting the *thing* as contradistinguished from its *name*. 2. As expressing a *something* in contrast to a *nothing*. 3. As denoting *material* or external, in contrast to *spiritual* or internal. 4. As synonymous with *actual*, and thus as opposed either to the potential or to the possible. 5. As denoting *absolute* or irrespective, in opposition to *relative* or phenomenal existence. 6. As indicating existence as a *subsistence in nature*, as contradistinguished from existence taken as a *representation in thought*. 7. And lastly, a thing which *really* or in itself is one and indivisible, may nevertheless be *logically* and by the mind considered as diverse and plural, and *vice versa*. (For further illustration of the meaning of this word, see Hamilton's edition of Reid's *Works*, note B, p. 805.)

REAL, a Spanish coin of two sorts,—first, the *real of plate*, value about 4¾d.; and the *real of vellon*, worth about 2½d.

REALEJO, a seaport of Nicaragua, on a bay of the Pacific, 28 miles W.N.W. of Leon. The harbour is very good, and is sheltered by an island having two entrances. Safe anchorage is afforded for as many as 200 ships of the largest size. Mahogany and other timber, sugar, cotton, indigo, &c., are exported from the town. Pop. 5000.

REALISM. See Nominalism and Realism.

REASON (Gr. λόγος, Lat. *ratio*, Fr. *raison*, Ger. *vernunft*), is a word of very various signification. Passing by its employment in most languages for cause, motive, argument, principle of probation, or middle term of a syllogism, it is found employed by various philosophers, and often to a greater or less extent by the same philosopher, in the following *five* significations:—1. It has been used both in ancient and modern times to denote our intelligent nature generally. In this sense of the word it comprehends,—(*a.*) Conception, or simple apprehension (ἔννοια, νόησις τῶν ἀδιαιρέτων, *conceptus, conceptio, apprehensio simplex, das Begriefen*); (*b.*) Judgment (ἀπόφανις, *judicium*); (*c.*) Reasoning, or the Discursive faculty (διάνοια, λόγος, λογισμὸς, το συλλογίζεσθαι, *discursus, ratiocinatio*); (*d.*) Intellect, or intelligence proper, either as the intuition or as the place of principles (νοῦς, *intellectus, intelligentia, mens*). 2. In close connection with the preceding signification, from which perhaps it ought not to be separated, is that meaning in which it is used to characterize the legitimate employment of our faculties in general. 3. It has been employed to denote the third and fourth of the above-mentioned functions,—viz., the dianoetic and the noetic. 4. It has been very generally used for the third of the above special functions, reason and reasoning being thus confounded. 5. It signifies the noetic in contrast to the dianoetic faculties, and especially with Kant and his school, who divide reason (*vernunft*) exclusively and emphatically from understanding (*verstand*). This abusive use of the word, for the faculty of the unconditioned, determined its adoption in the philosophy of Fichte, Schelling, and Hegel. (See note A by Sir William Hamilton, in his edition of Dr Reid's *Works;* also the article METAPHYSICS.)

REATE (*Rieti*), an ancient city of the Sabines, was situated on the Velinus (*Velino*), about 48 miles from Rome. Its political importance was small. Although admitted to the Roman franchise along with the neighbouring towns in 290 B.C., it did not enjoy in the time of Cicero any higher privileges than those of a *præfectura*. The chief importance of Reate was derived from its connection with the Velinus. That river moved in a broad and placid stream through the level district on the N.W. side of the city. Its waters rested at intervals in a series of picturesque lakes, which they had formed for themselves along their course. Its ample flood plentifully moistened the soil, and created in the neighbouring meadows the fresh and blooming luxuriance of a garden. So charming, indeed, was the entire scene, that the valley was called by Cicero the *Reatine Tempe*, and the meads were commonly known by the name of the *Rosei Campi*. But this same river was also the cause of public calamity and strife. Its waters held in solution a large quantity of carbonate of lime, which settled down upon the bed in the shape of travertin. When this deposit was allowed to accumulate it checked the current, and the district of Reate was inundated. When it was cleared away the stream became too rapid, and, rushing over a precipice (the *Falls of Terni*) into the Nar, swelled that river until the fields of the neighbouring town of Interamna (*Terni*) were overflowed. Thus a dispute arose between the inhabitants of the two cities, which continued at intervals for many centuries. Cicero, as the patron of Reate, was one of the first who took part in it; and it did not end until in 1785 the evil was rectified by making the Velino join the Nar at an oblique angle.

REAUMUR, RENÉ ANTOINE FERCHAULT, *Sieur de*, distinguished for his laborious researches in natural science, was born at Rochelle, of a good family, in 1683. After having finished his early education in the place of his birth, he studied philosophy at Poictiers, and civil law at Bourges; but he soon relinquished the latter to apply himself to mathematics, physics, and natural history. Having come to Paris, he was received into the Academy of Sciences in 1708. From that hour he was wholly employed in natural history, to which his inclination particularly led him; and his inquiries were not confined to any one department of the subject. His memoirs, observations, and discoveries on the formation of shells, spiders, muscles, the marine flea, the berry which affords the purple dye, and on the numbing power of the torpedo, excited the curiosity of the public, and early announced him as an able, curious, and entertaining naturalist. The French were indebted to him for the discovery of the turquoise mines in Languedoc. He also found out a substance, now used to give false stones a colour, which is obtained from a certain fish called in the French *able* or *ablete*, on account of its whiteness, and which is the *bleak* or *blay* of our writers. His experiments on the art of turning iron into steel, not previously known in France, obtained him a pension of 12,000 livres; and this reward was to be continued to the Academy to support the expense which might accrue in this art. His work on that subject, which first brought him into general notice, was entitled *L'Art de Convertir le Fer Forgé en Acier, et l'Art d'Adoucir le Fer Fondú*, 4to, 1722. He continued his inquiries on the art of making tin and porcelain, and endeavoured to perfect the thermometers then in use. He composed a *Histoire des Rivières Aurifères de France*, and made curious and important observations on the nature of flints, on fossil shells (whence is obtained in Touraine an excellent manure for land), and likewise on birds and insects. He adopted the method for preserving eggs practised from time immemorial in Greece and the islands of the Archipelago, which is to steep or immerse them in oil or melted fat. Another experiment, still more important, made by Reaumur, was the introduction into France of the art of hatching fowls and birds, as practised in Egypt, without covering the eggs. The climate of France proved too severe, however, for carrying out this experiment with entire success. Active, sedulous, and attentive, he was early in his study, often at six in the morning. Exact in his experiments and observations, he let no circumstance escape him. In society he was distinguished through life for his modest and agreeable behaviour. His probity, benevolence, and goodness of heart endeared him to his countrymen. He died in the seventy-fifth year of his age, on the 18th of October 1757. His death was the consequence of a fall, which happened at the castle of Barnardière on the Maine, where he went to pass his vacation. He bequeathed to the Academy of Sciences his manuscripts and all his natural productions. His works consist of a very great number of memoirs and observations on different parts of natural history, printed in the collections of the Academy of Sciences; and a large work, printed separately in 6 vols. 4to, entitled *Memoirs pour servir à l'Histoire des Insectes*, 1734–42. (See Life of Reaumur by Cuvier, in the *Biographie Universelle.*)

REBEC, a three-stringed instrument, tuned in fifths, and played with a bow, similar to the violin. It was introduced by the Moors into Spain, where it seems to have been much used on festive occasions. Milton represents, in his *L'Allegro*, youth and maid dancing to "the jocund *rebeck's* sound;" and Byron, speaking of Seville, says that here "love's *rebec* sounds."

REBUS, an enigmatical representation of some name or thing, by using figures or pictures instead of words or parts of words. Camden mentions an instance of this kind of wit in a gallant who expressed his love to a woman named Rose Hill, by painting in the border of his gown a rose, a hill, an eye, a loaf, and a well; which, in the style of the rebus, reads "Rose Hill I love well." This kind of wit was long practised by the great, who took the pains to find devices for their names. It was, however, happily ridiculed by Ben Jonson in the humorous description of Abel Drugger's device in the *Alchemist*, by the *Spectator* in the device of Jack of Newberry. The origin of the word is ascribed to the priests of Picardy, who have an annual practice of satirizing their neighbours in ingenious squibs called "De *rebus* quæ geruntur." *Rebus*, in heraldry, is a coat of arms which bears an allusion to the name of the person; as three castles for Castleton, three cups for Butler, three conies for Coningsby; a kind of bearings which are of great antiquity.

RECANATI, a town of the Papal States, in the province of Macerata, on the Musone, near the Adriatic, 4 miles S.W. of Loretto, and 9 N.E. of Macerata. A small old town, it stands on a steep height, looking towards the distant Apennines, over an expanse of grassy meadows and rich corn-fields, with clumps of mulberry-trees, and winding streams. There are a cathedral and two other churches here, partially of Gothic architecture; several splendid palaces, and some convents. In the vicinity is a fine aqueduct, stretching from hill to hill over the country between Recanati and Loretto. Pop. 16,000.

RECITATIVO, or Recitative, in music, a kind of singing that differs but little from ordinary pronunciation; such as that in which the several parts of the liturgy are rehearsed in cathedrals, or that in which actors deliver themselves at the opera.

RECKONING. See Navigation, book i., c. x.

RECORDE, Robert, a physician and eminent mathematician, was descended of a respectable family at Tenby in Wales, and lived in the time of Henry VIII., Edward VI., and Mary of England. The time of his birth is not exactly known, but it must have been about the beginning of the sixteenth century; for he was entered of the university of Oxford about 1525, and was elected fellow of All-Souls College in 1531. As he made physic his profession, he went to Cambridge, where he was honoured with the degree of doctor in that faculty in 1545, and was very much esteemed for his extensive knowledge of many of the arts and sciences. He afterwards returned to Oxford, where he publicly taught arithmetic and mathematics, as he had done prior to his going to Cambridge. It appears that he afterwards went to London, and acted as physician to Edward VI. and to Queen Mary, to whom some of his books are dedicated. He wrote, the year he went to the capital, the *Urinal of Physic*, which passed through several editions. He died in the King's Bench prison, Southwark, where he was confined for debt in the year 1558.

He published several works upon mathematical subjects, chiefly in the form of dialogue between master and scholar. Of these the following is a list, viz.:—*The Pathway to Knowledge, containing the first principles of geometry, as they may moste aptly be applied unto practice, bothe for the use of Instrumentes Geometricall and Astronomicall, and also for projection of Plattes, much necessary for all sortes of men*, London, 1551, 4to; *The Ground of Arts, teaching the perfect worke and practice of Arithmeticke, both in whole numbers and fractions, after a more easie and exact forme then in former time hath been set furth*, 1552, 8vo; *The Castle of Knowledge, containing the Explication of the Sphere both Celestiall and Materiall, and divers other things incident thereto, with sundry pleasaunt proofes and certaine newe demonstrations not written before in any vulgare woorkes*, London, 1556, folio; *The Whetstone of Witte, which is the second part of Arithmetike, containing the extraction of rootes, the Cossike practice, with the rules of equation, and the woorkes of surde numbers*, London, 1557, 4to. Wood says that he was the author of several pieces on physic, anatomy, politics, and divinity; but they do not seem ever to have been published. Sherburne states that he also published *Cosmographiæ Isagoge;* that he wrote a book, *De Arte faciendi Horologium*, and another *De usu Globorum, et de statu Temporum*. Professor de Morgan says of him, in *The Companion to the British Almanac for* 1837, in his "Notices of English Mathematical and Astronomical Writers between the Norman Conquest and the year 1600," that he is a "man whose memory deserves a much larger portion of fame than it has met with, on several accounts."

RECORDER, is a person appointed by Her Majesty, by warrant under the sign-manual, as the chief judicial officer of a borough or city having a court of quarter-sessions. His salary is fixed by the council of the borough, and he holds his office during good behaviour. He is placed next in rank to the mayor, and is the sole judge of the court of quarter-sessions, and where there is such, of any court of record for the trial of civil actions. The mayor and recorder are respectively, *ex officio*, justices of the peace within the borough. The recorders were formerly chosen by the corporations.

RECORDS, Public, in the legal sense of the term, are contemporary statements of the proceedings in those courts of law which are courts of record, written upon rolls of parchment. In a popular sense, the name is given to all public documents preserved in a recognised repositary. There is no country in the world so rich as ours in stores of public records, in all branches of its government, whether constitutional, judicial, parliamentary, or fiscal. During the last sixty years upwards of a million of pounds sterling has been expended by the appointment of successive commissioners and parliamentary committees of inquiry on these records; and an act of Parliament was passed (1 and 2 Vict., c. 94), whereby a special agency was constituted for their proper custody. The agency thus specially appointed was the Master of the Rolls. The records of our earlier history are kept on rolls written on skins of parchment and vellum, from nine to fourteen inches wide, and about three feet in length. Sometimes these are attached together, bookwise, by the tops; sometimes they are sewed together consecutively. The earliest record written on paper is during the reign of Edward II. These documents are recorded in Norman-French, Latin, and English, which became the prevailing language of records in the reign of the second George. The public records are now being methodized, regulated, digested, and bound, besides being calendared and indexed. The task is a gigantic one; and if one may judge from a single specimen,—the Court of Common Pleas,—some 1200 miles of parchment, 9 inches wide, will require patiently to be read through, before any one can consult these important records with any degree of facility. By a recent regulation of the Master of the Rolls, literary inquirers are permitted to search for and make notes of records gratis, provided they can satisfy the deputy-keeper that their application is for a *bona fide* literary purpose. Besides the offices for modern records attached to each court, there are the following repositories in which different branches of the public records are to be found:—

The Tower, Thames Street; Chapter-House, Westminster Abbey; Rolls Chapel, Chancery Lane; Duchy of Lancaster, Lancaster Place, Strand; Duchy of Cornwall, Somerset House; Common Pleas, Carlton Ride and Whitehall Yard; Queen's Remembrancer's Records in Carlton Ride and Tower of Westminster Hall; Augmentation Office, Palace-Yard, Westminster; Pipe Office, Somerset House; Lord Treasurer's Remembrancer, Somerset House; Land Revenue, Carlton Ride; Pell-Office, 1 Whitehall Yard; Exchequer Pleas, 3 Whitehall Yard; First-Fruits Office, Temple.

The best works of general reference as to the subjects of the public records is the *Report of the Select Committee of* 1800.

RECTOR. See Parson.

RECURRING SERIES. See Algebra.

RECUSANTS, the name applied to those who refused to attend divine service on Sundays or holidays, according to the forms of the church established in England. The use of the term in temporal courts can be traced back as far as 1 Elizabeth, c. 2. The statutes against recusancy were fourfold: 1. Those who absented themselves from the church from indifference, irreligion, or dissent, were termed "recusants" simply; 2. After conviction, such persons were styled "recusants-convict;" 3. Those professing the Roman Catholic faith received the name of "Popish recusants;" and 4. Those who had been convicted of Popery in a law court were termed "Popish recusants-convict." Protestant dissenters were relieved from the penalties instituted against recusancy at the Revolution by the Toleration Act, 1 Will. and Mary, c. 18. The exemption in this act in favour of those denying the doctrine of the Trinity, was repealed in 1813 by 53 Geo. III., c. 160; and Roman Catholics were exempted from prosecution in 1791 and 1729, on the ground of their peculiar faith. The statutes against recusants, who not being Roman Catholics or Protestant dissenters, are still in force, though seldom insisted on.

RED. See CHROMATICS.

REDDITCH, a town of England, county of Worcester, on a hill near the borders of Warwickshire, 12 miles S.S.W. of Birmingham. It is a well-built, straggling place, containing places of worship belonging to the Established Church, the Methodists, Independents, and Roman Catholics; national schools, a literary and scientific institution, &c. Needles, fish-hooks, and similar articles are made in large quantities. There are, too, breweries, malt-houses, and brick-kilns. Pop. 4802.

REDEMPTION. See THEOLOGY.

REDON, a town of France, capital of an arrondissement in the department of Ille-et-Vilaine, at the foot of a hill on the Vilaine, 39 miles S.S.W. of Rennes. It is well built, and contains a fine Gothic church, formerly attached to an abbey, with a much-admired apse. The abbey buildings are now occupied by a college. Redon is favourably situated for commerce, as the Vilaine is navigable, and the two branches of the canal between Nantes and Brest unite here. Ship-building and the making of serge are carried on here; and there are large slate quarries in the vicinity. The chief articles of trade are,—colonial produce, slates, iron, lead, timber, pitch, tar, wine, brandy, butter, salt, hemp, flax, sail-cloth, leather, &c. Pop. (1856) 4847.

REDOUBT. See FORTIFICATION.

RED RIVER, one of the affluents of the Mississippi, from the west, is formed by the union of the Salt Fork and South Fork in Texas, about N. Lat. 34. and W. Long. 100. It flows at first eastward, separating between Texas and the Indian territory, till it enters the state of Arkansas. At the village of Fulton, in this state, it bends to the south, passes into Louisiana, and traverses that state in a S.E. direction, joining the Mississippi about 200 miles above New Orleans. Its whole length is estimated at 1200 miles, about 500 of which are regularly navigated by steamers. The name is characteristic; for the water is tinged with red, from the soil of the prairies through which it flows. About 530 miles above its confluence with the Mississippi the river is obstructed by what is called "the Great Raft." This is a vast accumulation of trees and drift-wood, conveyed down the stream and lodged here; so that the river, obstructed in its course, flows over the adjacent country, and forms many side channels and lakes. The impediment was cleared away by the government at great expense in 1834–5, but since that time it has again been formed.

REDRUTH, a market-town of England, county of Cornwall, on the brow of a hill, 8 miles W.S.W. of Truro, and 9 N.W. of Falmouth. The surrounding country, barren and covered with heaps of rubbish, presents no very delightful appearance to the eye, but is full of mineral riches, especially copper and tin. In the town, consisting mainly of one long street, are a town-hall, court-house, market-house, and fine granite clock-tower. The church, about half a mile off, was, with the exception of its Gothic tower, rebuilt in 1768. A chapel of ease in the pointed style, and places of worship for Baptists and Methodists, are among the ecclesiastical edifices of the place. National schools, a grammar school, a literary institution, reading-room, and small theatre, provide for the instruction and amusement of the inhabitants, who are chiefly employed in mining operations and iron-foundries. There is some trade in minerals; and railways connect the town with several seaports. Redruth is said by some antiquaries to be one of the oldest places in the kingdom; but this opinion has been called in question. Pop. (1851) 7095.

RED SEA, an extensive inland sea separating Arabia in Asia, from Abyssinia, Nubia, and Egypt, in Africa. It extends in a north north-westerly direction from the Straits of Bab-el-Mandeb, which connect it with the Indian Ocean, till it terminates in the two gulfs of Suez and Akaba, which inclose between them the mountain region of Sinai.

The name Red by which this sea is known in the present day is simply a translation of *Rubrum*, *Erythræum*, or 'Ερυθρὰ, terms by which it is designated in the works of the ancient classics. This last term, however, as used by Herodotus and some other writers, includes likewise the Persian Gulf and Indian Ocean; and when the Red Sea only is meant, the term *Arabicus Sinus* ('Αράβιος or 'Αραβικὸς κολπος) is used. How the name Red came to be applied to it is a question which neither ancients nor moderns have been able satisfactorily to solve. By some it is held to arise from the red and purple hues of the coral with which this sea abounds, or from the red colour which is occasionally imparted to it by numerous animalculæ floating near the surface; by others from the adjacent country of Edom, which, in the Phœnician and Hebrew tongues, means *red*; while Strabo, Pliny, Curtius, &c., consider it to be derived from a great king named Erythrus, who reigned over that country. It is not improbable that the name, as originally bestowed, was derived from that of the king or the country, and that, when afterwards adopted by the Greeks and Romans, they, mistaking a proper for a descriptive name, translated instead of adopting it. The Hebrew name, *Yam Suph* ("Weedy Sea"), which is also its Egyptian name, is supposed to be derived from the plant-like corals with which it abounds.

This sea lies between Lat. 12. 30. and 30. 2. N., and Long. 32. 38. and 43. 40. E., and has a length of above 1280 miles from the Straits of Bab-el-Mandeb to the town of Suez. Its greatest breadth is 192 miles, under the parallel of 17. N.,—that is, one-third up the sea, whence it narrows pretty uniformly towards both extremities, being 72 miles across at Ras-Mahommed, where it divides to form the gulfs of Suez and Akaba, and nearly of similar breadth at Gibbel Zugar, under the 14th parallel. Its entire circuit, measured round both gulfs, is about 4020 miles, its area 108,154 square miles, and its contents probably about 800,000 cubic miles. The Gulf of Suez, the longer and more western arm of this sea, has a length of 167 miles, and an average breadth of about 20. Its extreme breadth is under 30, and at its mouth it has a breadth of about 17 miles. Its depth, where greatest, is about 50 fathoms, and averages about 22. The port of Suez, from which it takes its name, is situated at the head of the gulf. (See SUEZ.) The area is estimated at 2000 square miles. The Gulf of Akaba, extending in a N.N.E. direction, has an area o[illegible] only about 800 square miles. It is 100 miles in length, 16 miles in breadth where widest, and 7 at the mouth. Its depth for two-thirds of its length is about 120 fathoms, and at one place a depth of 200 fathoms was reached without bottom. The mean depth is probably not less than 70 fathoms.

The Red Sea itself may be said to have generall[illegible] depth of more than 100 fathoms, and in one place 10[illegible] fathoms were sounded without finding bottom. A reef [illegible] shallow, running across from Mocha, in Lat. 13. 30., has been carefully sounded, and has an average depth of from 25 to 30 fathoms, its greatest depth being 40, near mid-channel. From this it again deepens to upwards of 125 fathoms as it approaches the straits. The entrance to the sea is divided by the small island of Perim into two channels, called the Great and Little Straits: the former, between the island and the coast of Africa, being 13 miles broad; the latter, between the island and Cape Bab-el-Mandeb, 1¾ miles. The Great Strait has an average depth of about 80 fathoms, and for a breadth of 6 miles in mid-channel it exceeds 100

The Little Strait has a depth of from 12 to 17 fathoms, and is the one that is almost always preferred by vessels entering the sea, having a fine sandy bottom and a depth of 30 feet of water up to both shores. The island of Perim has recently been taken possession of by the English. (See Perim.)

The islands of the Red Sea are numerous, but they are mostly all of small size, and occur chiefly along the shores. Off the western coast, not far from Massuah, is a numerous group called the Dhalak Archipelago, and not far from the opposite coast is a group called the Farsan Islands. South of these groups are several other islands, one of which, Gibel-Teer, in Lat. 15. 30., has an active volcano rising about 900 feet above the sea. A violent eruption took place in one of the Zugar islands, in Lat. 15., in 1846. Indeed, all the islands in the middle of the sea between 12. and 16. N. Lat. are volcanic. Coral reefs and islands are also numerous in this sea, and are very detrimental to navigation. The reefs most commonly extend in long strips parallel to, and generally about a quarter of a mile from, the shore. Their outer side rises from deep water; and their summits are seldom more than 4 or 5 feet from the surface. They are frequently united with the adjacent continent, so as to render the shores almost inaccessible; but in other cases the side towards the mainland has a gentle slope downwards, forming a channel of sufficient depth to admit of being navigated by small vessels. The Red Sea is the most northern portion of the ocean where coral reefs occur, and they are more numerous here than in any other part of equal extent.

From the position of the Red Sea, in a deep valley between the elevated table-land of Arabia on the E., and the high lands of Abyssinia, Nubia, and Egypt, on the W., the prevailing winds are in the direction of its length, either S.S.E. or N.N.W. The former commences in October and continues till May or June, blowing with considerable strength in February, but diminishing gradually as summer sets in, and occasionally ceasing almost altogether. In the lower part of the sea, being confined within comparatively narrow limits, it blows with considerable violence, and is stronger towards the Arabian than the Abyssinian shore; but it slackens as it passes the Harnish and Zugar islands, under the 14th parallel, where the sea begins to expand, and by the time that it gets as high as Jiddah, Lat. 21. 30., it is for the most part light and variable. From December to April southerly winds are occasionally experienced in the Gulf of Suez, sometimes freshening into a gale, and blowing for several days. The winds, however, from Suez to Jiddah are mostly northerly throughout the year, and occasionally blow with considerable violence. The N.N.W. winds prevail in the lower half of the Red Sea from June to October, blowing with considerable violence in June and July, and becoming light and variable in August and September. As the time of their extinction approaches, there are sometimes calms of several days, when the sea breezes become excessive. In those parts where, or at the times when, the regular winds are little felt, land and sea breezes prevail, particularly on the coast of Arabia. The fine season is usually from August to October; and showers, such as they are, are chiefly experienced from November to March.

The direction of the wind has a considerable effect in raising or lowering the surface of the sea, especially in the northern parts. Near Suez the direction of the wind makes a difference of about 4 feet in the depth of water. Little is yet known of the tides of the Red Sea: at Suez they are said to rise 5 feet at neap and 7 at spring tides; but of course this must depend very much upon the wind. It was long supposed that the Red Sea must be much salter than the general ocean, being situated in an almost rainless and riverless district, while the evaporation was very considerable. This, however, is found not to be the case; and hence it is supposed that there is a constant under-current of the denser and salter water through the straits to the Indian Ocean. The evaporation is estimated at about 8 feet annually over the entire surface; whereas the quantity of rain falling in the course of a year cannot exceed an inch. According to the measurements of the French engineers in 1799, the Red Sea at Suez was said to be 30 feet higher than the Mediterranean; but recent measurements have shown this to be a mistake, and that the height is only about 3 feet. Indeed, there is every reason to believe that the Red Sea at one time communicated with the Mediterranean. The distance between the two is only about 90 miles, and all the intervening space is of recent deposit, a considerable portion of it being still below the level of the two seas. It is proposed to construct a canal connecting the two seas, and thus materially to shorten our communication with the East. (See Suez.)

Round its entire circuit the Red Sea is walled in by immense masses of mountain, which, down to Jiddah, in Lat. 21. 30., approach close to the shore. On the African side, down to the 16th parallel, isolated hills alone skirt its borders, the higher ranges being 40 or 50 miles off; while on the opposite shore, between the same parallels, the land rises gently towards the interior of Arabia. Between the 16th and 12th parallels a range of volcanic hills runs nearly parallel to, and at the distance of above 14 miles from, the shore on the African side, and there is a similar range of greater magnitude and of the same character on the Arabian coast. The other rocks consist chiefly of nummulite limestone, forming part of that vast band which stretches from the Alps to the Himalayas. The immediate shore consists of a belt of sand and gravel sloping upwards from high-water mark to a distance varying from some hundred yards to many miles. It abounds with shells and corals identical with those in the sea itself, and is obviously an upheaved beach of comparatively modern date.

Within the last few years the commerce and navigation of the Red Sea have very much increased, and it is now regularly navigated by British steamers, as forming part of the overland route to India. During the year 1857 no fewer then 111 English steamers entered and left the port of Suez, having an aggregate burden of 144,500 tons, and 36,600 horse-power. They carried 10,156 passengers, 23,520 cases of letters, and 137,770 packages of merchandise or gold and silver, to the value of L.28,248,670. A considerable communication is kept up between the two shores by pilgrims from the eastern countries of Africa visiting Mecca and Medina. Grain and slaves are also largely transported from Africa to Arabia. The principal harbours on the Arabian side are Mocha, Hodeida, Locheia, and Jiddah; and on the African, besides Suez, Cosseir, Suakim, and Massuah. Mocha, Hodeida, and Locheia are the three ports of Yemen, and export coffee, wax, myrrh, gums, ivory, leather, and grain; receiving in return cotton goods, silks, draperies, iron, copper, lead, tools, tobacco, rice, and sugar. The aggregate value of the exports and imports is estimated at about L.730,000 annually. The first of these, Mocha, is now in a ruinous condition, having probably not more than 2000 inhabitants. The value of its exports does not exceed L.80,000, of which coffee constitutes about a fourth. Hodeida is now the principal place for the export of coffee, amounting in value to about L.200,000 annually, while its other exports amount only to about L.40,000. Locheia exports chiefly grain, the value of which may be about L.40,000 annually. Jiddah carries on a very considerable trade, and being the port of Mecca, it is the resort of numerous pilgrims from all parts. It is built along the shore in the form of a parallelogram, and contains about 4000 houses, with a resident population of about 20,000. Merchants assemble here; and goods are brought from Muscat, India, Singapore, Persia, Syria, Egypt, and Eastern Africa. The exports and imports together exceed a million sterling. The trade of Jiddah is almost entirely in the hands of Indian merchants, who are English subjects. There are very few European houses of commerce; but France and England have each a consul here. In June last (1858) the Mussulman population rose against the Christians, and massacred no less than forty-five of them, including the two consuls. Massuah, the principal *entrepot* of the trade of Abyssinia, stands on a low, sandy, and barren island, separated from the mainland by a channel about a quarter of a mile wide, which serves as its port. Its exports, which are estimated to exceed L.500,000 annually, consists chiefly of coffee, myrrh, incense, hides, gum, ivory, senna, slaves, and gold-dust; and its imports, of cotton and silk stuffs, red and blue cloths, matchlocks, rice, sugar, tea, lead, iron, copper, timber, &c. Cosseir derives its importance from being the granary of the barren Hedjaz. The export of cereals amounts to about L.25,500; and that of hides, tusks, &c., to about L.3000; while the imports are about L.17,500. The exports of Suakim amount to about L.51,000. The principal article is butter, which is consumed in incredible quantities on the Arabian coast. Among the other exports are slaves, salt, coffee, dates, gums, hides, cereals, ivory, gold, cattle, musk, and ostrich feathers. At present (May 1859) an electric telegraph is being laid down in the Red Sea.

The Red Sea is celebrated in sacred history as having been miraculously divided, and a passage opened up through it for the children of Israel in their journey from Egypt. The exact place of this miracle has been the subject of much controversy; but it is now generally agreed that it must have been at one or other of two places,—either in the neighbourhood of Suez, or 18 miles farther south, at the mouth of the Wady Tuârik. Which of these it was, would depend upon the route that they took on leaving Egypt; and if we can fix upon that with any degree of certainty, with the like certainty can we declare that the one or the other was the scene of the miracle. Egypt is connected with the Red Sea by two valleys, along one or other of which the Israelites must have travelled; the one terminating at Suez, the other at Wady Tuârik. The former and more northern of these has its entrance in the province of Esh-Shurkiyeh, near the ruins of the ancient Heroopolis; the latter in the neighbourhood of Cairo. According to Josephus, they must have taken the latter of these routes, for he says that they set out from Latopolis, near Cairo; but against him there is the authority of the Septuagint, which makes the departure to have been from the neighbourhood of Heroopolis. Goshen, too, is now generally agreed to have been in the present province of Esh-Shurkiyeh, which at this day is what Goshen was in ancient times, "the best of the land" of Egypt, and that portion of the country lying nearest to Canaan. The distance by the more southern of these routes is no less than 70 miles; and this of itself is a strong objection to any argument that may be advanced in its favour, as they accomplished the journey in three days, though encumbered with women and children and cattle; whereas the usual day's march of the best appointed armies, either in ancient or modern times, is not estimated higher than 14 English miles. Dr Robinson, after examining this route, says, "We were quite satisfied, from our own observation, that they could not have passed to the Red Sea from any point near Heliopolis or Cairo in three days, the longest interval which the language of the narrative allows. Both the distance and the want of water on all the routes are fatal to such an hypothesis." The distance by the northern route is only about 30 or 35 miles; and this they could have easily accomplished in three days. Some indeed hold that they set out by the northern passage, and afterwards took a road between two ranges of mountains, and thus entered the more southern valley; but in this way the journey would be at least as long as by the longer of the two routes.

We think, however, that a careful study of the recorded narrative itself is sufficient to settle the question as to the route. On the evening of the second day they were "encamped in Etham, in the edge of the wilderness," when God commanded them to "turn and encamp before Pi-hahiroth, between Migdol and the sea over against Baal-zephon." Now, in Numbers (xxxiii. 8) we are told that "they departed from before Pi-hahiroth, and passed through the midst of the sea into the wilderness, and went three days' journey into the wilderness of Etham." This wilderness of Etham must therefore have been on the eastern side of the Red Sea, and Etham itself in all probability was somewhere about the head of the sea. What more natural, then, than to suppose that the children of Israel, on setting out, had received no special directions as to their course, and had thus taken the usual and proper route to Sinai, intending to pass round the head of the sea and along its eastern side. On reaching Etham, however, they were commanded to "turn," and instead of continuing along the eastern side, to come down the western, and to encamp "between Migdol and the sea," God having thus intended to bring about their deliverance from the host of Pharaoh. The object of the miracle was thus not to open up a passage for the Israelites, but to deliver them from the Egyptians.

If we examine the sea itself, its evidence is almost equally strong in favour of the northern passage. At Wady Tuârik it is about 12 miles across, and it is difficult to suppose how a large body, of upwards of two millions, as the Israelites must have been, including women and children, with numerous flocks of cattle, could have passed over here in a single night. The depth also is about 180 or 200 feet; and we cannot suppose that even Pharaoh would have attempted to pass through twelve miles of a defile, with water piled up to that height on each side, especially with the terrible ten plagues still fresh in his memory. At Suez, where a tongue of land projects into the sea, it is only about 1150 yards across, but is of some depth. Above and below this, where it is wider, there are fords. Niebuhr crossed at one of these, above the town, at low tide, when the water only came up to about the knee. There is here, however, undoubted evidence of a gradual filling up going on. "The passage," says Niebuhr, "would have been naturally more difficult for the Israelites some thousands of years back, when the gulf was probably larger, deeper, and more extended towards the north; for, in all appearance, the water has retired, and the ground near this end has been raised by the sands of the neighbouring desert." Dr Robinson's testimony is to the same effect. He says,—"The sand from the northern part of the desert, driven by the strong north-east wind which often prevails, is continually carried towards and into the water; and the process of filling up is still going on." Though it is not improbable that the passage took place here, above Suez, we are rather inclined to think that it was effected at a point below that town. At a short distance below Suez there is at the present day a ford, which is sometimes crossed by the Arabs at low tides, the water being then about five feet deep. Shoals extend to some distance from either shore; but if we suppose, with Dr Robinson, that they crossed in an oblique direction, the distance from bank to bank would be from three to four miles. The depth of water may then have been greater here than it is at present; but even now, at high water, it is from ten to twelve feet. Naturally, if we may so speak, this place was peculiarly well adapted for the miracle. It is exactly the part of the sea most likely to be affected by the wind in the manner described. A strong north-east wind (as Dr Robinson supposes that it was, for in the indefinite phraseology of the Hebrew an east wind means any wind from the eastern quarter), supernaturally directed, might readily be supposed to dry up this ford, by coming down obliquely upon it, and driving away the waters to the south, at the same time that it was keeping back, within the tongue of land at Suez, the waters to the north of it. This, in fact, answers exactly to the account of the miracle as given by Moses; for he says that the "Lord caused the sea to go back by a strong east wind." The wind being thus the immediate agent in the miracle, we are naturally led to look for a place where it could have had some effect in bringing it about; and at no place, as we have seen, could it have acted so efficiently as at the ford below Suez. At Wady Tuârik, on the other hand, the depth is so great that it is impossible to suppose that the wind could have had any effect in dividing the waters; and had the miracle been wrought here, it is likely that Moses would have taken some other mode of describing it than by attributing to the wind what it manifestly could have had no power to bring about; besides, as one writer shrewdly remarks, the waters would not then have been said to form a wall, but a mountain. It is to be remembered too, that the Israelites were crossing from west to east; and how in the course of a single night, encumbered as they were, could they pass over 12 miles in the bottom of the sea with a strong east wind blowing directly against them. Indeed, those who maintain that the passage was effected at Wady Tuârik require the aid of some half-dozen miracles; whereas from Moses' account, we have no reason to infer that there were more than one.

There are some, however, who object to this view, that it reduces the miracle to the smallest possible dimensions; and as they cannot bring forward any arguments to support their opinions, they attempt to strengthen their cause by branding as rationalists and disbelievers all who differ from them. It is to be regretted that this mode of argument has been adopted by even those from whom it was little to be expected, and serves only to indicate the extreme weakness of their cause. A miracle is not the less a miracle because the means by which it is effected may seem small in our eyes. In this case the miracle consisted in the delivering of the children of Israel from the host of the Egyptians. The apparent insignificance of the means only manifests the more strikingly the power of God. If the simplicity and plainness of the sacred Scriptures be an argument for their inspiration, not less do we think is the simplicity of the miracles an argument that they were wrought by God. There were many more striking and signal ways in which He could have destroyed the Egyptians, and delivered the Israelites; but His workings are always simple and unostentatious. He ever chooses the smallest and most easy means for the accomplishment of even the greatest ends. Indeed so much is this the case, that if the claims of the two were otherwise equal, we should unhesitatingly declare in favour of the narrower, shallower, and easier passage. Those who attempt to magnify God's miracles, and fancy that in this way they are doing Him a service, would do well to remember that they are doing what neither He nor the inspired penmen have done before, and may well doubt whether they be not assuming an office which has not His sanction. The days of miracles are now past. God speaks not to us in the great and strong wind, rending the mountains and breaking in pieces the rocks, nor in the earthquake, nor in the fire, but in the still small voice of reason and conscience. It is wrong, then, to attempt to build upon the former that faith which can only have a sure foundation upon the latter.

RE-DUPLICATION of sounds in musical harmony. See the article MUSIC, under section *Harmony*.

REE, LOUGH, a lake of Ireland, formed by an expansion of the Shannon, lying between the counties of Longford and Westmeath on the E., and that of Roscommon on the W.: length, from N. to S., about 15 miles; greatest breadth, 8; area, 42 square miles; extreme depth, 75 feet. Its shores are irregular in outline, but extremely beautiful in scenery; and the few islands which the lake contains also possess many attractions. Besides the Shannon, Lough Ree receives the Inny from the east.

REEFS, CORAL. See PHYSICAL GEOGRAPHY, § 86.

REES, ABRAHAM, a very learned dissenting divine, was born in 1743 at Llanbrynmair in Wales, and studied for the ministry at Hoxton academy. As his mind developed, it became eminently and keenly practical. He was eager to seize and ready to employ any knowledge that might be turned to immediate advantage. There was scarcely an office within the sphere of his profession for which he had not qualified himself, and to which he was not willing to apply all his energies. For a considerable period he was both mathematical tutor at Hoxton academy and pastor of the Presbyterian congregation, St Thomas's, Southwark. His activity only extended itself when, in 1783, he was translated to the congregation of Jewin Street, in the Old Jewry. Every subject that had any reference to the cause of public enlightenment received part of his attention. He kept up his acquaintance with the general learning of the day. He delivered occasional lectures at Salters' Hall in the winter evenings; became a leading business-man among the Nonconformists of the capital; and took an active part in every scheme of philanthropy. His literary labours at the same time were not neglected. Many of his sermons issued at intervals from the press. Several contributions from his pen found their way into the *Monthly Review*. *Chambers's Encyclopædia* appeared under his editorship between 1781 and 1786. At length his own *Cyclopædia* began to be published in 1802, and was completed in forty-five quarto volumes in 1819. In consideration of all these great and multifarious labours, Rees was held in high estimation. At his death in 1825 he was D.D. of the university of Edinburgh, and a member of the Royal Society, and of several other learned bodies.

REETH, a market-town of England, in the North Riding of Yorkshire, on the left bank of the Swale, 53 miles N.W. of York. It contains various dissenting churches and two endowed schools. Lead is obtained in the vicinity. Besides weekly markets, several annual fairs are held here. Pop. (1851) 1344.

REEVE, CLARA, the authoress of *The Old English Baron*, was the daughter of the Rev. William Reeve, rector of Freston and of Kerton in Suffolk, and perpetual curate of St Nicholas, and was born at Ipswich in 1723. Her father was "an old Whig," and from him she learned all that she knew: he was her oracle, and used to make her read the parliamentary debates while he smoked his pipe after supper. Under the same paternal tuition, she also read Rapin's *History of England*, Cato's *Letters*, the Greek and Roman histories, and Plutarch's *Lives*, at an age when few people of either sex can read their own names. She first became an authoress by translating from the original Latin Barclay's fine old romance of Argenis, which was published in 1762, under the title of *The Phœnix*. It was not, however, until 1767 that she produced her *Champion of Virtue*, afterwards called *The Old English Baron*, a work written after the manner of the *Castle of Otranto*, by Horace Walpole. This production is inscribed to Mrs Brigden, the daughter of Richardson, who is stated to have lent some assistance in the revision and correction of the work. The success of *The Old English Baron* encouraged

Miss Reeve to devote more of her leisure hours to literary composition, and accordingly she published in succession *The Two Mentors*, *The Progress of Romance*, *The Exile*, *The School for Widows*, *Plans of Education*, and *Memoirs of Sir Roger de Clarendon*, a natural son of the Black Prince, with *Anecdotes* of many other eminent persons of the fourteenth century. The various novels produced by this lady are all marked by excellent good sense, pure morality, and a considerable command of those qualities requisite to constitute a good romance. They were, generally speaking, favourably received at the time; but none of them took the same strong possession of the public mind as *The Old English Baron*, upon which the fame of the author may be considered as now exclusively rested, and by which alone she will be known to posterity. She died at Ipswich in December 1808, in her seventy-fifth year. (For an estimate of her works, see Romance.)

REFLECTION OF LIGHT. See Optics.

REFORM, Parliamentary. See Parliament.

Reformation begun by Luther.

REFORMATION is, in general, the act of reforming or correcting an error or abuse in religion, discipline, or the like. The word is used, by way of eminence, for that great reformation in the corrupted system of Christianity commenced by Luther in the year 1517. By some it is pretended that the only motive which Luther had in beginning the Reformation was his enmity to the Dominicans, who had excluded his order, the Augustinians, from all share in the gainful traffic of indulgences. But this does not seem at all probable, for such a motive would not naturally lead him to deny the virtue of indulgences, whilst his conduct could not but exclude him for ever from any chance of a share in the traffic, which otherwise he might perhaps have obtained. Besides, this traffic was so contrary to the common principles of reason and honesty, that we cannot wonder at finding one man in the world who had sense enough to discern it, and courage enough to oppose such a disgraceful practice. In all probability, however, the imagined insignificance of the first Reformer was the reason why he was not persecuted and exterminated at the very outset, as others had been before him. Another reason probably was, that he did not at once attack the whole errors of Popery, but brought about his reformation gradually, probably as it occurred to himself.

Zuinglius in Switzerland.

The Reformation commenced in the city of Wittenberg in Saxony, but was not long confined either to that city or to the province in which it is situated. In 1520 the Franciscan friars, who had the care of promulgating indulgences in Switzerland, were opposed by Zuinglius, a man not inferior in understanding and knowledge to Luther himself. He proceeded with the greatest vigour to overturn the whole fabric of Popery; but his opinions were declared to be erroneous by the universities of Cologne and Louvain. Notwithstanding this, the magistrates of Zurich approved of his proceedings; and the whole of that canton, together with those of Berne, Basle, and Schaffhausen, embraced his opinions.

Reformation opposed in Germany.

In Germany, Luther continued to make great advances, without being in the least intimidated by the ecclesiastical censures which were thundered against him from all quarters. Continually protected by the German princes, either from religious or political motives, his adversaries could not accomplish his destruction as they had done that of others. Those princes who were upon bad terms with the court of Rome took advantage of the success of the new doctrines, and in their own dominions easily overturned a church which had lost all respect and veneration amongst the inferior ranks. The court of Rome had disobliged some of the smaller princes in the north of Germany, whom the Pope probably thought too insignificant to be worth managing; and they, in revenge, universally established the Reformation in their own dominions. Melancthon, Carlstadt, and other men of eminence, also greatly forwarded the work of Luther; and in all probability the papal hierarchy would have soon come to an end, in the northern parts of Europe at least, had not the Emperor Charles V. given a severe check to the progress of the Reformation in Germany. In order to follow out the schemes dictated by his ambition, he thought it necessary to ingratiate himself with the Pope; and the most effectual method of doing this seemed to be by the destruction of Luther. The Pope's legates insisted that Luther ought to be condemned by the Diet of Worms as a most notorious, avowed, and incorrigible heretic. This, however, appeared unjust to the members of the Diet, and he was summoned to appear personally, which he accordingly did without hesitation. There is not the least doubt that his appearance there would have been his last in this world, if the astonishing respect that was paid him, and the crowds who came daily to see him, had not deterred his judges from employing summary means against the author of such a heresy. He was therefore permitted to depart with a safe-conduct for a certain time; after which he remained in the state of a proscribed or intercommuned criminal, to whom it was unlawful to perform any of the ordinary offices of humanity.

Form of worship first altered at Wittenberg.

During the confinement of Luther in a castle near Wartburg the Reformation advanced rapidly, almost every city in Saxony embracing the Lutheran opinions. At this time an alteration in the established forms of worship was first adventured upon at Wittenberg, by abolishing the celebration of private masses, and giving the cup as well as the bread to the laity in the Lord's Supper. In a short time, however, the new opinions were condemned by the university of Paris, and a refutation of them was attempted by Henry VIII. of England. But Luther was not to be thus intimidated. He published his animadversions on both with as much acrimony as if he had been refuting the meanest adversary; and a controversy conducted by such illustrious antagonists attracted general attention, the Reformers daily gaining new converts both in France and Germany. (See Luther).

Disputes and divisions.

But whilst the efforts of Luther were thus everywhere crowned with success, the divisions began to prevail which have since so much agitated the Reformed churches. The first dispute occurred between Luther and Zuinglius concerning the manner in which the body and blood of Christ were present in the Eucharist. Luther and his followers, although they had rejected the notion of transubstantiation, were nevertheless of opinion that the body and blood of Christ were really present in the Lord's Supper in a way which they could not pretend to explain. Carlstadt, who was Luther's colleague, first suggested another view of the subject, which was afterwards confirmed and illustrated by Zuinglius, namely, that the body and blood of Christ were not really present in the Eucharist; and that the bread and wine were no more than external symbols to excite the remembrance of Christ's sufferings in the minds of those who received them. Both parties maintained their tenets with the utmost obstinacy, and, by their divisions, first gave their adversaries an argument against them, which to this day the Catholics urge with great force; alleging that the Protestants are so divided that it is impossible to know who is right or who is wrong; and arguing from these divisions, that the whole doctrine is false.

Civil war in Germany.

To these intestine divisions were added the horrors of a civil war, occasioned by oppression on the one hand, and by enthusiasm on the other. In 1525 a great number of seditious fanatics arose on a sudden in different parts of Germany; and having taken arms, they united their forces, and made war against the empire, laying waste the country with fire and sword, and committing everywhere the most barbarous cruelties. The greater part of this furious mob was composed of peasants and vassals, who groaned under heavy burdens, and declared that they were no longer able to bear the despotic government of their chiefs; and hence this sedition received the name of the War of the Peasants. At first this rabble declared that they had no other motives than the redress of their grievances; but no sooner had Munzer the Anabaptist placed himself at their head, than the face of things was entirely changed, and the civil commotions in Saxony and Thuringia rapidly increased. (See the article ANABAPTISTS; also Ranke's *History of the Reformation*, vol. ii., English edition, 1845; and Mrs Sinnett's *Bye-ways of History*, 1847.

Reformation established in Saxony.

In the meantime Frederick, Elector of Saxony, and Luther's great patron, died, and was succeeded by his brother John. Frederick, though he had protected and encouraged Luther, yet was at no pains to introduce the reformed religion into his dominions. But with his successor it proved otherwise; for he, being convinced that Luther's doctrine must soon be totally destroyed and suppressed unless it received a speedy and effectual support, ordered Luther and Melancthon to draw up a body of laws relating to the form of ecclesiastical government, the method of public worship, and other necessary matters, which were to be proclaimed by heralds throughout his dominions. This example was followed by all the princes and states of Germany who had renounced the papal supremacy; and a similar form of worship, discipline, and government was thus introduced into all the churches which had dissented from that of Rome. This open renunciation of the ancient ecclesiastical jurisdiction changed the face of affairs; and the patrons of Popery intimated, in a manner not at all ambiguous, that they intended to make war upon the Lutheran party. On the other hand, the Lutherans, apprised of these hostile intentions, began to deliberate on a proper plan of defence against the attack with which they were threatened.

Resolutions of the Diet of Spires.

The Diet of the empire assembled in the year 1526 at Spires, where the emperor's ambassadors were desired to use their utmost endeavours to suppress all disputes about religion, and to insist upon the rigorous execution of the sentence which had been pronounced against Luther and his followers at Worms. The greater part of the German princes, however, opposed this motion with the utmost resolution, declaring that they could neither execute the sentence, nor come to any determination with regard to the doctrines by which it had been occasioned, before the whole matter had been submitted to the decision of a council lawfully assembled; and further alleging that the decision of controversies of this nature belonged properly to a general council, and to it alone. This opinion, after long and warm debates, was adopted by a majority, and was at length consented to by the whole assembly. It was unanimously agreed to present a solemn address to the emperor, entreating him to assemble a general council without delay; whilst in the meantime it was also agreed that the princes of the empire should, in their respective dominions, be at liberty to manage ecclesiastical affairs in the manner they should think most proper, yet so as to be able to give to God and the emperor a proper account of their administration whenever it should be required of them.

These resolutions proved exceedingly favourable to the cause of reformation. Neither had the emperor for some time any leisure to give disturbance to the Reformed. The war which about this time ensued between him and the Pope gave the greatest advantage to the friends of reform, and considerably augmented their number. Several princes, whom the fear of persecution and punishment had hitherto prevented from lending their assistance, publicly renounced the Catholic religion, and introduced among their subjects the same forms of religious worship, and the same system of doctrine, which had been received in Saxony. Others, though placed in such circumstances as discouraged them from acting in an open manner against the interests of the Roman Pontiff, were, however, far from discovering the smallest opposition to those who withdrew the people from his despotic yoke; nor did they molest the private assemblies of those who had separated themselves from the communion of Rome. And in general all the Germans who, before these resolutions of the Diet of Spires, had rejected the papal discipline and doctrine, were now, in consequence of the liberty they enjoyed, wholly employed in bringing their schemes and plans to a certain degree of consistence, and in adding vigour and firmness to the cause in which they were engaged.

Revoked by the emperor.

But this tranquillity and liberty were not of long duration. In the year 1529 a new Diet was assembled at the same place by the emperor, after he had quieted the troubles in various parts of his dominions, and concluded a peace with the Pope. The power which had been granted to princes, of managing ecclesiastical affairs until the meeting of a general council, was now revoked by a majority of votes; and every change declared unlawful that should be introduced into the doctrine, discipline, or worship of the established religion, before the determination of the approaching council was known. This decree was considered as iniquitous and intolerable by the Elector of Saxony, the Landgrave of Hesse, and other members of the Diet, who were persuaded of the necessity of a reformation. The promise of speedily assembling a general council they looked upon as an artifice of the Church of Rome, conceiving that a free and lawful council would be the last thing to which the Pope would consent.

Origin of the name *Protestants.*

When, therefore, they found that all their arguments and remonstrances made no impression upon Ferdinand, the emperor's brother, who presided in the Diet, Charles himself being then at Barcelona, they entered a solemn protest against this decree on the 19th of April, and appealed to the emperor and a future council. Hence arose the denomination of *Protestants*, which from this period has been given to those who separated from the communion of the Church of Rome. The princes of the empire who entered this protest were, John, Elector of Saxony; George, Elector of Brandenburg; Ernest and Francis, dukes of Lunenberg; the Landgrave Philip of Hesse; and Wolfgang, Prince of Anhalt; and they were seconded by fourteen imperial towns, viz., Strasburg, Ulm, Nuremberg, Constance, Reutlingen, Windsheim, Memmingen, Nordlingen, Lindau, Isny, Kempten, Heilbron, Wissenburg, and St Gall. (See Walch's *Dis. Histor. de Liberis Imperii Civitatibus*, Gött. 1755.)

The dissenting princes, who were, besides, the protectors and heads of the Reformed churches, had no sooner entered their protest, than they sent proper persons to the emperor, who was then upon his passage from Spain to Italy, to acquaint him with their proceedings in this matter. The ministers employed in this commission executed it with the greatest intrepidity and presence of mind; but the emperor, exasperated at the audacity of those who presumed to differ from him, caused the ambassadors to be arrested. The news of this violent step made the Protestant princes conclude that their personal safety and the success of their cause depended entirely upon their own courage and union. They therefore determined to enter into a solemn confederacy; and for this purpose they held several meetings at Rothach, Nuremberg, Smalcald, and other places; but so different were their opinions and views that for a time they could determine upon nothing. (See Salig's *Hist. of the Augs. Confession*, vol. i., book ii., c. i.)

Conference between Luther and Zuinglius.

One great obstacle to the intended confederacy was the dispute which had arisen between Luther and Zuinglius concerning the real presence of Christ in the Lord's Supper. To terminate this dispute if possible, Philip, Landgrave of Hesse, in the year 1529, invited Luther and Zuinglius to a conference at Marpurg, together with several other of the more eminent doctors who adhered to the respective parties of these contending chiefs. But this measure was not attended with the salutary effects which were expected from it. The divines disputed for four days in presence of the landgrave. Luther attacked Œcolampadius, and Zuinglius was attacked by Melancthon. Zuinglius was accused of heresy, not only on account of his explanation of the nature and design of the Lord's Supper, but also in consequence of the false notions which he was supposed to have adopted concerning the divinity of Christ, the efficacy of the Divine Word, original sin, and some other parts of the Christian doctrine. This illustrious Reformer, however, cleared himself from the greater part of these charges with the most triumphant evidence, and in such a manner as appeared satisfactory even to Luther himself. But their dissension concerning the manner of Christ's presence in the Eucharist still remained; nor could either of the contending parties be persuaded to abandon, or even to modify, their opinions upon that matter. The only advantage, therefore, which resulted from the meeting was, that the jarring doctors formed a kind of truce, by agreeing to a mutual toleration of their sentiments, and leaving to the disposal of Providence the cure of their divisions. (See Hospinian's *Historia Sacramentaria*, part ii.)

The Confession of Augsburg.

In the meantime, news were received that the emperor designed to come into Germany, with a view to terminate all religious differences at the approaching Diet of Augsburg. Having foreseen some of the consequences of those disputes, and, besides, having taken the opinion of men of wisdom, sagacity, and experience, he became gradually more cool in his proceedings, and more impartial in his opinions respecting the contending parties and the merits of the cause. He, therefore, in an interview with the Pope at Bologna, insisted, in the most serious and urgent manner, on the necessity of a general council. His remonstrances and expostulations, however, could not move the Pontiff, who maintained with zeal the papal prerogatives; reproached the emperor with an ill-judged clemency; and alleged that it was the duty of that prince to support the church, and to execute speedy vengeance upon that obstinate and heretical faction who had dared to call in question the authority of Rome. To this discourse the emperor paid no regard, looking upon it as a most iniquitous thing, and a measure directly opposed to the laws of the empire, to condemn unheard so many men who had always approved themselves good citizens, and in other respects deserved well of their country.

Hitherto indeed it was not easy for the emperor to form a clear idea of the matters in debate, since no regular system had as yet been composed by which it might be known with certainty what were the true causes of Luther's opposition to the Pope. The Elector of Saxony, therefore, ordered Luther and other eminent divines to commit to writing the chief articles of their religious system, and the principal points in which they differed from the Church of Rome. Luther, in compliance with this order, delivered to the elector at Torgau seventeen articles which had been agreed upon in a conference at Schwabach in 1529; and hence these received the name of the Articles of Torgau. But though these were deemed by Luther a sufficient declaration of the sentiments of the Reformers, yet it was judged proper to enlarge them, in order to give perspicuity to their arguments and strength to their cause. In this work Melancthon was employed; but in it he showed much deference to the counsels of Luther, expressing his sentiments and doctrine with the greatest elegance and perspicuity, and thus came forth the famous Confession of Augsburg. (See on the whole of this period Merle d'Aubigné's *History of the Reformation*; also Ranke's *History of the Reformation*, vol. iii., on the Diet and Confession of Augsburg. The Confession itself may be seen in Walch, Tittmann, or Hase's Collection of the Symbolical Books of the Prussian Church. The reader may likewise consult with profit the Histories of Scott and Waddington on both the Diet and the Confession.)

This Confession presented to the emperor.

On the 15th of June 1830, Charles arrived at Augsburg, and the Diet was opened five days afterwards. The Protestants received a formal permission to present an account of their tenets to the Diet on the 25th of the same month; and in consequence of this, at the time appointed, Christian Bayer, chancellor of Saxony, read aloud, in the German language, before the emperor and princes assembled, the Confession of Augsburg above mentioned. It contained twenty-eight chapters, of which twenty-one were employed in representing the religious opinions of the Protestants, and the other seven in pointing out the errors and superstitions of the Church of Rome. The princes heard it with the deepest attention. It confirmed some in the principles which they had embraced; it surprised others who had not given much consideration to the subject; and many who before this time had little or no idea of the religious sentiments of Luther, were now not only convinced of their innocence, but delighted with their purity and simplicity. The copies of this Confession, after being read, were delivered to the emperor, being signed by John, Elector of Saxony; George, Marquis of Brandenburg; Ernest, Duke of Lunenburg; Philip, Landgrave of Hesse; Wolfgang, Prince of Anhalt; and by the imperial cities of Nuremberg and Reutlingen.

Attempted refutation of this Confession.

The creatures of the Church of Rome who were present at this Diet employed John Faber, afterwards bishop of Vienna, together with Eck and Cochlæus, to draw up a refutation of the Protestant Confession; and this having been publicly read, the emperor required the Protestant members to acquiesce in it, and put an end to the religious disputes by an unlimited submission to the opinions and doctrines contained in this answer. But this demand was far from being complied with. The Protestants, on the contrary, declared that they were by no means satisfied with the reply of their adversaries, and earnestly desired a copy of it, that they might more fully demonstrate its extreme insufficiency and weakness. But this reasonable request was refused by the emperor, who interposed his supreme authority to prevent any further proceedings in this matter, and solemnly prohibited the publication of any new writings or declarations which might contribute to protract these religious debates. This, however, did not reduce the Protestants to silence. The divines of that communion who had been present at the Diet endeavoured to recollect the arguments and objections employed by Faber, and had again recourse to the pen of Melancthon, who refuted them in an ample and satisfactory manner, in a piece which was presented to the emperor on the 22d of September, but which Charles refused to receive. This answer was afterwards enlarged by Melancthon, when he had obtained a copy of Faber's reply; and was published in the year 1531, with the other pieces that related to the doctrine and discipline of the Lutheran Church, under the title of *Apology for the Confession of Augsburg*.

Severe decree against the Pro testants

Matters now began to draw towards a crisis. There were only three ways of bringing to a conclusion these religious differences: *First*, To grant the Protestants a toleration and privilege of serving God as they thought proper; *secondly*, To compel them to return to the Church of Rome by the violent methods of persecution; or, *thirdly*, That a reconciliation should be made upon fair, and candid, and equitable terms, by engaging each of the parties to temper their zeal with moderation, to abate reciprocally the rigour of their pretensions, and to remit something of their respective claims. The third expedient was most generally approved of, being peculiarly agreeable to all who had at heart the welfare of the empire; nor did even the Pope seem to look upon it with aversion or contempt. Various conferences, therefore, were held between persons eminent for piety and learning upon both sides; and nothing was omitted which might have the least tendency to calm the animosities and heal the divisions which reigned between the contending parties. But the differences were too great to admit of a reconciliation; and therefore the votaries of Rome had recourse to the powerful arguments of imperial edicts and the force of the secular arm. On the 19th of November a severe decree was issued by order of the emperor, in which everything was manifestly adapted to deject the friends of religious liberty, excepting only a faint and dubious promise of engaging the Pope to assemble a general council about six months after the separation of the Diet. In this decree the dignity and excellence of the Catholic religion were extolled beyond measure; a new decree of severity and force was added to that which had been published at Worms against Luther and his adherents; the changes which had been introduced into the doctrine and discipline of the Protestant churches were severely censured; and a solemn order was addressed to the princes, cities and states, who had thrown off the papal yoke to return to their allegiance to Rome, on pain of incurring the indignation and vengeance of the emperor, as the patron and protector of the church.

The league of Smalcald.

Of this formidable decree the Elector of Saxony and the confederated princes were no sooner informed than they assembled in order to deliberate on the measures proper to be taken in such an emergency. In the years 1530 and 1531 they met, first at Smalcald, and afterwards at Frankfort, where they formed a solemn alliance and confederacy, with the intention of defending vigorously their religion and liberties against the dangers and encroachments with which they were threatened by the Edict of Augsburg, without attempting, however, anything offensive against the votaries of Rome; they invited the kings of England, France, and Denmark to join this confederacy, leaving no means unemployed that might strengthen and cement so important an alliance. (See Ranke's *History of the Reformation*, vol. iii., translated by Mrs Austin.)

Invitation to Henry VIII. of England.

This confederacy was at first opposed by Luther, from an apprehension of the calamities and troubles which it might produce; but at last, perceiving the necessity of concert, he consented, though he uncharitably, as well as imprudently, refused to comprehend in it the followers of Zuinglius amongst the Swiss, as well as the German states and cities which had adopted the sentiments and confession of Bucer. In the invitation addressed to Henry VIII. of England, whom the confederate princes were willing to declare the head and protector of their league, the following things, amongst others, were expressly stipulated:—That the king should encourage, promote, and maintain the true doctrine of Christ as it was contained in the Confession of Augsburg, and defend the same at the next general council; that he should not agree to any council summoned by the Bishop of Rome, but protest against it, and neither submit to its decrees nor suffer them to be respected in his dominions; that he should never allow the Roman Pontiff to have any pre-eminence or jurisdiction in his dominions, and should advance 100,000 crowns for the use of the confederacy, engaging to double the sum if necessary,—all which articles the confederate princes were equally obliged to observe upon their part. To these demands the king replied that he would maintain and promote the true doctrine of Christ; but, at the same time, as the true ground of that doctrine lay only in the Holy Scriptures, he would not accept at any one's hand what should be his own faith or that of his kingdom; and therefore desired that they would send over two learned men to confer with him, in order to promote a religious union between him and the confederates. He, however, declared himself of their opinion with regard to the meeting of a free general council, and promised to join with them in all such councils for the defence of the true doctrine; but he thought the regulation of the ceremonial part of religion, being comparatively a matter of indifference, should be left to the choice of each sovereign for his own dominions. Subsequently the king gave them a second and more satisfactory answer; but after the execution of Ann Boleyn this negotiation came to nothing. On the one hand, the king grew cold when he perceived that the confederates were no longer of use to him in supporting the validity of his marriage; and, on the other, the German princes became sensible that they could never succeed with Henry unless they allowed him an absolute dictatorship in matters of religion. (See Froude's *History of England.*)

Peace of Nuremberg.

Whilst everything thus tended to an open war between the opposite parties, the Elector Palatine and the Elector of Mentz offered their mediation, and endeavoured to bring about a reconciliation. The emperor himself, for various reasons, was at this time inclined to peace; for, on the one hand, he stood in need of succours against the Turks, which the Protestant princes refused to grant as long as the Edicts of Worms and Augsburg remained in force; and, on the other, the election of his brother Ferdinand to the dignity of king of the Romans, which had been carried by a majority of votes at the Diet of Cologne in 1531, was by the same princes contested as being contrary to the fundamental laws of the empire. In consequence of all this, after many negotiations and projects of reconciliation, a treaty of peace was concluded at Nuremberg, in 1532, between the emperor and the Protestant princes, on the following conditions, viz.,—that the latter should furnish a subsidy for carrying on the war against the Turks, and acknowledge Ferdinand as lawful king of the Romans; and that the emperor upon his part should abrogate and annul the Edicts of Worms and Augsburg, and allow the Lutherans the free and undisturbed exercise of their religious doctrine and discipline, until a rule of faith should be fixed either in the free general council which was to be assembled in the space of six months, or in a Diet of the empire.

A general council proposed.

Soon after the conclusion of the peace of Nuremberg, John, Elector of Saxony, died, and was succeeded by his son John Frederick, a prince of invincible fortitude and magnanimity, but whose reign was little better than one continued series of disappointments and calamities. The religious truce, however, gave new vigour to the Reformation. Those who had hitherto been only secret enemies of the Roman Pontiff now publicly threw off his yoke, and various cities and provinces of Germany enlisted themselves under the religious banners of Luther. On the other hand, as the emperor had now no other hope of terminating the religious disputes except by the meeting of a general council, he repeated his request to the Pontiff that such a council should be assembled. But Pope Clement VII., whom the history of past councils filled with the greatest uneasiness, endeavoured to retard what he could not with decency refuse. At last, in the year 1533, he made a proposal by his legate to assemble a council at Mantua, Piacenza, or Bologna; but the Protestants refused their consent to the nomination of an Italian council, and insisted that a controversy which had its rise in the heart of Germany should be determined within the limits of the empire. The Pope, by his usual artifices, eluded compliance with this demand, and in 1534 he was cut off by death before any determination could be come to. His successor, Paul III., seemed to show less reluctance to the assembling of a general council, and in 1535 expressed his inclination to convoke one at Mantua; and the year following he actually sent circular letters for that purpose throughout all the states and kingdoms under his jurisdiction. This council was summoned by a bull issued on the 2d of June 1536, to meet at Mantua in the following year. Several obstacles, however, prevented its meeting, one of the most material of which was, that Frederick, Duke of Mantua had no inclination to receive at once so many guests, some of them very turbulent, into the place of his residence. On the other hand, the Protestants were firmly persuaded that, as the council was to be assembled in Italy, and by the authority of the Pope alone, the latter must have an undue influence in that assembly, and consequently that all things would be carried by the votaries of Rome. For this reason they assembled in the year 1537 at Smalcald, where they solemnly protested against this partial and corrupt council, and at the same time had a new summary of their doctrine drawn up by Luther, in order to present it to the assembled bishops if it should be required of them. This summary, which received the title of the Articles of Smalcald, is commonly conjoined with the creeds and confessions of the Lutheran Church.

Fruitless attempts at accommodation.

After the meeting of the general council in Mantua had thus been prevented, many schemes of accommodation were proposed both by the emperor and by the Protestants; but, by the artifices of the Church of Rome all of them came to nothing. In 1541 the emperor appointed a conference to be held at Worms on the subject of religion, between persons of piety and learning chosen from the contending parties. This conference, however, was for certain reasons removed to the Diet which was to be held at Ratisbon that year, and in which the principal subject of deliberation was a memorial presented by a person unknown, containing a project of peace. But the conference produced no other effect than a mutual agreement of the contending parties to refer their matters to a general council, or, if the meeting of such a council should be prevented, to the next German Diet.

Council of Trent. Plan of reformation proposed by the Pope.

This resolution was rendered ineffectual by a variety of incidents which widened the breach, and put off to a future day the deliberations which were designed to heal it. The Pope ordered his legate to declare to the Diet of Spires, assembled in 1542, that he would, according to the promise he had already made, assemble a general council, and that Trent should be the place of its meeting if the Diet had no objection to that city. Ferdinand, and the princes who adhered to the cause of the Pope, gave their consent to this proposal; but it was vehemently objected to by the Protestants, both because the council was summoned by the authority of the Pope only, and also because the place was within the jurisdiction of his holiness; whereas they desired a free council, which should not be biassed by the dictates nor awed by the proximity of the Pontiff. But this protestation produced no effect. Paul III. persisted in his purpose, and issued his circular letters for the convocation of the council, with the approbation of the emperor. In justice to this pontiff, however, it must be acknowledged that he showed that he was not averse to certain measures of a reformatory character. He appointed four cardinals, and three other persons eminent for their learning, to draw up a scheme for the reformation of the church in general, and of that of Rome in particular. The reformation proposed in this plan was indeed extremely superficial and partial; yet it contained some particulars which could scarcely have been expected from those who composed it. They complained of the pride and ignorance of the bishops, and proposed that none should receive orders but learned and pious men, and that care should therefore be taken to have proper masters for the instruction of youth. They condemned translations from one benefice to another, with grants of reservation, non-residence, and pluralities. They proposed that some convents should be abolished; that the liberty of the press should be restrained and limited; that the Colloquies of Erasmus should be suppressed; that no ecclesiastic should enjoy a benefice out of his own country; that no cardinal should have a bishopric; that the questors of St Anthony and several other saints should be abolished; and, which was the best of all their proposals, that the effects and personal estates of ecclesiastics should be given to the poor. They concluded with complaining of the prodigious number of indigent and ragged priests who frequented St Peter's church; and declared that it was a great scandal to see prostitutes lodged so magnificently at Rome, and riding through the streets on fine mules, whilst the cardinals and other ecclesiastics accompanied them in the most courteous manner. This plan of reformation was turned into ridicule by Luther and Sturm; and indeed it left unredressed the greatest grievances of which the Protestants complained.

War between the emperor and the Protestants.

All this time the emperor had been labouring to persuade the Protestants to consent to the meeting of the council at Trent; but when he found them fixed in their opposition to the measure he began to listen to the sanguinary measures of the Pope, and resolved to terminate the disputes by force of arms. Upon this, the Elector of Saxony and the Landgrave of Hesse, who were the chief supporters of the Protestant cause, took proper measures to prevent their being surprised and overwhelmed by a superior force; but before the horrors of war commenced Luther died in peace at Eisleben, the place of his nativity, in the year 1546.

The emperor and the Pope had mutually resolved on the destruction of all who should dare to oppose the Council of Trent. The meeting of this council was to serve as a signal for taking up arms; and accordingly its deliberations were scarcely commenced in 1546 when the Protestants perceived undoubted signs of the approaching storm, and of a formidable union between the emperor and the Pope, which threatened to overwhelm them at once. This year, indeed, there had been a new conference at Ratisbon upon the old subject of accommodating differences in religion; but from the manner in which the debates were carried on, it appeared plain that these differences could only be decided in the field of battle. The Council of Trent, in the meantime, promulgated their decrees; whilst the Reformed princes, in the Diet of Ratisbon, protested against their authority, and were on that account proscribed by the emperor, who raised an army to reduce them to obedience.

Elector of Saxony defeated and taken prisoner.

The Elector of Saxony and the Landgrave of Hesse led their forces into Bavaria against the emperor, and cannonaded his camp near Ingolstadt. It was supposed that this would bring on an engagement, which would probably have been advantageous to the cause of the Reformed; but this was prevented chiefly by the perfidy of Maurice, Duke of Saxony, who invaded the dominions of his uncle. Divisions were also fomented amongst the confederate princes by the dissimulation of the emperor, and France failed in paying the subsidy which had been promised by its monarch,—all which so discouraged the heads of the Protestant party that their army soon dispersed, and the Elector of Saxony was obliged to direct his march homewards. But he was pursued by the emperor, who made several forced marches, with a view to overpower the enemy before he could have time to recover his vigour. The two armies met near Mulberg on the Elbe, on the 24th of April 1547, and, after a sanguinary action, the elector was entirely defeated and taken prisoner. Maurice, who had so basely betrayed him, was now declared Elector of Saxony; and by his entreaties Philip, Landgrave of Hesse, the other chief of the Protestants, was persuaded to throw himself on the mercy of the emperor and to implore forgiveness. To this he consented, relying on the promise of Charles for obtaining pardon and being restored to liberty; but, notwithstanding these expectations, he was unjustly detained prisoner by a scandalous violation of the most solemn convention. It is said that the emperor retracted his promise, and deluded this unhappy prince by the ambiguity of two German words. History, indeed, can scarcely furnish a parallel to the perfidious, mean-spirited, and despotic behaviour of the emperor in the present case. After having received in public the humble submission of the prince on his knees, and set him at liberty in virtue of a solemn treaty, he caused him to be arrested anew without any reason, nay, without any pretence, and kept him a close prisoner for several years. When Maurice remonstrated against this new confinement, the emperor answered that he had never promised that the landgrave should not be imprisoned anew, but only that he should be exempted from perpetual imprisonment; and, to support this assertion, he produced the treaty. (See Ranke's *History*, vol. iv., already referred to; and Robertson's *History of Charles V.*)

The council suddenly dissolved. A formulary drawn up.

The affairs of the Protestants now seemed to be desperate. In the Diet of Augsburg, which was soon afterwards called, the emperor required the Protestants to leave the decision of these religious disputes to the wisdom of the council which was to meet at Trent. The greater part of the members consented to this proposal, being convinced by the powerful argument of an imperial army, which was at hand to dispel the darkness from the eyes of such as might otherwise have been blind to the force of Charles's reasoning. However, this general submission did not produce the effect which was expected from it. A plague which broke out, or was said to have done so in the city, caused the greater part of the bishops to retire to Bologna, by which means the council was in effect dissolved; nor could all the entreaties and remonstrances of the emperor prevail upon the Pope to re-assemble it without delay. During this interval, therefore, the emperor judged it necessary to fall upon some method of accommodating the religious differences, and maintaining peace until the council so long expected should finally be decided on. With this view he ordered Julius Pflug, Bishop of Naumberg, Michael Sidonius, a creature of the Pope, and John Agricola of Eisleben, to draw up a formulary which might serve as a rule of faith and worship, till the council should be assembled. But as this was only a temporary expedient, and had not the force of a permanent or perpetual institution, it thence obtained the name of the *Interim.* (In addition to the other authorities, the reader may consult Gieseler's *Lehrbuch neueren Kirchenges.*, Bonn, 1840.)

This formulary rejected. Melancthon's scheme.

This project of Charles was formed partly with a design to vent his resentment against the Pope, and partly to answer other political purposes. It contained all the essential doctrines of the Church of Rome, though considerably softened by the artful terms which were employed, and which were quite different from those employed before and after this period by the Council of Trent. There was even an affected ambiguity in many of the expressions, which made them susceptible of different meanings, and applicable to the sentiments of both communions. The consequence of all this was, that the imperial formulary was reprobated by both parties. However, it was promulgated with great solemnity by the emperor at Augsburg. The Elector of Mentz, without even asking the opinion of the princes present, gave a sanction to this formulary, as if he had been commissioned to represent the whole Diet. Many remained silent through fear, and that silence was interpreted as a tacit consent. Some who had the courage to oppose it, were reduced by force of arms; and the most deplorable scenes of bloodshed and violence were enacted throughout the whole empire. Maurice, Elector of Saxony, who had hitherto kept neutral, now assembled the whole of his nobility and clergy, in order to deliberate on this critical affair. At the head of the latter was Melancthon, whose word was respected as a law amongst the Protestants. But this man had not the courage of Luther, and was therefore on all occasions ready to make concessions, and to propose schemes of accommodation. In the present case he gave it as his opinion, that the whole of the book called *Interim* could not by any means be adopted by the Protestants; but at the same time he declared that he saw no reason why this book might not be approved, adopted, and received as an authoritative rule in things that did not relate to the essential parts of religion, and which he accounted indifferent. But this scheme, instead of cementing the differences, rendered them worse than ever; and produced a division amongst the Protestants themselves, which might have overthrown the Reformation entirely, if the emperor and the Pope had seized the opportunity.

The Council of Trent re-assembled.

In the year 1549 Pope Paul III. died, and was succeeded by Julius III., who, at the repeated solicitations of the emperor, consented to re-assemble the Council of Trent. A Diet was again held at Augsburg under the cannon of the imperial army, and Charles laid the matter before the princes of the empire. Most of those present gave their consent to it, and amongst the rest Maurice, Elector of Saxony, who consented on the following conditions, namely, that the points of doctrine which had already been decided there should be re-examined; that this examination should be made in presence of the Protestant divines; that the Saxon Protestants should have the liberty of voting as well as of deliberating in the council; and that the Pope should not pretend to preside in that assembly, either in person or by his legates. This declaration of Maurice was read in the Diet, and his deputies insisted upon its being entered into the registers, which the Archbishop of Mentz obstinately refused. (See Sleidan's *Comment.*, lib. xxii., 1556; also Father Paul Sarpi's *History of the Council of Trent*, and Bungener's *History of the Council of Trent.*) This Diet was concluded in the year 1551; and at its breaking up the emperor desired the assembled princes and states to prepare all things for the approaching council, and promised to use his utmost endeavours to procure moderation and harmony, impartiality and charity, in the transactions of that assembly.

The emperor surprised, and forced to conclude a peace.

On the breaking up of the Diet the Protestants took such steps as they thought most proper for their own safety. The Saxons employed Melancthon, and the Würtembergers Brentius, to draw up confessions of faith to be laid before the new council. The Saxon divines, however, proceeded no farther than Nuremberg, having received secret orders from Maurice to stop there; for the elector, perceiving that Charles had formed designs against the liberties of the German princes, resolved to take the most effectual measures for at once crushing his ambition. He therefore entered with the utmost secrecy and expedition into an alliance with the king of France and several of the German princes for the security of the rights and liberties of the empire; after which, having assembled a powerful army in 1552, he marched against the emperor, who lay with a handful of troops at Innspruck, expecting no attack from any quarter. By this sudden and unforeseen accident Charles was so much dispirited that he was willing to make peace almost on any terms. The consequence was, that he concluded a treaty at Passau, which by the Protestants is considered as the basis of their religious liberty. By the first three articles of this treaty, it was agreed that Maurice and the confederates should lay down their arms, and lend their troops to Ferdinand to assist him against the Turks, and that the Landgrave of Hesse should be set at liberty. By the fourth it was agreed that the rule of faith called the *Interim* should be considered as null and void; that the contending parties should enjoy the free and undisturbed exercise of their religion, until a Diet should be assembled to determine amicably the present disputes, which Diet was to meet in the space of six months; and that this religious liberty should continue always, in case it should be found impossible to come to an uniformity in doctrine and worship. It was also determined that all those who had suffered banishment, or any other calamity, on account of their having been concerned in the league or war of Smalcald, should be reinstated in their privileges, possessions, and employments; that the imperial chamber at Spires should be open to the Protestants as well as to the Catholics; and that there should always be a certain number of Lutherans in that high court. To this peace Albert, Marquis of Brandenburg, refused to subscribe, and continued the war against the Roman Catholics, committing such ravages in the empire that a confederacy was at last formed against him. At the head of this conspiracy was Maurice, Elector of Saxony, who died of a wound received in battle in 1553.

Treaty of Augsburg.

The assembling of the Diet promised by Charles was delayed by various incidents; however, it met at Augsburg in 1555, where it was opened by Ferdinand in name of the emperor, and terminated those deplorable calamities which had so long desolated the empire. After various debates, the following acts were passed, on the 25th of September, viz.:—That the Protestants who followed the Confession of Augsburg should be for the future considered as entirely free from the jurisdiction of the Roman Pontiff, and from the authority and superintendence of the bishops; that they were left at perfect liberty to enact laws for themselves relating to their religious sentiments, discipline, and worship; that all the inhabitants of the German empire should be allowed to judge for themselves in religious matters, and to join that church whose doctrine and worship they thought the purest and most consonant to the spirit of true Christianity; and that all those who should injure or persecute any person under religious pretences, and on account of their opinions, should be declared and proceeded against as public enemies of the empire, invaders of its liberty, and disturbers of its peace.

Account of the Reformation in Sweden.

Thus was the Reformation established in many parts of the German empire, where it continues to this day; nor have the efforts of the Catholic powers at any time been able to suppress it, or even to prevent it from gaining ground. It was not, however, in Germany alone that a reformation of religion took place. About the same time almost all the kingdoms of Europe began to open their eyes to the truth. The Reformed religion was propagated in Sweden, soon after Luther's rupture with the Church of Rome, by one of his disciples, named Olaus Petri. The zealous efforts of this missionary were seconded by Gustavus Vasa, whom the Swedes had raised to the throne instead of Christiern, King of Denmark, who by his horrid barbarity lost the crown (A.D. 1523-61). This prince, however, was as prudent as he was zealous; and as the minds of the Swedes were in an unsettled state, he wisely avoided any show of vehemence and precipitation in spreading the new doctrine. Accordingly, the first object of his attention was the instruction of his people in the sacred doctrines of the Holy Scriptures; and for this purpose he invited into his dominions several learned Germans, and spread abroad throughout the kingdom the Swedish translation of the Bible which had been made by Olaus Petri. Some time after this, in 1526, he appointed a conference at Upsal, between this Reformer and Peter Gallius, a zealous defender of the ancient faith, in which each of the champions was to bring forth his arguments, that it might be seen on which side the truth lay. In this dispute Olaus obtained a signal victory, which contributed much to confirm Gustavus in his persuasion of the truth of Luther's doctrine, and to promote its progress in Sweden. The following year another event gave the finishing stroke to its propagation and success. This was the assembly of the states at Westeraas, where Gustavus recommended the doctrine of the Reformers with such zeal that, after warm debates fomented by the clergy, it was unanimously resolved that the reformation introduced by Luther should be adopted in Sweden. This resolution was principally owing to the firmness and magnanimity of Gustavus, who declared publicly that he would lay down the sceptre and retire from the kingdom, rather than rule a people enslaved by the orders and authority of the Pope, and more controlled by the tyranny of their bishops than by the laws of their monarch. The papal empire in Sweden was now overthrown, and Gustavus declared head of the church. (See the Histories of Gerdes and Schroeckh.)

Reformation in Denmark.

In Denmark the Reformation was introduced as early as the year 1521, in consequence of the ardent desire discovered by Christiern II. of having his subjects instructed in the doctrines of Luther. This monarch, notwithstanding his cruelty, for which his name has been rendered odious, was nevertheless desirous of delivering his dominions from the tyranny of the Church of Rome. For this purpose, in the year 1520 he sent for Martin Reynhard, one of the disciples of Carlstadt, and appointed him professor of divinity at Copenhagen; and after the death of this man, which happened in 1521, he invited Carlstadt himself to fill that important place. Carlstadt accepted of this office indeed, but in a short time returned to Germany; upon which Christiern used his utmost endeavours, but in vain, to engage Luther to visit his dominions. However, the progress of Christiern in reforming the religion of his subjects, or rather of advancing his own power above that of the church, was checked in the year 1523 by a conspiracy, in consequence of which he was deposed and banished; his uncle Frederick, Duke of Holstein and Schleswick, being appointed his successor.

Frederick conducted the Reformation with much greater prudence than his predecessor. He permitted the Protestant doctors to preach publicly the sentiments of Luther, but did not venture to change the established government and discipline of the church. However, he contributed greatly to the progress of the Reformation by his successful attempts in favour of religious liberty, in an assembly of the states held at Odensee in 1527. Here he procured the publication of a famous edict, by which every subject of Denmark was declared free to adhere either to the tenets of the Church of Rome or to the doctrine of Luther. The papal tyranny was totally destroyed by his successor Christiern III. He began by suppressing the despotic authority of the bishops, and restoring to their lawful owners a great part of the wealth and possessions which the church had acquired by various stratagems. This was followed by a plan of religious doctrine, worship, and discipline, laid down by Bugenhagen, whom the king had sent for from Wittenberg for the purpose; and in 1539 an assembly of the states at Odensee gave their solemn sanction to all these transactions. (See the works of Gramm and Ranke; also Pontoppidan's *History of the Reformation in Denmark*, 1734; and especially the work of Münter, *Kirchengeschichte von Danemarck und Norwegen*, 1833, 3 vols.)

Reformation in France.

In France also the Reformation began very early to make some progress. Margaret, Queen of Navarre, and sister of Francis I., the perpetual rival of Charles V., was a great friend to the new doctrine; and it appears that, as early as the year 1523, there were in several of the provinces of France great numbers of people who had conceived the greatest aversion both to the doctrine and tyranny of the Church of Rome, amongst whom were many of the first rank and dignity, and even some of the episcopal order. But as their number increased daily, and troubles and commotions were excited in several places on account of the religious differences, the authority of the king intervened, and many persons eminent for their virtue and piety were put to death in the most barbarous manner. Indeed, Francis, who had either no religion at all, or, at best, no fixed and consistent system of religious principles, conducted himself towards the Protestants in such a manner as best answered his private views. Sometimes he resolved to invite Melancthon into France, probably with a view to please his sister the Queen of Navarre, whom he loved tenderly, and who had strongly imbibed the Protestant principles. At other times he exercised the greatest cruelty towards the Reformed; and once made the following absurd declaration, that if he thought the blood in his arm was tainted by the Lutheran heresy, he would have the arm cut off; and that he would not spare even his own children if they entertained sentiments contrary to those of the Catholic Church. About this time Calvin began to attract the attention of the public, but more especially that of the Queen of Navarre. His zeal exposed him to danger; and as Francis was daily committing to the flames the friends of the Reformation, he was placed more than once in the most perilous situation, from which he was only delivered by the interposition of the Queen of Navarre. He therefore retired from France to Bâle in Switzerland, where he published his *Christian Institutes*, and afterwards became celebrated in the history of Protestantism. (See CALVIN.)

Those amongst the French who first renounced the jurisdiction of the Church of Rome are commonly called Lutherans by the writers of those early times. Hence it has been supposed that they had all imbibed the peculiar sentiments of Luther. But this appears not to have been the case; for the vicinity of the cities of Geneva, Lausanne, and some others, which had adopted the doctrine of Calvin, produced a remarkable effect upon the French Protestant churches; insomuch that, about the middle of this century, they all entered into communion with the Church of Geneva. The French Protestants were, by way of contempt, called Huguenots by their adversaries. Their fate was very severe, being persecuted with unparalleled fury; and though several princes of the blood, and many of the first nobility, had embraced their sentiments, yet in no part of the world did the Reformers suffer so much. At last all commotions were quelled by the fortitude and magnanimity of Henry IV., who in the year 1598 granted all his subjects full liberty of conscience by the famous Edict of Nantes, and seemed to have thoroughly established the Reformation throughout his dominions. During the minority of Louis XIV., however, this edict was revoked by Cardinal Mazarin, since which time the Protestants have often been cruelly persecuted; nor has the profession of the Reformed religion in France been at any time so safe as in most of the other countries of Europe. (Besides the Histories of Beza, Benoit, and Salig, the reader is referred to the third volume of Merle d'Aubigné.)

Reformation in the Netherlands.

In the other parts of Europe the opposition to the Church of Rome was but faint and ambiguous before the Diet of Augsburg. Prior to that period, however, it appears, from undoubted testimony, that the doctrine of Luther had made a considerable, though probably a secret, progress throughout Spain, Hungary, Bohemia, Britain, Poland, and the Netherlands; and had in all these countries gained many friends, of whom several repaired to Wittenberg, in order to enlarge their knowledge by means of Luther's conversation. Some of these countries threw off entirely the yoke of Rome, and in others a prodigious number of families embraced the principles of the Reformed religion. It is certain, indeed, and some Roman Catholics themselves acknowledged it without hesitation, that the papal doctrines and authority would at once have fallen into ruin in all parts of the world had not the force of the secular arm been employed to support the tottering edifice. In the Netherlands particularly the most grievous persecutions took place, so that by the Emperor Charles V. upwards of a hundred thousand were destroyed, whilst still greater cruelties were exercised upon the people by his son Philip II. The revolt of the United Provinces, however, and motives of real policy, at last put a stop to these furious proceedings; and although in many provinces of the Netherlands the establishment of the Catholic religion was still continued, the Protestants have been long free from the danger of persecution on account of their principles. (The reader may consult, after the Histories of Gerdes and Schrœckh, Brandt's *History of the Reformation in the Low Countries*, 4 vols., translated from the Dutch, 1720–23.)

Reformation in Italy.

The Reformation made considerable progress in Spain and Italy soon after the rupture between Luther and the Roman Pontiff. In all the provinces of Italy, but more especially in the territories of Venice, Tuscany, and Naples, the superstition of Rome lost ground, and great numbers of people of all ranks expressed an aversion to the papal yoke. In the year 1546, this occasioned violent and dangerous commotions in the kingdom of Naples; which, however, were at last quelled by the united forces of Charles V., and his viceroy Don Pedro di Toledo. In several places the Pope put a stop to the progress of the Reformation, by letting loose the inquisitors, who spread dreadful marks of their barbarity throughout the greater part of Italy. These formidable ministers of persecution put so many to death, and perpetrated such horrible acts of cruelty and oppression, that most of the Reformed consulted their safety by a voluntary exile, whilst others returned to the religion of Rome, at least in external appearance. But the Inquisition which frightened into the profession of Popery several Protestants in other parts of Italy, could never make its way into the kingdom of Naples, nor could either the authority or the entreaties of the Pope engage the Neapolitans to admit even visiting inquisitors. (See the admirable *History of the Progress and Suppression of the Reformation in Italy*, by the elder M'Crie, Edinburgh, 1833; also Gieseler's *Lehrbuch*, vol. i.)

Reformation in Spain.

In Spain, several persons embraced the Protestant religion, not only from the controversies of Luther, but even from those divines whom Charles V. had brought with him into Germany in order to refute the doctrines of the Reformer. For these doctors had imbibed the pretended heresy instead of refuting it, and propagated it more or less on their return home. But the Inquisition, which could obtain no footing in Naples, reigned triumphant in Spain, and by the most dreadful methods frightened the people back into Popery, and suppressed the desire of exchanging their superstition for a more rational plan of religion. It was indeed presumed that Charles himself died a Protestant; and it seems to be certain that when the approach of death had dissipated those schemes of ambition and grandeur which had so long blinded him, his sentiments became much more rational and agreeable to Christianity than they had ever been before. All the ecclesiastics who had attended him, as soon as he expired, were sent to the Inquisition, and committed to the flames, or put to death by some other method equally terrible. Such was the fate of Augustin Casal, the emperor's preacher; of Constantine Pontius, his confessor; of Egidius, whom he had named to the bishopric of Tortosa; of Bartolomeo de Caranza, a Dominican, who had been confessor to Philip and Mary of England; with many others of less note. (See M'Crie's *History of the Progress and Suppression of the Reformation in Spain*, Edin. 1829.)

Reformation in England.

In England the principles of the Reformation began to be adopted as soon as an account of Luther's doctrines could be conveyed thither. In that kingdom there were still remains of the sect called Lollards, whose doctrine resembled that of Luther; and amongst whom consequently the sentiments of the Reformer gained great credit. (See LOLLARDS.) Henry VIII., King of England, was at that time a violent partisan of the Church of Rome, and had a particular veneration for the writings of Thomas Aquinas. Being informed that Luther spoke of his favourite author with contempt, he conceived a violent prejudice against the Reformer, and even wrote against him, as has been already alluded to. Luther did not hesitate about writing against his majesty, overcame him in argument, and treated him with very little ceremony. The first step towards public reformation, however, was not taken until the year 1529. Great complaints had been made in England from a very early period respecting the usurpations of the clergy; and the prevalence of the Lutheran opinions rendered these complaints more loud and general than before. The House of Commons, finding the occasion favourable, passed several bills restraining the impositions of the clergy; but what threatened the ecclesiastical order with the greatest danger were the severe reproaches thrown out in the House, almost without opposition, against the dissolute lives, ambition, and avarice of the priests, and their continual encroachments on the privileges of the laity. The bills for regulating the clergy met with opposition in the House of Lords; and Bishop Fisher imputed them to want of faith in the Commons, and to a formed design, proceeding from heretical and Lutheran principles, of robbing the church of her patrimony, and overturning the national religion. The Commons, however, complained to the king, by their speaker, Sir Thomas Audley, of these reflections thrown out against them; and the bishop was obliged to retract his words. Though Henry had not the least idea of rejecting any even of the most absurd observances of the Catholic Church, yet as the oppressions of the clergy were very ill suited to the violence of his own temper, he was pleased with every opportunity of lessening their power. In the Parliament of 1531 he showed his design of humbling the clergy in the most effectual manner. An obsolete statute was revived, from which it was pretended that to submit to the legatine which had been exercised by Cardinal Wolsey was criminal. By this stroke the whole body of clergy was at once declared guilty. They were too well acquainted with Henry's disposition, however, to reply, that their ruin would have been the certain consequence of their not submitting to Wolsey's commission, which had been given by royal authority. Instead of making any defence of this kind, they chose to throw themselves on the mercy of their sovereign; which, however, cost them some L.118,840 to procure. A confession was likewise extorted from them, that the king was protector and supreme head of the Church of England; though some of them had the dexterity to get a clause inserted which invalidated the whole submission, namely, "in as far as is permitted by the law of Christ." The king having thus begun to reduce the power of the clergy, kept no bounds with them afterwards. He did not indeed attempt any reformation in religious matters; nay, he persecuted most violently such as did in the least degree attempt anything of the kind. Indeed, the most essential article of his creed seems to have been his own supremacy; for whoever denied this, whether Protestant or Papist, was sure to suffer the most severe penalties. He died in the year 1547, and was succeeded by his only son, Edward VI. This amiable prince gave new spirit and vigour to the Protestant cause, and was its brightest ornament, as well as its most effectual support. He encouraged learned and pious men of foreign countries to settle in England, and addressed a particular invitation to Martin Bucer and Paul Fagius, whose moderation added a lustre to their other virtues; in hopes that, by the ministry and labours of these eminent men, in concert with those of the friends of the Reformation in England, he might purge his dominions from the fictions of Popery, and establish in their room the pure doctrines of Christianity. For this purpose, he issued the wisest orders for the restoration of true religion; but his reign was too short to accomplish fully such a glorious purpose. In the year 1553 he was taken from his loving and afflicted subjects, whose sorrow was great, and suited to their loss. His sister Mary, the daughter of Catharine of Aragon, from whom Henry had been divorced, blindly bigoted to the Church of Rome, and a princess whose natural character, like the spirit of her religion, was despotic and cruel, succeeded him on the throne, and imposed anew the arbitrary laws and the tyrannical yoke of Rome upon the people of England. Nor were the methods which she employed in the cause of superstition better than the cause itself, or tempered by any sentiments of equity or compassion. Barbarous tortures, and death in the most shocking forms, awaited those who opposed her will, or made the least stand against the restoration of Popery. And amongst many other victims, the learned and pious Cranmer, Archbishop of Canterbury, who had been one of the most efficient instruments of the Reformation in England, fell a sacrifice to her fury. But this odious scene of persecution was happily concluded in the year 1558, by the death of the queen, who left no issue; and as soon as her successor Elizabeth ascended the throne all things assumed a new aspect. The glorious period of this reign was alike eminent for religious knowledge and for daring genius, for civil prosperity and for martial glory. Elizabeth, whose sentiments, and councils, and projects, breathed a spirit superior to the natural softness and delicacy of her sex, exerted this vigorous and masculine spirit in the defence of oppressed conscience and expiring liberty; broke anew the despotic yoke of papal authority and superstition; and, delivering her people from the bondage of Rome, established that form of religious doctrine and ecclesiastical government which still subsists in England. This religious establishment differed in some respects from the plan which had been formed by those whom Edward VI. had employed for promoting the cause of the Reformation, and approached nearer to the rites and discipline of former times; though it is widely different, and in the most important point entirely opposite to the principles of the Roman Catholic hierarchy. (Burnet, Neal, Collier, Soames, Carwithen, have written Histories of this period; and a comparatively recent and very spirited outline of the English Reformation will be found in Blunt's *Sketch of the Reformation in England*, Lond. 1832.)

Reformation in Ireland.

The cause of the Reformation underwent in Ireland the same vicissitudes and revolutions which had attended it in England. When Henry VIII., after the abolition of the papal authority, was declared supreme head of the Church of England, George Brown, a native of England, and a monk of the Augustinian order, whom that monarch had created, in the year 1535, archbishop of Dublin, began to act with the utmost vigour in consequence of this change in the hierarchy. He purged the churches within his diocese from superstition in all its various forms; pulled down images; destroyed relics; abolished absurd and idolatrous rights; and, by the influence as well as authority he had obtained in Ireland, caused the king's supremacy to be acknowledged in that nation. Henry soon afterwards showed that this supremacy was by no means a vain title; for he banished the monks out of that kingdom, confiscated their revenues, and destroyed their convents. In the reign of Edward VI. still further progress was made in the removal of popish superstitions by the zealous labours of Archbishop Brown, and the auspicious encouragement he granted to all who exerted themselves in the cause of the Reformation. (See *The Harleian Miscellany*, which contains a Life of Brown, vol. v., No. 73, Lond. 1745.) The death of this young prince, however, and the accession of Queen Mary, had nearly changed the face of affairs in Ireland as much as in England; but her designs were disappointed by a very curious adventure, of which the following account has been copied from the papers of Richard, Earl of Cork.

Curious disappointment.

"Queen Mary having dealt severely with the Protestants in England, about the latter end of her reign, signed a commission for to take the same course with them in Ireland; and to execute the same with greater force, she nominates Dr Cole one of the commissioners. The doctor coming, with the commission, to Chester on his journey, the mayor of that city, hearing that her majesty was sending a messenger into Ireland, and he being a churchman, waited on the doctor, who in discourse with the mayor taketh out of a cloke-bag a leather box, saying unto him, Here is a commission that shall lash the heretics of Ireland, calling the Protestants by that title. The good woman of the house being well affected to the Protestant religion, and also having a brother named John Edmonds of the same persuasion, then a citizen in Dublin, was much troubled at the doctor's words; but watching her convenient time, while the mayor took his leave, and the doctor complemented him down the stairs, she opens the box, takes the commission out, and places in lieu thereof a sheet of paper with a pack of cards wrapt up therein, the knave of clubs being faced uppermost. The doctor coming up to his chamber, suspecting nothing of what had been done, put up the box as formerly. The next day going to the water-side, wind and weather serving him, he sails towards Ireland, and landed on the 7th of October 1558 at Dublin. Then coming to the castle, the Lord Fitzwalters being lord-deputy, sent for him to come before him and the Privy-Council; who, coming in, after he had made a speech relating upon what account he came over, he presents the box unto the lord-deputy; who causing it to be opened, that the secretary might read the commission, there was nothing save a pack of cards with the knave of clubs uppermost; which not only startled the lord-deputy and council, but the doctor, who assured them he had a commission, but knew not how it was gone. Then the lord-deputy made answer: Let us have another commission, and we will shuffle the cards in the meanwhile. The doctor being troubled in his mind, went away, and returned into England, and coming to the court obtained another commission; but staying for a wind on the water-side, news came to him that the queen was dead; and thus God preserved the Protestants of Ireland." Queen Elizabeth was so delighted with this story, which was related to her by Lord Fitzwalter on his return to England, that she sent for Elizabeth Edmonds, whose husband's name was Mattershad, and gave her a pension of L.40 a year during her life. (See Phelan's *Policy of the Roman Catholic Church in Ireland*, London, 1827; and especially Dr Seaton Reid's *History of the Presbyterian Church in Ireland*, Edinburgh, 1834. The reader may likewise consult Dr Mant's *History of the Church of Ireland*, London, 1840.)

Reformation in Scotland.

In Scotland the seeds of the Reformation were very early sown by several noblemen who had resided in Germany during the religious disputes there; but for many years it was suppressed by the power of the Pope, seconded by severe laws and not a few executions. The most eminent opponent of the papal jurisdiction was John Knox, a disciple of Calvin, and a man of great zeal and invincible fortitude. (See KNOX.) On all occasions he raised the drooping spirits of the Reformers, and encouraged them to go on with their work, notwithstanding the opposition and treachery of the queen-regent, until at last, in 1561, by the assistance of an English army sent by Elizabeth, Popery was in a manner totally extirpated from every part of the kingdom. From this period the form of doctrine, worship, and discipline established by Calvin at Geneva has had the ascendancy in Scotland. (See the Histories of Calderwood, Knox, and Cook; also M'Crie's *Life of John Knox;* Robertson's *History of Scotland;* Scott's *Protestant Reformers of Scotland;* and the Histories of Spottiswood, Keith, and Tytler.)

REFRACTION. See ASTRONOMY, and OPTICS.

REGALIA, politically considered, is the privileges, prerogative, and right of property belonging, in virtue of his office, to the sovereign of a state. The most common signification of the word, however, is the heraldic one, in which it is applied to the royal insignia. The regalia of England are the crown, the sceptre, the virge, St Edward's staff, the orb or mound, the sword of mercy, the two swords of justice, the ring of alliance, the armillæ or bracelets, the spurs of chivalry, and sundry royal vestments. These are preserved, all except the royal vestments, in the jewel-office in the Tower of London. The insignia of Scottish royalty are a crown, a sceptre, and a sword of state. They are deposited in the crown-room of Edinburgh Castle.

REGARDANT. See HERALDRY.

REGATTA, originally a Venetian term applied to a great fête in which the gondoliers contended for superiority in rowing, but which has now been naturalized into all the languages of Europe, in which it is employed to designate any brilliant species of boat-race.

REGENT, one who exercises the power without the name of a king. In a hereditary monarchy the appointment of a regent becomes necessary on the crown descending to a minor too young to be entrusted with the regal office, or in case of mental incapacity, or incapacity by illness which will probably be of long duration, or on absence from the realm. There have been several instances in English history of the appointment of a regent, usually styled a *protector*, during the sovereign's minority; the last occurred during the minority of Edward VI., when the protector, the Duke of Somerset, was uncle to the sovereign. Blackstone, in his *Commentaries* (book i., c. 7), gives a summary of the appointment of regents in England during the nonage of the heir. In cases of ill health there existed no recognised constitutional rule; so that on the illness of George III. it became a matter of hot dispute whether his eldest son, then of full age, should become regent, or whether the choice and nomination of that grand functionary rested with the Parliament. The king's recovery, meanwhile, destroyed the problem; but on a relapse all parties were unanimous in the choice of the Prince of Wales. The regency of the kingdom of Great Britain and Ireland, in case of minority upon the demise of the present sovereign, is provided for by the "Regency Bill," 3 and 4 Vict., c. 52.

REGGIO (anc. *Rhegium Julii*), a town of Naples, capital of the province of Calabria Ultra I., stands near the southern extremity of the Italian peninsula, on the Straits of Messina, and 9 miles S.E. of that town. Notwithstanding that the Apennines rise in barren, rugged masses behind the town, the surrounding country is almost unrivalled for its clear atmosphere, delicious climate, and luxuriant vegetation. Groves of oranges and lemons extend for miles around, and in the gardens grow many exotics from various countries. The scenery, too, is exceedingly beautiful, especially when the outline of the Sicilian hills stands out against the setting sun, and the huge mass of Ætna looms in the distant south. From a broad street called the Marina, running along the shore, the town gradually rises with its handsome buildings and broad streets, laid out on a regular plan. The cathedral and other churches, the convents, the college, theatre, hospital, and foundling asylum are conspicuous among the public edifices. Manufactures of silk, linen, hosiery, oils, &c., are carried on here, and there is some trade, especially in silk and oil. The modern city has been entirely built since 1783, when it was laid in ruins by a tremendous earthquake. Pop. 20,000. (See RHEGIUM.)

REGGIO (anc. *Rhegium Lepidi*), a town of Italy, in the duchy and 15 miles W. of Modena, on the canal of Tassone, leading to the Po. A handsome and well-built though extremely dull town, defended by walls and a castle, it contains a cathedral of the fifteenth century, adorned with marble columns, and containing several monuments by Clementi, as well as his tomb. Another beautiful church is that of Madonna della Ghiara, in the shape of a Greek cross, surmounted by five cupolas, and adorned with many fresco paintings. Besides many other churches and convents, there are at Reggio a public library of 30,000 volumes, a theatre, Jesuit college, lyceum, and lunatic asylum. Silk and linen fabrics are made here; and various delicately-carved articles in ivory, horn, and wood. The town has an active trade in wine, cattle, and other articles; and a fair held here annually is much frequented. Reggio is celebrated as the birthplace of Ariosto. A house is pointed out by tradition as that where the poet first saw the light, though, according to some, the event must have taken place in the castle. Pop. about 20,000.

REGIFUGIUM, or FUGALIA (*the king's flight*), a festival of Rome, celebrated annually on the 24th of February, and, according to some ancient Calendaria, on the 24th of May. Verrius and Ovid say it was meant to memorialize the flight of King Tarquin from Rome, while a number of other writers, both ancient and modern, concur in regarding it as commemorative of the symbolical flight of the Rex Sacrorum from the comitium.

REGILLUS, LAKE OF, situated in the territory of Tusculum in Latium, was celebrated in Roman story as the scene of a great battle. Here it was that the dictator A. Postumius Albus engaged the Latin confederacy under the expelled Tarquins and Mamilius of Tusculum; and here it was that Castor and Pollux appeared on two white steeds, heading the charge of the Roman cavalry against the flying foe. At the present day Regillus has not been identified with certainty; but it is now generally supposed to be the same as the *Lago di Cornufelle*. That lake, about half a mile in diameter, lying at the foot of the hill on which the modern Frascati is built, is of a singular character. Its basin is evidently the crater of an extinct volcano. Its waters have been completely drained away by an emissary made in the seventeenth century. The dry channel during summer swarms with vipers, so that it is dangerous to approach it. The ruins of an old Roman villa are the only vestige of a building in its immediate neighbourhood.

REGIMEN. See DIETETICS.

REGIMENT. See ARMY.

REGIOMONTANUS. See MÜLLER, *Johann.*

REGIS, PIERRE SYLVAIN, a Cartesian philosopher, was born in Agenois in the year 1632. He studied languages and philosophy under the Jesuits at Cahors, and subsequently theology at the Sorbonne at Paris. He heard Rohault's lectures on the Cartesian philosophy, which soon determined him to give up theology. In 1665 he was appointed to the philosophical chair at Toulouse, where his eloquence attracted great masses of the people. The magistrates, the learned, the ecclesiastics, and the very women, all affected to abjure the ancient philosophy. In 1680 he returned to Paris, where the concourse which flocked to him was such that the Peripatetics got alarmed. They applied to the Archbishop of Paris, who thought it expedient, in the name of the king, to put a stop to the lectures, which accordingly were discontinued for several months. The whole life of Regis was spent in propagating the new philosophy. In 1690 he published his *Cours entier de philosophie, ou Système général selon les principes de Descartes*, 4 vols. 4to, in which he embraced logic, metaphysics, physics, and morals. In the two following years he was occupied with the publication of his refutations of Huet, Duhamel, and Spinoza. In 1691 there appeared at Paris his *Réponse au livre qui a pour titre* Censura philosophiæ Cartesianæ; in 1692 his *Réponse aux Réflexions critiques de M. Duhamel sur le système Cartésien de la philosophie de M. Regis;* and in 1704 his last work, *L'Usage de la Raison et de la Foi, ou l'Accord de la Raison et de la Foi*, followed by an attack on Spinoza. Regis was made a member of the Academy of Sciences in 1699, and he died in 1707. The reader may consult the *Eloge de Régis* by Fontenelle, the *Histoire de la Philosophie du 17th siècle*, by Damiron, vol. ii., p. 61, &c., and Bouillier's notice of him in the *Dictionnaire des Sciences Philosophiques.*

REGISTRATION.

REGISTRATION, *General*, of Births, Baptisms, Marriages, Deaths, and Burials in England and Wales. The first known public authority under which registers recording births or baptisms, marriages, deaths, or burials, were systematically kept in England, was an injunction issued in September 1538 (30 Hen. VIII.) by Thomas, Lord Cromwell, lord privy seal and vicegerent to the king, which enjoined that in every parish a register-book should be kept in a coffer with two locks by the parson, vicar, or curate, and churchwardens; and that every Sunday, in the presence of one of the churchwardens, the parson, &c., should enter in a register-book a written record of the dates and names of the weddings, christenings, and burials of the preceding week; by neglect of which duty he incurred a fine of three shillings and fourpence, to be employed in the repair of the church.

In 1547 an injunction was issued by Edward VI. similar to that of 1538, excepting only that the penalty was directed "to be employed to the poore-box" of the parish.

Inquiry was directed, at the instance of Cardinal Pole, under Philip and Mary, in the years 1555 and 1557, whether the clergy had complied with these directions; and in the first year of Queen Elizabeth, 1559, a further injunction was issued, which differed from that of Edward VI. in 1547 only in directing that the penalty should be divided between the poor-box and the repair of the church. These injunctions were not very strictly observed, as appears by the preamble of a bill to "authorize every archbishop and bishop to erect one office of registership of all the church-books, to be kept in every diocese," which, in March 1563, was read a first time in the House of Commons, but did not pass.

The great importance of registration was in 1590 represented to the Lord-Treasurer Burghley, who, impressed with the force of the representation, communicated a plan to the Archbishop of Canterbury. Nothing, however, appears to have been done in consequence until October 1597, when a constitution was made by the archbishop, bishops, and clergy of the province of Canterbury, and approved by the queen, which notices the very great utility of parish registers, and gives minute directions for keeping them, and for the transmission of a transcript yearly to the diocesan registrar. It appears, too, that persons were appointed for the purpose of ascertaining if the several orders had been complied with; and that every minister, at institution, was required to declare that he would "keep the register-book according to the queen's majesty's injunctions."

In 1603, the first year of the reign of James I., another injunction was issued similar to that of 1597, with the important addition of a clause appointing that the ancient registers, so far as they could be procured, but especially since the beginning of the reign of Elizabeth, should be copied into a parchment-book, to be provided by every parish; after which nothing more appears to have emanated, either from the ecclesiastical or civil authorities, on this subject, till the time of the Long Parliament, when the following entry in the Journal of the House of Commons gives evidence of attention to the importance of registration:—

"Anno 1644, Dec. 6. Ordered, that it be referred to the committee for bringing in the ordinance for the establishing the directory, to bring in a clause in that ordinance, for registering the time of baptizing of children, and their parents' names, and for registering of burials." In the same year an ordinance was made, directing that in every parish or chaplery in England and Wales the minister and other church-officers should keep a register of birth and baptism, of marriage and of burial; and that all persons reasonably desiring it might search therein and obtain copies.

In August 1653, in pursuance of the recommendations of a law-reform committee appointed in the preceding year, and including many eminent persons, an act was passed, which directed that in every parish a register-book should be provided for registering all marriages, births, and burials in the parish; and that the custody of such book, and the duty of registration, should be given to a person, to be called the parish registrar, appointed by the parishioners chargeable to the poor, and approved by a justice of the peace. It was also enacted that extra-parochial places, or small parishes, might be united, for the purposes of registration, to other parishes, by the justices at their sessions; and that all existing register-books should be kept by the registering officers appointed under that act.

This act was not confirmed at the Restoration, and the business of registration reverted to the clergy of the established church. During the reigns of Charles II. and James II. nothing was done with respect to registers, except that, by a clause in the act of 30 Car. II., c. 3, entitled "An Act for Burying in Woollen," it was enacted that all clergymen "do, within their respective parishes, precincts, and places, take an exact account, and keep a register, of all and every person or persons buried in his or their respective parishes or precincts, or in such common burial-places as their respective parishioners are usually buried."

In the reign of William III. registration was rendered a source of revenue. The act of 6 and 7 William III., c. 6, granted duties on births, marriages, and burials, and compelled the clergy, under a penalty of L.100, to keep an exact register of all persons born, christened, married, or buried in their respective parishes, to which register the collector of the tax, and all persons concerned, might have free access without fee. It thus imposed on the clergyman the onerous duty of acting gratuitously as a civil functionary, and collecting information of all births within his parish, without distinction of sect, and irrespective of baptism; a duty the difficulty of which was rendered greater by the attempts of the parents to conceal the birth, in order to elude the payment of the tax. With a view to obviate this objection, an act was passed in the following year (7 and 8 William III., c. 35), which provided that parents should, within five days after birth, give notice of the day of the birth to the clergyman, under a penalty of 40s., and that the clergyman should, under a like penalty, register such birth, for which the parents were to pay 6d.; and by the 4th of Anne, c. 12, the clergy were relieved from the ruinous penalties incurred under the act of 6 and 7 William III., c. 6, in all cases where the duties had been really paid.

In 1751 a bill was introduced into Parliament by Mr Potter (son of Archbishop Potter), for providing a general registry of births, deaths, and marriages, and for taking a yearly account of the population and number of paupers. Although strongly opposed, this bill passed the House of Commons, but was rejected by the Lords.

The 26th Geo. II., c. 33, an act "to prevent clandestine marriages," directed the church-wardens of every parish to provide books of vellum, or good and durable paper, for the registration of marriages. By the 23d of Geo. III., c. 67, a stamp-duty of 3d. was imposed upon every registered entry of burial, marriage, birth, or christening, to be demanded by the clergyman from the undertaker, or from the parties married, or from the parents of the child whose birth or christening had been registered. By 25 Geo. III., c. 75, the provisions of that act were extended to dissenting ministers. These measures excited much objection, and were repealed in 1794.

The next legislative measure affecting registers was the 52 Geo. III., c. 146, entitled, "An Act for the better regulating and preserving Parish and other Registers of Births, Baptisms, Marriages, and Burials in England." After reciting that "the amending the manner and form of keeping and of preserving registers of baptisms, marriages, and burials of his Majesty's subjects in the several parishes and places in England, will greatly facilitate the proof of pedigrees of persons claiming to be entitled to real or personal estates, and be otherwise of great public benefit and advantage," it enacts that, after the 31st of December 1812, registers of baptisms, marriages, and burials, according to the rites of the Established Church, shall be made and kept by the officiating minister of every parish and chapelry, in books to be provided by the king's printer, at the expense of the respective parishes, according to the forms contained in schedules annexed to that act. These schedules contain the following particulars: In case of *baptism*,—when baptized; child's Christian name; parents' Christian names and surnames; abode; quality, trade, or profession; by whom the ceremony was performed. In case of *marriage*,—the name and parish of the man; the same of the woman; when married; whether by banns or license; whether by consent of parents or guardians; when; by whom; signature of officiating minister of the parties married, and of two witnesses. In case of *burial*,—the name; abode; when buried; age; by whom the ceremony was performed.

The registers of baptism, marriage, and burial were to be kept in separate books, and signed within seven days after each ceremony had been performed. Annual copies were to be made, verified, and signed by the officiating minister, and attested by the church-wardens, and transmitted by them yearly to the registrar of the diocese; which registrar must report thereon to his bishop; must deposit such copies in a safe receptacle, arranged for reference; and cause alphabetical lists of persons and places to be made, kept, and opened for search.

It is to be observed that this act, which referred in its title to registers of births, made no provision for recording the date of birth. Neither did it provide a record of the date of death. It only provided records of the performance of the religious ceremonies of baptism, marriage, and burial, according to the rites of the Established Church. It therefore afforded an insufficient register, even for members of the Established Church; whilst for those who dissented from the Established Church, and therefore did not avail themselves of its ordinances for baptism or burial, it provided no register at all.

The inadequacy of this system, even if fully carried into effect, and the insufficient manner in which it was complied with, called loudly for investigation and remedy, and became the subject of inquiry before a select committee of the House of Commons, appointed in March 1833, who having, as they state, received evidence on registration "from clergymen of the Established Church, and from parish-clerks; from gentlemen of the legal profession; from authors devoted to antiquarian research; from persons of different religious denominations, including Catholics, Dissenters, Jews, and Quakers; from gentlemen eminently scientific, and attached to statistical inquiries; from medical authorities, who have long desired ampler and more accurate information on the extent and causes of mortality;

from an eminent foreigner, distinguished for extensive and accurate statistical intelligence; and others, whose wide-spread inquiries in foreign countries, and peculiar facilities of information, entitled them to respect," unanimously agreed to a report, which expressed the following opinions as the conclusions at which they had arrived:—

"1. That the subject is urgently important.

"2. That it involves matters of great public and national interest, as well as individual satisfaction, and rights and claims to property; and deserves the attention of the humblest artisan as well as of the most philosophical and statesman-like inquirer.

"3. That the existing law is imperfect and unjust, and requires not merely partial amendment, but real fundamental reform.

"4. That the present plan, even if improved and perfected, as applicable to the members of the Established Church, being founded on religious rights, is exclusive and intolerant, as it would not include a very considerable portion of the reflecting, intelligent, and influential population of the country, who are Protestant and Catholic dissenters from that church, and 1100 congregations who disapprove infant baptism, and must practically punish them (including, too, the community who may purchase or derive property from them) for claiming the rights of conscience, and believing what their judgments direct.

"5. That even to many pious and worthy clergymen of the Established Church the system is productive of pain and regret, as it often induces a compliance, from mere secular motives, with sacraments which they highly estimate and devoutly revere. But,

"6. That even as to the members of the church it is detrimental and absurd, since the registers are mere registers of baptisms and not of births, of burials and not of deaths; since they supply no adequate proof of pedigrees, or means of proving or tracing ancestral descent; since they are often falsified, stolen, burnt, inaccurately inscribed, and carelessly preserved; since the securities intended to be given by the last general register act (52 Geo. III.), by directing the yearly and universal transcription of the registers, their deposit with the diocesan records, and the preparation of indexes to facilitate searches, have all experienced only the most limited fulfilment, as, while one-fourth of the parishes make no returns, the returns that have been sent are never indorsed, and are subject to fire and decay, and the directions of the act have not and cannot be enforced; and since the value of property is diminished by the difficulties incident to its transfer, and the insecurity by which it is so often held and acquired. And,—

"7. That great trouble, vast expense, utter uncertainty, capricious charges, and local and general evils exist, while no means are supplied to obtain the information other countries possess, and justly value, as to the state of disease, the operation of moral and physical causes on the health of the people, the progress of population, and other matters on which accurate knowledge can scarcely be too highly appreciated or too intensely pursued."

The committee further recommended that, as a remedy for the defects before mentioned, "a national civil registration of births, marriages, and deaths should be established," including "all ranks of society, and religionists of every class."

In pursuance of these recommendations, measures for effecting a better registration were laid before Parliament; and in August 1836 the act for registering births, deaths, and marriages in England, and the act for marriages in England, became law. Their operation was suspended for a limited time by the act of 7 Will. IV., c. 1, and they were amended by the act of 1 Vict., c. 22, and thus amended they came into operation on the 1st of July 1837.

These acts leave untouched the act of 1812, so far as it relates to the registration of baptisms and burials, but repeal what relates to the registration of marriages, and provide a new registration of marriages, of *births*, and of *deaths*.

Existing registration of births, deaths, and marriages.

The circumstances recorded in the register-book under the existing law are, in case of *birth*, the time and place; the name, if any; sex; name and surname of father; name and maiden surname of mother; rank or profession of father; signature, description, and residence of the informant; and the baptismal name, if added after registration of birth. In case of *death*, the time and place; name and surname; sex; age; rank or profession; *cause of death;* signature, description, and residence of the informant. Every entry must be signed by the informant and by the registrar, who discharges this duty without any immediate expense to the parties requiring registration, but is remunerated by a moderate fee on each entry paid quarterly out of the poor-rates. The *informant*, in a case of *birth*, must be one of the parents, or the occupier of the house or tenement in which the child was born; or, if it be a foundling, the overseer of the poor. In a case of *death*, it must be some person present at the death, or in attendance during the last illness; or, in default of such person, the occupier, or, in default of the occupier, an inmate of the house in which the death occurred; or, if there be an inquest, the coroner. There is no legal obligation upon any one to give notice of a birth or a death to the registrar; the only obligation upon these parties is to give the required particulars, and to sign the register *on being requested so to do;* and without such signature no birth or death can be duly registered except in cases of inquest.

The form for registration of marriages, applicable alike to all religious denominations, records the place and time of marriage; names and surnames of the parties; whether they are of full age or minors; their civil condition (that is, whether bachelor or spinster, widower or widow); their rank or profession; residence at the time of marriage; father's name and surname; rank or profession of father; by what rites and ceremonies, after what preliminary forms (that is, whether license, banns, or certificate), and by whom solemnized; the entry must also contain the signatures of the parties and of two witnesses.

One of the most important circumstances not previously recorded, for which provision is made in the present register, is the "cause of death," to which a column is assigned in the registers of death, and where it is exhibited in juxtaposition with the period, locality, sex, age, and occupation, thus affording valuable data of the highest importance to medical science. In order to attain the utmost accuracy in the returns of the causes of death, the co-operation of medical practitioners in England and Wales has been invited, and the president of the Royal College of Physicians, the president of the Royal College of Surgeons, and the master of the Society of Apothecaries have recommended "that every practising member of any branch of the medical profession who may have been present at the death, or in attendance during the last illness of any person, shall, immediately after such death, place in the hands of such other persons as were in attendance, or of the occupier of the house in which the death occurred, or of some inmate who may probably be required to give information, a *written statement of the cause of death*, which such persons may show to the registrar, and give as their information on that subject."

In order that fatal diseases may be recorded in one uniform manner, the registrar-general furnishes all qualified medical practitioners, amounting to about 13,000, with books of printed forms of "certificates of cause of death," to be filled up and given to registrars of births and deaths; and he has circulated a nosological table of diseases for the purpose of securing, as far as possible, uniformity of nomenclature in the medical certificates.

General Register Office.

The registration system now in force is peculiarly distinguished from other previous measures on that subject, by the provision of a central office in London, called the General Register Office, for the deposit of certified copies of all registers, and general superintendence over everything relating to registration. This office, which is established at Somerset House, London, is presided over by an officer named the Registrar-General, appointed under the great seal, under whom are a chief clerk (who acts as secretary and assistant registrar-general), six superintendents, and a staff of clerks, who are appointed by the lords of the Treasury. Instructions emanate from the central office to all the local officers charged with the various duties of registration under this act, namely, superintendent registrars, registrars of births and deaths, and registrars of marriages, with their respective deputies, all of whom act within their several districts under the directions of the registrar-general, in whom is vested the power of dismissal.

Registrar-General.

The registrar-general is charged with the direction and superintendence of the entire system, every part of which is subject to his control and responsibility. He also executes various other duties under different acts of Parliament, in addition to those imposed upon him by the Registration Act. Among these may be mentioned the certifying of Nonconformist places of worship, the register of which he keeps; the execution of the provisions of the Compulsory Vaccination Act; the preservation and indexing of registers of marriages solemnized before British consuls abroad, and of marriages celebrated in India; the preparation of returns of mortality in towns, &c., under the Public Health Act; and the custody of the non-parochial registers authenticated by royal commissions in 1836 and 1857. He was also charged with the duty of taking the last decennial census (1851); and as the objects of that important work, and the machinery employed in accomplishing it, are analogous to the ordinary operations of the registration system, it may be presumed that the same course will be adopted on future occasions. The office of registrar-general was held by Thomas Henry Lister, Esq., author of a *Life of Clarendon*, and other literary productions, to June 1842, since which period it has been filled by George Graham, Esq.

Superintendent registrars.

The superintendent-registrar is a local officer created by the registration and marriage acts, acting solely within his district, which is usually identical with a poor-law union, in which case he is either the clerk of the guardians, who, as such, is entitled *ex officio* to take the office, or he is some person whom, the clerk not accepting, the guardians may have appointed, subject in either case to such qualifications as the registrar-general may by any general rule require.

The principal duty of this officer is to receive quarterly, from the registrars of births and deaths and registrars of marriages within his district, the certified copies of births, deaths, and marriages registered by them for the preceding quarter, and, having verified them by comparison with the original entries in the register-books, to certify their correctness, and transmit them to the registrar-general; to receive also and transmit, but not to verify, the certified copies of marriages registered by all clergymen of the Established Church within his district, or by any registering officer of the Quakers, or secretary of a Jewish synagogue, if there be any within or assigned to his district. He has also the care of the register office of his district, where are deposited all register-books within the district when filled; and he is to make indexes of these, and permit searches, and give copies of entries in the register-books, on payment of certain fixed fees. He may appoint registrars of marriage within his district; and the required previous notice having been given, he may grant certificates for marriage, and also licenses for marriage: the latter, however, can only be granted for marriage in a dissenting place of worship or in the district register-office. It is his duty to be present at marriages in the register-office, where no religious ceremony is permitted.

Registrars of births and deaths.

The registrar of births and deaths is a local officer, appointed in poor-law unions by the board of guardians. His duties are to register, in the books provided for that purpose, the births and deaths occurring within his sub-district; and four times in every year to make, on forms furnished for that purpose, copies of the entries, and to deliver them to the superintendent registrar of his district, who, on comparing them with the register-book, will certify their correctness, and transmit them to the registrar-general. He also delivers an account of the number of entries so copied, which the superintendent registrar verifies, if correct, to enable the registrar to obtain payment of the fees due thereupon from the guardians or overseers of the poor. Registrars of births and deaths are registrars of successful vaccinations, under the Act of 16 and 17 Vict., c. 100.

Registrars of marriages.

The registrar of marriages is a local officer appointed by the superintendent-registrar, and acts solely within his district, which is the same as that of the superintendent-registrar by whom he was appointed. His duty is to be present at and to register marriages not according to the forms of the Church of England, solemnized either in registered places of worship or in the district register office; and to deliver quarterly to the superintendent-registrar certified copies of such entries, in like manner as is done by the registrar of births and deaths.

Marriages, according to the forms of the Established Church, are registered by the officiating clergyman, who delivers certified copies quarterly to the superintendent-registrar of his district, to be transmitted to the registrar-general. The marriages are registered at the time *in duplicate;* and one of the books, when filled, is deposited in the district register office.

Marriages, according to the ceremonies of the Quakers and of the Jews, are registered respectively in duplicate by the registering officer of the Quakers and the secretary of the synagogue, and certified copies are given quarterly to the superintendent-registrar for transmission.

Number of registration officers, &c.

The number of persons by whom the registration of births, deaths, and marriages under the existing law is conducted (exclusive of the central establishment of the General Register Office) is as follows:—

There are 630 superintendent-registrars, each of whom may appoint a deputy, with the approval of the registrar-general, to act for him in case of his illness or absence. Of these, 586 have accepted the office as clerks of boards of guardians, or have been appointed by the guardians; and 44 are temporary, and have been appointed by the registrar-general.

There are 2197 registrars of births and deaths, each of whom may appoint a deputy, and of this number 2055 are appointed by the guardians established under the Poor-Law Amendment Act, and 142 are registrars of temporary districts, appointed by the Poor-Law Board.

The number of registrars of marriages on the 31st of December 1858 was 1250, each of whom may appoint a deputy; of these about one-half are also registrars of births and deaths. The number of other persons by whom registration of marriage is effected is as follows:—1*st*, 12,332 officiating ministers of the Established Church, to whom register-books have been furnished; 2*d*, 86 registering officers of Quakers; 3*d*, 47 secretaries of synagogues. All these are in communication with the registrar-general with respect to the duties of registration.

The 630 superintendent-registrars' districts, which are in general co-extensive with poor-law unions, vary greatly in population and extent. On an average, each district comprises three or four sub-districts, 26 parishes or places, 28,700 persons (census of 1851), and 59,800 statute acres. The 2197 sub-districts have each on an average 7 parishes or places, 8200 population, and 17,000 acres.

Registration districts.

Inspectors of registration.

Two inspectors are constantly employed in visiting every district into which England has been divided, for the purpose of instituting a searching inquiry as to the mode in which the responsible duties entrusted to the various registration officers are performed. The inspectors personally visit and instruct in each particular of their duties the registrars of births and deaths and of marriages, scrutinizing the register-books in use, and pointing out any erroneous practices they may discover; they likewise visit the district register-offices, and ascertain that the regulations issued for the guidance of superintendent-registrars are adhered to. At the end of each week the inspectors report to the registrar-general the result of their inquiries.

Deposit, arrangement, examination, and indexing of certified copies.

One of the most important features of the present system is the provision, that certified copies shall be deposited quarterly in the General Register Office in London, there to be arranged and indexed for facility of reference; a provision, by means of which a copy of an entry of any registered birth, death, or marriage, in any part of England or Wales, may be obtained by application at a single office, at the trifling cost of 3s. 6d., which includes the fee for search.

The certified copies thus transmitted from the clergy, registrars, registering officers, and secretaries (amounting together to more than 16,000 persons), are all made on separate leaves of durable paper, of an uniform size and peculiar texture, having a distinguishing water-mark for the prevention of forgery, and furnished by the registrar-general to every one of the foregoing persons, on whom the duty of registration devolves. They are sent by the superintendent-registrars by the post, each class of return (*i.e.*, birth, death, and marriage) being sent separate, and in a cover denoting by a mark the nature of the contents, and bearing the name of the district to which it belongs.

On their reception at the central office they are arranged and examined *seriatim*, and all defects are noted; and letters on the subject of such defects as are of any importance are addressed to the persons from whom the defective copies come, and who are required to furnish either other copies or such explanations as may remove doubt. The copies are then paged, and bound up in volumes for reference.

Means of immediate reference to any one of the entries of births, deaths, and marriages deposited in the General Register Office are provided in the alphabetical indexes which are made there. This vast work, far exceeding in magnitude anything of a similar kind ever before attempted in this country, is performed in the following manner:—The few particulars requisite for the index are copied from each entry *seriatim* on forms prepared for that purpose. These, after having been checked, are cut into separate slips, each containing the reference to one entry; and the slips are then sorted and arranged alphabetically on files, from whence they are then taken off one by one by the indexing clerks, and the contents of each copied into the index. In this manner about a million and a quarter of names are now indexed alphabetically in the course of each year, the processes of transcribing, sorting, and indexing being performed by nineteen persons, most of whom are paid by piece-work. After the lapse of a reasonable time for the completion of the arrangements referred to, the entry of any marriage, birth, or death which has been registered can generally, on the mere mention of the name, without intimation of the exact date or of the part of the kingdom in which it occurred, be very soon discovered, and a certified copy given; which copy, being stamped with the official seal, will be "received as evidence of the birth, death, or marriage to which the same relates, without any further or other proof of such entry." Thus not only are means afforded of obtaining for legal purposes, by application at one central office, certified copies of registers from every part of England and Wales, but the copies so obtained have the additional advantage of being sufficient evidence, without an affidavit, of their being correct, which is often required for the confirmation of extracts given from such registers.

Extent of the registration indexes.

The alphabetical indexes prepared in the General Register Office comprised, at the end of the year 1858, no less than 26,600,392 names,—viz., 6,083,906 of persons married, 12,209,383 of children born, and 8,307,103 of persons who died in the 20½ years from 1st July 1837, when the present law came into operation. The following table exhibits the yearly additions to the registers and indexes during this period:—

I. *Marriages, Births, and Deaths registered in England and Wales from July* 1, 1837, *to Dec.* 31, 1858.

Year.	Marriages.		Births.	Deaths.	Total of Names entered in the Registers and Indexes.
	Number.	Persons Married.			
1837*........	58,479	116,958	164,116	148,701	429,775
1838........	118,067	236,134	463,787	342,760	1,042.681
1839........	123,166	246,332	492,574	338,984	1,077,890
1840........	122,665	245,330	502,303	359,687	1,107,320
1841........	122,496	244,992	512,158	343,847	1,100,997
1842........	118,825	237,650	517,739	349,519	1,104,908
1843........	123,818	247,636	527,325	346,445	1,121,406
1844........	132,249	264,498	540,763	356,933	1,162,194
1845........	143,743	287,486	543,521	349,366	1,180,373
1846........	145,664	291,328	572,625	390,315	1,254,268
1847........	135,845	271,690	539,965	423,304	1,234.959
1848........	138,230	276,460	563.059	399,833	1,239,352
1849........	141,883	283,766	578,159	440,839	1,302.764
1850........	152,744	305,488	593,422	368,995	1,267,905
1851........	154,206	308,412	615,865	395.396	1,319,673
1852........	158,782	317,564	624,012	407,135	1,348,711
1853........	164,520	329,040	612,391	421,097	1,362,528
1854........	159,727	319,454	634,405	437,905	1,391,764
1855........	152,113	304,226	635,043	425,703	1,364,972
1856........	159,337	318,674	657,453	390,506	1,366,633
1857........	159,097	318,194	663,071	419,815	1,401,080
1858........	156,297	312,594	655,627	450,018	1,418,239
Total in 20½ yrs.	3,041,953	6,083,906	12,209,383	8,307,103	26,600,392

* Half-year from July 1, 1837, when operation of act commenced.

Facts relating to surnames deduced from the indexes.

From these extensive nominal lists of the immediate subjects of one or more of the events of birth, death, and marriage, many interesting facts have been derived with respect to the family or personal nomenclature of the people—a subject which has engaged the attention of antiquaries and others, who have discovered much that is illustrative of the early condition, customs, and employments of the inhabitants of this country in the names which have been handed down from bygone generations. A striking circumstance connected with this subject is the extraordinary number and variety of the surnames found to exist in England. The indexes of the births and deaths registered in a single quarter, after a careful elimination of all duplicates, were found to yield together 32,818 *different* surnames out of 275,405 entries; and from this result it is estimated that between 35,000 and 40,000 different surnames exist in England and Wales. This number is probably below the truth; at least, it is clear that by the introduction of the fresh names of foreigners and immigrants, and the corruption of existing names amongst the illiterate, the number is constantly increasing.

The acquisition of a particular surname was the result in most cases of arbitrary circumstances affecting the individual who first bore it; for instance, John *Smith*, instead of being called after his occupation, might equally have chanced to become John *Johnson*, from his father's Christian name; or John *Brown*, from his tawny complexion; or John *Hill*, from the local position of his abode. But the curious question arises, whether the surnames which have attained so remarkable a predominance over others owe this wholly to their original numerical importance, or whether any circumstances acting upon the ordinary laws of increase, have caused the descendants of their first possessors to multiply at a faster rate than the bearers of other names. The indexes have determined one point—namely, the surnames which have acquired the strongest hold on the people. The following list of 50 of the most common surnames—embracing 18 in every 100 persons registered—is derived from 25 quarterly indexes (9 of births, 8 of deaths, and 8 of marriages); and the probable number of persons in England and Wales of each surname is computed from the indexes of 1853:—

Common surnames.

II. *Fifty of the most common Surnames in England and Wales, and Estimated Number of Persons bearing each Surname in the Year* 1853.

Surnames.	Estimated Number of Persons of each Surname in 1853.	Of the entire Population, one in	Surnames.	Estimated Number of Persons of each Surname in 1853.	Of the entire Population, one in	Surnames.	Estimated Number of Persons of each Surname in 1853.	Of the entire Population, one in
1. Smith	253,600	73	18. Walker ...	59,300	310	35. James	43,100	427
2. Jones......	242,100	76	19. Hughes ...	59,000	312	36. King	42,300	435
3. Williams .	159,900	115	20. Edwards ..	58,100	316	37. Morgan ...	41,000	449
4. Taylor	124,400	148	21. Lewis	58,000	318	38. Allen......	40,500	454
5. Davies	113,600	162	22. White	56,900	323	39. Moore	39,300	468
6. Brown	105,600	174	23. Turner	56,300	327	40. Parker.....	39,100	471
7. Thomas ...	94,000	196	24. Jackson...	55,800	330	41. Clarke	38,100	483
8. Evans	93,000	198	25. Hill	52,200	352	42. Cook.......	38,100	483
9. Roberts ...	78,400	235	26. Harris	51,900	355	43. Price	37,900	486
10. Johnson...	69,500	265	27. Clark	50,700	363	44. Phillips...	37,900	486
11. Wilson....	66,800	275	28. Cooper	48,400	380	45. Shaw	36,500	504
12. Robinson	66,700	276	29. Harrison ..	47,200	390	46. Bennett...	35,800	514
13. Wright ...	62,700	293	30. Ward......	45,700	402	47. Lee	35,200	523
14. Wood......	61,200	301	31. Martin.....	43,900	420	48. Watson ...	34,800	529
15. Thompson	60,600	304	32. Davis......	43,700	421	49. Griffiths...	34,800	529
16. Hall	60,400	305	33. Baker	43,600	422	50. Carter	33,400	551
17. Green	59,400	310	34. Morris	43,400	424	Total.........	3,253,800	5·7

Thus nearly one-sixth of the entries in the indexes relate to persons of these fifty surnames. The three at the head of the list, *Smith*, *Jones*, and *Williams*, are greatly in advance of the others; and so numerous are the great tribes bearing these names, that on an average one person in every 28 of the population would answer to one or other of them. *Smith* is pre-eminently the most common *English* surname, but that of *Jones*, from its frequency in Wales, not only competes for priority in point of numbers with the *Smiths*, but in several years contributes a larger number to the indexes. The following table exhibits—

III. *Number of Entries of the respective Surnames of Smith and Jones in the Registration Indexes*, 1838–54.

Year.	Entries in the Indexes of the Surname of		Difference.	
	Smith.	Jones.	More Smiths than Joneses.	More Joneses than Smiths.
1838...........	14,891	14,414	477	...
1839...........	14,905	15,096	...	191
1840...........	15,483	16,256	...	773
1841...........	15,237	15,539	...	302
1842...........	15,315	15,437	...	122
1843...........	15,841	15,554	287	...
1844...........	16,203	15,932	271	...
1845...........	16,633	16,676	...	43
1846...........	17,299	17,177	122	...
1847...........	16,917	17,296	...	379
1848...........	17,313	16,958	355	...
1849...........	18,091	17,677	414	...
1850...........	17,405	17,135	270	...
1851...........	18,156	17,525	631	...
1852...........	18,564	17,649	915	...
1853...........	18,775	17,926	849	...
1854...........	19,000	18,653	356	...
Total.........	286,037	282,900	4947	1810

The result of this tabular view of the relative frequency of these widely-spread surnames in the indexes of the years 1838–54, is an excess of 3137 *Smiths* in the seventeen years, but in six of the years the *Joneses* were more numerous than the *Smiths*; together, they furnish no less than 568,937 entries, or 1 in 36 of the whole number recorded. Thus it appears that, while *Smith* is the most generally diffused of English surnames, *Jones* is considerably superior to *Smith* in point of local distribution.

These large alphabetical lists of surnames have also determined the proportionate number occurring under each *initial letter*—a fact which may not be without interest to the philologist. The letter B is, it seems, the most frequent initial of surnames in England, comprising more than a tenth of the whole; next in number are the surnames ranked under the letter H (9·5 per cent.); then those under S and W (8·9 and 8·7 per cent.) The vowels are not of extensive occurrence as initial letters of surnames, although the contrary is the case with respect to the ordinary words of the English language. Other curious particulars, including a list of singular surnames met with in the indexes, will be found in the Sixteenth Annual Report of the Registrar-General.

Results of registration; vital statistics.

Although the primary object of registration is to furnish the means of establishing descent, and thereby to facilitate the legal distribution of property, it answers several other public purposes not less important. The expectations of those who predicted that from this system of observation and record materials would be derived of vast importance to the science of vital statistics have not been disappointed. No other country now possesses so extensive a collection of digested facts illustrative of the laws of mortality, the progress of population, and the influence of locality, occupation, seasons, and other physical causes upon the health of the people. The task of analysing the registered causes of death, and of collecting and arranging the important statistical materials deducible from the registers of births and marriages, as well as of deaths, has been committed to Dr William Farr.

Sanitary measures.

Before the results of the researches conducted by Dr Farr were published in the reports of the registrar-general, scarcely any attention was given to measures for the promotion of the public health. Dr Southwood Smith and others had indeed strongly urged the necessity for attending to the conditions essential to the preservation of health in towns, but it remained for the registration system to furnish the fundamental facts which led to a practical recognition of the importance of the question. The influences arrayed against sanitary legislation were powerful, and the general want of knowledge on the subject served to encourage the opposition with which it was assailed by vested interests. It was impossible, however, to disregard or controvert the facts and statistical calculations contained in the registrar-general's reports, in which it was shown that certain districts were infested with epidemics constantly recurring, while others enjoyed a comparative immunity; and that people suffered most in town districts where the causes of insalubrity operated with greater force than in other parts of the country. The excess of mortality in unhealthy districts, as compared with other localities, was unhesitatingly ascribed to artificial and preventible causes, producing "unnatural deaths" and inflicting material loss on the nation. With wealth, industry, and science at command, it was urged that means could be found to check the waste of life and health, and the evils resulting from men being cut off from their country and mankind before their time. In the year 1845 the first general enactment for enforcing measures of sanitary improvement passed the legislature; and by several subsequent acts extensive powers have been granted for the same purpose. Able and intelligent officers of health have been appointed in the metropolis, Liverpool, and most of the principal towns; extensive drainage works have been undertaken; and an improved water supply obtained. It cannot be doubted that these and other measures adopted to improve the public health are calculated to effect an amelioration in the physical condition of the inhabitants of this country.

Annual reports.

The annual reports of the registrar-general, of which nineteen have been laid before Parliament, form a valuable store-house of information upon the various subjects connected with vital statistics. Besides detailed abstracts for each year of the marriages, births, and deaths, tables of the fatal diseases, classified in combination with ages, are given, and comments upon the salient points of the year's registration accompany the whole. With regard to the marriages, a great number of statistical details are published, showing whether according or *not* according to the rites of the Established Church, the preliminary form (whether banns, license, or certificate), the civil condition of the parties, their ages, and whether they signed the marriage-register by writing their names or by making marks. The latter fact is not without interest, as throwing light upon the state of elementary education in England some fifteen years before; and it is grievous to find from this test that in the year 1857, of 100 men married, 28 could not write their names; of 100 women married, 39 signed with marks. No less than 30,518 marriages were celebrated in that year in which both the husband and the wife signed with marks; so that it may be inferred that an equal number of families would be founded in which neither the father nor the mother could read and write. In this respect, however, England cannot be unfavourably contrasted with France, for it is a curious fact that, exclusive of the metropolitan cities in the two countries, nearly the same proportion (34 in every 100) of the men who marry sign the register with marks; while the French women are even less versed in writing than English women, for of 100 women married, 55 in France, against 48 in England, did not write their names. These proportions, which are for the year 1853, are deplorably high, and show how much has to be done to convey the first rudiments of instruction to the great body of the people in two of the most enlightened nations of the world. In the abstract of births, those of children born out of wedlock are distinguished. All these particulars relating to marriages and births are given for each of the registration districts, counties, and divisions of England and Wales. The causes of death in each year are returned in detailed tables and discussed by Dr Farr, who has also, in occasional papers which have appeared in the reports, treated of the construction of life tables, the English life table and its uses, the principles of a statistical nosology, violent deaths in England, and many other subjects connected with vital statistics. These various practical applications of the facts shown in the abstracts are of great value and interest. An elaborate report on the cholera epidemic of 1849 has also been printed in a separate form.

From the annual reports of the registrar-general it appears that the mean annual rate of marriage in England is 8 *marriages*, or 16 *persons married*, to every 1000 persons living,—or one person in 61 of the population is married annually; there are 33 *births* to every 1000 persons living, or 1 birth in 30 of the population; and 22 *deaths* to 1000 persons living, or one death in 45 of the population. The marriage-rate was highest in the years 1845, 1846, 1850, and four following years, in all of which it exceeded 85 marriages to 1000 persons living; it was lowest in 1842 and 1843, when it fell below 76 per 1000. The birth-rate was highest (over 34 per 1000) in 1851, 1852, 1856, and 1857; and lowest in the earlier years of registration, when many births were unrecorded. Fluctuations in the death-rate are mainly influenced by epidemics, and by the varying temperatures of different years. In 1849 and 1854, years in which cholera greatly increased the mortality in this country, the rates were 25 and 23·5 per 1000; in 1847, when influenza prevailed epidemically, the rate was 24·7 per 1000. Amongst the healthiest years were 1845, 1850, and 1856, in each of which the rate of mortality was below 21 per 1000.

Quarterly and weekly reports.

About thirty days after the termination ot each quarter a return is published showing the number of births and deaths registered in the quarter in each of the 630 superintendent-registrars' districts in England and Wales, derived from statements sent to the central office by the 2197 registrars of births and deaths; the number of marriages is stated for the preceding three months. This return also comprises tables exhibiting the progress of population, emigration, the average prices of the funds and provisions, with meteorological observations taken at stations in different parts of the country under the supervision of Mr Glaisher; the whole is accompanied with remarks, in which the facts are generalized, and inferences drawn on points to which it is desirable that public attention should be directed. These quarterly reports have been continued since the year 1842; in the first instance, however, they referred only to the more populous districts, and not to the whole of England as at present.

Weekly reports.

Since the commencement of the year 1840 a report relating to London has been printed on the Tuesday in each week, compiled from returns received at the General Register Office on the preceding Monday. The metropolitan registrars who furnish these returns are 136 in number; they extract from the death register-books certain particulars respecting all the deaths registered in the week ending Saturday night, and state the total number of births registered. In this manner, early and accurate information is obtained with respect to the causes affecting the mortality of an aggregated town population, which amounted in 1851 to 2,362,236, the largest of which there is any reliable account. Remarks on the most noteworthy facts accompany the return, and the meteorology of the week, as observed at the Royal Observatory, Greenwich, is given. During the height of the cholera epidemics of 1849 and 1854 the registrars in London transmitted to the registrar-general *daily* returns of the deaths in their respective sub-districts.

Cost of registration.

The cost to the country of the registration system in force in England and Wales is now about L.100,000 a year, of which sum about L.65,000 are defrayed from the poor-rates for registrars' fees; and the remainder—consisting of L.18,000, for the central establishment, and L.17,000 for fees to superintendent-registrars and expenses of registration officers—is defrayed out of the public revenue. The portion of the expenditure paid from the national exchequer is annually voted by Parliament.

Defects of the system.

It is to be regretted that a machinery entailing so large an expense on the public is in some of its details marred by defects which render its operation unsatisfactory. In the first place, the registration of *births* is incomplete; for although the preamble of the act of William IV. sets forth the expediency of establishing and maintaining "a complete and uniform system of registration of births," &c., no obligation is imposed upon any one to give notice of a birth to the registrar. As a consequence of this laxity in the law many births pass altogether unrecorded, especially in large towns and amongst the poor. The registrar-general, in his Sixth Annual Report (1844), thus refers to the results of this omission in the act,—"At present I am well aware that many thousands of births annually escape registration; increased exertions on the part of the registrars may effect much; but in my opinion *all* the births will not be registered until by law it be made compulsory on the father or mother, or some other qualified informant, to give notice within a fixed period to the registrar of a birth having occurred, under a small penalty to be inflicted on default of giving such notice." This statement was made to the secretary of state nearly fifteen years ago, but no remedy has yet been applied, although under the provisions of the Compulsory Vaccination Act of 1854, the penalty for neglect of vaccination can only be enforced after due notice has been given by the registrar to the parents of the child on the registration of its birth. In order to make the first movement in the machinery of this statute universal, it is obvious that the penalty ought to be extended to the neglect of registering the birth.

The next defect of the English registration system is the absence of effectual precautionary measures against fabricated and fraudulent entries. Any person who has a sufficient motive for so doing has but to go to the house of the registrar and profess to give information of a birth or a death, and, by inventing consistent particulars, he may procure the insertion in the register of a purely fictitious entry, merely signing his name or making his mark as informant. In the memorable case of "Regina *v.* Barber, Fletcher, and others," a fraud to a considerable extent was effected on the Bank of England by means of a forged will, and a certified copy of a false entry of the pretended death of one Ann Slack. Besides the frauds committed by informants, several instances have occurred in which, for the sake of increasing their fees, registrars have fabricated entries on a very large scale; and similar frauds on a smaller scale may be carried on in town districts almost with impunity.

Obvious remedies.

After twenty years' experience of the working of the present system, the application of a remedy to these defects could not be a very difficult matter. Some additional checks are obviously required for the prevention of fictitious and fraudulent entries. If, in the case of births, the register were attested by another witness besides the informant, such as the accoucheur or mid-wife, or some other person assisting at the birth,—and, in the case of deaths, the register were to contain an authenticated statement of the fact of *burial* as well as of the *cause of death*, inserted from the certificates of authorized parties,—these guarantees would interpose great difficulties in the way of frauds. A compulsory enactment, making it incumbent on all who are present at a birth or a death, and the occupier of the house in which it takes place, to give notice of the fact to the registrar, would ensure *complete* resignation. The schedules are also susceptible of considerable improvement. The following schedules, compiled by a committee of the Statistical Society of London from the schedules of other states in which registration is practised, are given as models; the information provided for in the English schedules is indicated by the words printed in *italics*:—

Schedule A.—Marriages.

COUNTY, *Middlesex*; DISTRICT, *Marylebone*.—1847. Marriages solemnized at *the Parish Church*, in the Parish of *Marylebone*.

No.	When, where, and how Married.	Names and Signatures of the Parties.	Residence.		Age.	Rank or Profession.	Condition.			Birth-place.	Parents.		Witnesses and Officiating Minister.
			Present.	Usual.			If a Widower or Widow, date of decease of former Wives or Husbands.	Children by each former Marriage. Living.	Children by each former Marriage. Dead.		Name.	Rank or Profession.	
124	On *March* 3, 1847, at *Marylebone Parish Church.* Marriage, after *banns*, was solemnized between us according to the rites and ceremonies of the Established Church.	*William Hastings.*	3 *South Street, Marylebone.*	Chelmsford, Essex.	32	*Carpenter.*	*Widower*, 4th Nov. 1840.	2	1	Bristol.	*Peter Hastings*, deceased, and Ann Hastings (maiden name, Payne).	*Upholsterer.*	*John Hastings, Jane Mitchell*, witnesses. *James Hollingshead, Curate*, officiating minister.
		Sophia Ann Mitchell.	17 *High Street, Marylebone.*	17 High Street, Marylebone.	20	*Dressmaker.*	*Spinster.*			Longbridge, Deverell, Wilts.	*Geoffrey Mitchell*, and Sarah Mitchell (maiden name, Evans), deceased.	*Butcher.*	

Schedule B.—Births.

COUNTY, *Middlesex*; DISTRICT, *St Pancras*; SUB-DISTRICT, *Tottenham Court.*

CHILD.					PARENTS.			INFORMANTS.	WITNESSES.	
					Father.		Mother.			
No.	Name, and whether produced or not.	Sex.	When Born: Year—day—hour.	Where born: If in lodgings, so stated.	Name, Rank or Profession, Age, Birthplace.	When and where married. Issue, living and deceased.	Name, Maiden Name, Rank or Profession, Age, Birthplace.	Signatures of Father and Mother, and other Informants, and where residing, if out of the house in which the Birth occurred.	Accoucheur, Nurse, by whom certified, and Signatures of Occupier or other Witnesses.	When, where, and by whom Registered.
98	*William Jones* (produced); *alteration of name, if any, and date thereof.*	*Male.*	1847. *February eleventh,* 5h. 30m. A.M.	169 *Tottenham Court Road.*	*Henry Jones, corn-dealer,* 40, Tingewick, Bucks.	1830, St Pancras. 2 boys, 2 girls, living; 1 girl dead.	*Harriet Jones, maiden name Hills* (her 5th child), 37 St Pancras.	*Henry Jones,* father; *Harriet Jones,* mother.	Ann Curry, nurse, witness. Certified by M. Clayton, accoucheur.	1847, *March* 10, at 169 Tottenham Court Road; *John Wells, Registrar.*

Schedule C.—Deaths.

COUNTY, *Middlesex*; DISTRICT, *Poplar*; SUB-DISTRICT, *Poplar.*

No.	(1.) Name.—(2.) Rank or Profession.	Sex.	Age.	(1.) When and (2.) where died, year—day—hour.	(1.) Cause of Death, and Duration of Disease.—(2.) Medical Attendant by whom Certified; when he last saw Deceased.	(1.) Burial-Place.—(2.) Undertaker by whom Certified.	Where born, and how long in this District.	(1.) Parents' Names, and (2.) Rank or Profession.	If Deceased was Married,		Signatures of (1.) Informant, (2.) Witness, and (3.) Registrar; (4.) Date of Registration.
									Where, at what age, and by whom.	Issue, in order of Birth, their Names and Ages.	
176	*William Canty, dock-labourer.*	*Male*	62	1847, *February twenty-eight, at* 16 *Cottage Row.* 6½h. A.M.	*Pneumonia,* 2 *months,* as certified by H. Bloomfield, M.D., who last saw deceased Feb. 27th.	Catholic burial-ground, Wade Street, as certified by M. Rutley, undertaker.	County of Cork, Ireland; 36 years in Poplar.	Timothy Canty, shoemaker, deceased; Mary Canty (m. n. Nicolas), deceased.	Scrill parish, Ireland, at age 22, to Honora M'Carty.	1, Timothy, 31—2, William, 30—3, Mary, 29—4, John, dec. at 27 in 1846—5, Catherine, 21.	*Honora Canty, widow,* informant; Mary Canty, daughter, witness; *T. W. Gagen, registrar, March third,* 1847.

In order to determine whether any practical difficulties would be found in eliciting for registration the various facts required in these schedules, experiments were made in several parts of London, and it was found that all the information was furnished without objection by the parties applied to; and the committee of the Statistical Society considered that no insuperable difficulties existed in the way of carrying out such a plan on a national scale.

Parochial registers.

It is stated in the preface to the Population Abstract for 1831, as the result of an inquiry respecting parochial registers in England, "that eight hundred and twelve English parish registers commence in the year 1538, about forty of which contain entries (copied probably from family Bibles and tomb-stones), anterior to the date of Cromwell's injunction; 1822 parish registers commence from A.D. 1538 to 1558, when Queen Elizabeth required a protestation from the clergy; 2448 parish registers commence from A.D. 1558 to 1603, when the canons authorized by King James directed a copy of all extant parish registers to be made and preserved; and nearly one-half of them (5082) have been preserved accordingly, and are now extant. Parish registers to the number of 969 commence between that time to the year 1650; 2757 from A.D. 1650 to 1700; 1476 parish registers from A.D. 1700 to the year 1750; the rest (six or seven hundred) since that time.

Non-parochial registers.

In addition to the registers heretofore and now kept under the sanction of ordinances and acts of Parliament, there is a vast number of non-parochial registers and records of marriages, births and baptisms, deaths or burials, which have been kept in some instances from a very remote period by various dissenting congregations, and in many cases with great care and correctness, but in no form prescribed by authority and under no legal sanction, and which were therefore not admitted in evidence as registers in courts of justice.

In September 1836 a commission was issued, directing certain commissioners to inquire into the state, custody, and authenticity of such registers or records; "and to inquire whether any or what measures could be beneficially adopted for collecting and arranging all or any of such registers or records, and for depositing the same, or copies thereof in the office of the registrar-general of births, deaths, and marriages, or for otherwise preserving the same; and also to consider and advise the proper measures to be adopted for giving full force and effect in evidence, in all courts of justice, to all such registers as might be found accurate and faithful, and for facilitating the production and reception of the same." From the report of the commissioners of the result of their labours, it appears that about 7000 non-parochial registers were transmitted to them for inspection, from 3630 religious congregations, namely,—

Foreign Protestant churches	37
Presbyterians, Independents, and Baptists	2264
Wesleyan Methodists	818
Moravians	10
Lady Huntingdon's Connection	44
Calvinistic Methodists	436
Swedenborgians	21
Total	3630

"Each of these registers," says the Report, "was authenticated by a certificate under the signature of the minister, or of some officer of the church or denomination, from whom it was received; and this certificate was generally accompanied by answers to the questions which had been circulated by the commissioners." After being "classed in lists according to the several counties in England and

Wales, and entered in a book, with a careful annotation of any particulars applicable to their state or custody," they were "submitted to the inspection of the board, by whom the question as to their admissibility was discussed and recorded; and in every instance the chairman, or the commissioner representing the chairman, authenticated such inspection and examination, by affixing his initials to the first and last entry in each register; or if some parts of the register appeared to be copies, or not to bear marks of authenticity, he affixes his initials to such parts only as were deemed original or authentic." With respect to all such registers as were thus examined and deemed authentic, wholly or in part, the commissioners recommended "that they be kept together in some secure place of deposit, under the care of the registrar-general, or some other officer to be appointed for that purpose, that, under certain conditions, they be receivable in evidence in all courts of justice;" and that the authorized custos of these registers should permit searches, and grant certified extracts, on payment of moderate fees.

These several recommendations were embodied in an act of Parliament, passed in 1840, "for enabling courts of justice to admit non-parochial registers as evidence of births or baptisms, deaths or burials, and marriages" (3 and 4 Vict., c. 92); and, pursuant to its provisions, the registers have been placed in the custody of the registrar-general, by whom searches are permitted, and certified copies granted. The Society of Friends having discovered in different parts of the country a considerable number of registers which had been overlooked when the others were collected, were naturally anxious to secure an extension to them of benefits similar to those conferred by the act above cited; and to afford the Society, and other religious communities who might be in possession of registers under similar circumstances, an opportunity to effect this object, a second royal commission was issued in 1857 for the purpose of verifying the registers. The general course of proceeding adopted by this commission was the same as on the former occasion, and 303 register-books were, after examination and inquiry, reported upon as fit to be received into the custody of the registrar-general. By an act which passed in 1858, these additional registers were placed on the same footing as the other non-parochial records.

Registration in Scotland.

The institution of parish registers in SCOTLAND dates from the year 1551, when, amongst other new canons enacted by the provincial council of Scottish clergy held at Edinburgh, was one establishing parochial registers of baptisms and proclamations of marriage. In this canon no provision was made for any record of burials, but the deficiency was afterwards supplied during the early struggles of the Reformation. In 1616 an act of the Scottish Privy Council ordained that in every parish a book should be kept in which the minister should insert "the tymes and names of the persones to be maryed, and of the bairnes to be baptized, within the said parrochine, with the witnesses of the saidis bairnes, as alswa the names and tymes of personis deceisand within the same;" and the minister or reader, along with two of the kirk-session, in the case of births and marriages, and two persons present at the burial, in the case of deaths, were to subscribe the register-book at the close of the entries of each day. The *Directory for Public Worship*, which was approved by an act of the General Assembly, and also by a statute of the Scottish Parliament in 1645, soon after the re-establishment of Presbyterianism, declares that a register for marriages shall be carefully kept, but contains no similar injunction regarding baptisms and burials. In the year 1746 the General Assembly appears to have found it necessary to pass an act to provide for the registration of *burials*. The records of the church contain no other provisions respecting registration until the year 1816, when the defective state of the parochial registers engaged the attention of the General Assembly, which recommended that the several presbyteries should take the steps necessary to secure the keeping of three separate registers in each parish: one for births, whether the parents of the children belonged to the church or were dissenters; another for marriages, whether legally solemnized or not; and a third for deaths and burials.

Ecclesiastical injunctions having failed to remedy the manifold defects of the system of parochial registration, Lord Rutherford, who then filled the office of Lord Advocate, in the year 1847 brought into Parliament two bills, by one of which it was proposed to alter the law concerning marriages, while the object of the other was to secure the compulsory registration of births, deaths, and marriages. These two bills passed the Upper House, and were read a second time in the House of Commons in the same session, and again in 1848, when they were finally abandoned by the government. With a more successful result, a bill was prepared and introduced into Parliament by Lord Elcho, M.P., one of the lords of the Treasury, to whose persevering efforts his country is indebted for the valuable measure which passed the legislature in 1854, "for the better registration of births, deaths, and marriages in Scotland" (17 and 18 Vict., c. 80).

The provisions of this act—which are in some degree analogous to those of the English acts, but with the necessary adaptations of machinery to the peculiarities of Scottish institutions, and some important improvements—came into full operation on 1st January 1855. A "General Registry Office" is established at Edinburgh, the business of which is conducted by a registrar-general (the deputy for the time being of the lord clerk register) and a secretary, besides clerks and other officers; and local registrars are appointed to act in every parish and burgh. The appointment of registrar in parishes not being burghal is vested in the parochial board; in burghs it is vested in the town-council. The control and superintendence of the registrars within each county devolves upon the sheriff, by whom they may be removed on the application of the parochial board or the registrar-general. It is the duty of the registrar to inform himself of every birth and death within his parish, and to register the same *in duplicate*. In order to assist informants, the registrar is to furnish *gratis* printed forms, setting forth the heads of the particulars required to be recorded. An important provision, the absence of which is one of the defects in the English law, secures the complete registration of births. Within twenty-one days after the occurrence of any birth, the parents or parent, or (in case of their death or inability) the person in charge of the child born, the occupier of the house, and the nurse, are required, under a penalty not exceeding 20s. in case of failure, to *attend personally* upon the registrar, and give information of the particulars of the birth. So also, in the case of deaths, the *nearest relatives present* at the death, and the occupier of the house in which it occurred—and if the occupier should be deceased, then his or her nearest relatives, and the *inmates* of such house—are bound, under a penalty not exceeding 20s. in case of failure, to *attend personally* upon the registrar, and give information concerning the particulars required to be registered. In both cases, one of the parties attending to give information is required to sign the register in duplicate in the presence of the registrar. After the expiry of three months, no birth can be recorded without the authority of the sheriff, by whom also the entry must be signed. In cases of doubt, parents may be required, under a penalty for refusal, to *produce the child* to the registrar.

The genuineness of the registry of death is supported by two important corroborative documents. Within fourteen days after the death, the medical attendant is required, under a penalty not exceeding 40s. in case of failure, to transmit to the registrar a certificate in the form prescribed; and within three days after the interment, the undertaker, under a like penalty for default, is to transmit to the registrar a certificate thereof. The particulars of these certificates are forthwith inserted in the registers.

The Scottish law of marriage and the proclamation of banns are nowise affected by the Registration Act; regular marriages are registered upon the receipt of the proper schedule, duly signed, from the contracting parties, or by the registrar on his attending for that purpose at the solemnization of the marriage. Due provision is made for the registry of irregular marriages.

All registers are required to be kept in duplicate; and after they have been examined, compared, and *docqueted* by the district examiner, one of the duplicates is retained by the registrar, and the other is transmitted to the registrar-general. At the General Registry Office alphabetical indexes of the duplicate registers there deposited are prepared, and any person is entitled to search the indexes on payment of the fee of 1s., and to have an extract of any entry under the hand of the registrar-general, on the payment of the further fee of 2s. *Gratis* searches may be permitted, and *gratis* extracts given to persons of whose inability to pay the registrar-general shall be satisfied.

The following are the numbers of births, deaths, and marriages, registered in Scotland, in each of the four complete years during which the present system has been in operation:—

Marriages, Births, and Deaths registered in Scotland 1855–58.

Year.	Marriages.		Births.	Deaths.
	Number.	Persons Married.		
1855...........	19,690	39,380	93,599	62,249
1856...........	20,487	40,974	101,748	58.456
1857...........	21,314	42,628	103.628	61,925
1858...........	19,603	39,206	104,195	63,532

Of the 104,195 births in the year 1858, 9256 were illegitimate. This gives the proportion of one illegitimate in every eleven births, or 9 per cent.; a proportion much higher than that shown by the English registers, which, however, are incomplete. In Scotland the ratio of births to population rather exceeds that in England; while the ratio of marriages is greatly inferior to it: the mean mortality in Scotland is below that of England.

The annual reports hitherto published consist merely of general abstracts of the numbers of registered births, deaths, and marriages, which the registrar-general is required to transmit to the secretary of state, to be laid before Parliament; the figures are given for Scotland, and for each of the divisions and counties, without comment. A quarterly return is prepared, showing each quarter's registration more in detail, the numbers for the several parishes or districts, as well as for counties and divisions, being given; and a monthly report is made for Glasgow, Edinburgh, and six other principal towns, comprising, in addition to other particulars respecting the results of registration, classified lists of the causes of death at four periods of age.

The schedules annexed to the Registration Act, according to which the registers were to be made, were framed with a view to obtain more comprehensive information than that provided for by the English schedule, and the additional facts to be ascertained on registering a birth, death, or marriage were of importance both for the better identification of the parties, and for the purposes of statistical inquiry. It is to be regretted, however, that under the powers given by the act to the registrar-general to alter the schedules, some of the additional heads of information have been omitted in the register books now in use, the alteration having been made after a very short trial of the schedules annexed to the act.

Registration in Ireland.

The want of a complete measure of registration for Ireland has on various occasions been the subject of representations in Parliament and elsewhere. In the year 1844 an act was passed for the registration of marriages in Ireland (7 and 8 Vict., c. 81); but that statute is obviously imperfect as a measure of registration since the marriages of Roman Catholics, who form the majority of the population, are excluded from its provisions. Such exclusion arose from the fact of certain formalities being required by the statute to be observed in the case of every marriage falling within its purview, the omission of which formalities might be held to render a marriage invalid; and these restrictions in the case of their marriages were considered objectionable by Roman Catholics. The registration under this act commenced on 1st April 1845; the total number of marriages registered in the nine years 1846–54 inclusive, was 83,085, giving an average of 9228 marriages annually, or about 1 marriage for every 710 of the population. In England, during the same nine years, the marriages were in the ratio of 1 to every 119 persons; so that, taking the marriages of the Irish people in the same ratio, an annual average of 55,062 marriages, instead of 9228, would have been recorded under a complete system. There is in Ireland no provision for the registration of births and deaths, the duties of the registrar-general and the district registrars being confined to marriages. A bill to provide for a general system of registration has been prepared by the chief secretary for Ireland, Lord Naas, M.P.; and it may reasonably be hoped that Ireland will not long be pointed at as the only civilized country in Europe, whether Roman Catholic or Protestant, in which there is no registry of births, deaths, and marriages.

Registration in France.

The registration of births, deaths, and marriages in France is conducted under the provisions of the *Code Civil* of Napoleon. The *maire* of each *commune*, of which there are about 37,300 in France, is the registering officer charged with the duty of registering, in books provided for the purpose, all births, deaths, and marriages occurring within his commune. Births and deaths are registered in duplicate, the former upon information, in the presence of two witnesses, and are signed in duplicate by the informant, the two witnesses, and the registering officer; in the case of deaths, one of the witnesses may be also the informant. Marriages are registered in the presence of four witnesses, and signed by the parties, the witnesses, and the registering officer. The register of births records the year, day, hour, and place of birth; the sex and name of the child; the name, surnames, professions, and residences of the parents, witnesses, and informant; the date of registration, and the name and quality of the registering officer; and must be signed by him, by the witnesses, and by the informant. When the child is illegitimate, the name of the father cannot be given except by the authority of the father himself.

The register of deaths records the year, day, hour, and place of death; the name, surname, age, profession, and residence of the deceased person; the names, surnames, ages, professions, and residences of the parents of the deceased, and of the witnesses; and the name and surname of the husband or wife, if the deceased was married; also the date of registration, and the name and quality of the registering officer.

The register of marriages records the names, surnames, ages, professions, places of birth, and residences of the parties; the names, surnames, professions, and residences of their respective parents, and of the four witnesses, with the relation in which they stand to the parties; the consent of the parents; whether the marriage has been opposed; time and place of solemnization and registration; and the name and quality of the registering officer.

Registration of births is secured by a provision which requires, under pain of fine and imprisonment, from the father of the child, or, in default of the father, from some person present and assisting at the birth, a declaration thereof, within three days afterwards, to the registering officer, to whom the child must also be shown.

The registration of deaths is secured by a provision rendering it penal for a burial to take place without the registering officer having first seen the body and registered the death.

The registers are closed at the end of every year, with formalities which preclude interpolation. Alphabetical indexes are annually formed in duplicate for each. One of the duplicate registers, with its index, remains in the commune to which it belongs; the other is transmitted to the tribunal of the district, where it is examined and placed under the superintendence of the *procureur du roi*, or the local officer of the crown. Abstracts are made by the registering officer of each commune, a copy of which is transmitted to the sub-prefect, who from thence frames an abstract for his arrondissement, a copy of which he sends to the prefect; he also from the abstracts of the arrondissement makes an abstract for his department; and copies of such abstracts are sent by the prefects of departments to be deposited in a central office at Paris.

The system of registration observed in France was introduced into Belgium, Geneva, and the Rhenish provinces of Prussia when under the dominion of France, and is still retained in those countries.

Registration in Austria.

In Austria, registers of births, deaths, and marriages are kept by each minister of the church for his parish, and also by the Jewish rabbin for those of their own persuasion.

The register of births records the year, month, and day of birth; the number of the house in which the birth occurred; the name of the child and its sex, and whether it be born in wedlock or illegitimate; the names and surnames of the parents; their religion; and the names and surnames and condition of the sponsors. In the case of illegitimate children the name of the father cannot be entered unless he acknowledges the paternity.

The register of deaths records the year, month, and day of death; the number of the house in which it occurred; the name, religion, sex, and stated age of the deceased; and, when the information of a physician or surgeon can be supplied, the name of the fatal disease. For this purpose, medical men are required to inform the minister, in writing, of the cause of death of such patients as they have attended.

The register of marriages records the year, month, and day of the marriage; the place of solemnization; the names and surnames of the parties; their religion, age, and whether single or widowed; and the names, surnames, and condition of the witnesses.

Bishops, on every visitation of their dioceses, are obliged to call for the production of the registers of births, deaths, and marriages. The provincial authorities are also required to ascertain whether these registers are kept in all places as prescribed by law.

Annual abstracts must be made by the ministers and the rabbin, of which copies must be sent to the district of the conscriptions, and to the office of the circle.

Registration in Prussia.

In Prussia, except the Rhenish provinces, registration is committed to the clergyman of the parish amongst Christians, and the elders amongst Jews. The clergyman is bound to enter the births, marriages, and deaths, of persons who are not of the Established Church, but who are "simply tolerated," on the declaration of the parties or their ministers, and to include these declarations in his annual returns. Duplicates of the registers are to be made, and at the end of each year deposited, when examined and verified, in the local civil court, being "the tribunal of the place."

(*Report by the Select Committee on Parochial Registration*, 1833; *History of Parish Registers in England*, by J. S. Burn, 1829; *Population Abstract for* 1831; *Report of the Commissioners appointed to inquire into the State, Custody, and Authenticity of Non-Parochial Registers*, 1838; Registrar-General's *Reports*, 1838 to 1858; *Letters on the Law of Registration*, by Horace Mann, barrister, 1849: *Manuel des Officiers de l'Etat Civil pour la tenue des Registres*, par A. E. le Mott, Paris, 1827; *Sketch of the History of the Parochial Records in Scotland*, by Geo. Seton, advocate, 1854. (J. T. H.)

REGISTRATION OF DEEDS. The 2d and 3d Anne, c. 4, provided for the public registry of all deeds, conveyances, and wills relating to any manors, lands, tenements, or hereditaments within the West Riding of the Riding and Kingston-upon-Hull by the 6th Anne, c. 35, county of *York*. This statute was extended to the East and to the North Riding by 8 Geo. II., c. 16. The act of 7 Anne, c. 20, provided for the registry of deeds, conveyances, wills, and other incumbrances on lands, &c., in the county of *Middlesex*. The effect of the register acts is to render prior unregistered deeds fraudulent and void, as to all subsequent deeds whereof memorials have been duly registered; so that a purchaser or mortgagee can only be affected by a deed duly registered, of which he may have notice by examining the register. The registration should be made immediately after the execution of the conveyance, otherwise the delay might enable another encumbrancer to take priority. Before Lord Campbell's abolition of Arrest Act, 1 and 2 Vict., c. 110, judgments of the superior courts constituted a charge on real estates, and searches had to be made for twenty years in the several courts to ascertain whether any such charges existed. By that act the remedies of creditors was extended over the property of their debtors; but it was enacted that no judgment or decree should affect any real estate otherwise than before the act, until registered with the senior master of the Common Pleas at Westminster. And the 2d and 3d Vict., c. 11, and the 3d and 4th Vict., c. 82, provided that these judgments should be renewed every five years, or be of no effect. But as against purchasers or mortgagees, *without notice*, such judgments or decrees should not bind any lands or tenements, although registered, otherwise than a judgment of the superior courts would have bound such purchaser or mortgagee before the act of the 1st and 2d Vict., c. 110.

If the purchaser or mortgagee has notice of a judgment against the vendor, the judgment creditor will take priority, but the purchaser or mortgagee is not required to search for judgments, though it is usual for solicitors, by way of precaution, to do so; and if there is an entry of a judgment within five years, the vendor will be required to remove the charge before he can call for a completion of the purchase. In the first session of Parliament of 1859 a bill passed the House of Lords to provide that no *bonâ fide* purchaser or mortgagee should be bound by any other than actual notice of any charge affecting the title to the property. It was also proposed in the House of Commons to establish a Landed Estates Court, in which the title to real property might be investigated (as in Ireland); and on due notice to all parties interested, and on satisfactory proof, the court might grant an indefeasible title; and by another bill it was proposed that such title might then be entered in a public registry, and all future dealings with the property so registered should be entered on the register of titles. These bills, on the dissolution of Parliament in April 1859, were postponed.

The system of registration in Scotland appears to secure the utmost safety that can be attained in transactions affecting heritable property. Wherever such property passes out of the hands of any individual, either voluntarily or by the act of the law, it is made the interest of the party to whom it is transferred to warn the public of the fact, by the insertion of certain instruments in a public register. If he delay to do so, it is at his own risk; for in all competitions for the property it is the date, not of the voluntary or judicial act, but of its publication in the appropriate register, which determines the preferable right. If a person wish to become the purchaser of any heritable property situated in a Scotch burgh, he may examine the burgh register, and if he find the right of the property standing unencumbered in the person with whom he proposes to transact, and find no legal interpellation in certain other registers, he may transact with perfect safety, provided he take care to publish his having done so in the burgh register immediately. The like arrangement follows in regard to heritable properties in counties, for which there are what is called the particular record for each county, and the general record applicable to them all. Thus an intending purchaser can always ascertain whether any prior disposition, or heritable bond or other burden, or adjudication by the law or other legal impediment, exist, which can prevent him in good faith from purchasing with safety. Some or all of these things may be actually in existence; but if they be not published in the manner now referred to, and if the purchaser took the precaution to have his own title timeously published, they can only affect the seller personally (who is punishable for granting double dispositions) and his heirs, but the purchaser's title is the preferable one. There is a strong feeling in England against the exposure of domestic and private arrangements by such registers; but that is now satisfactorily avoided in Scotland, where, by recent improvements, the fact of the real right having passed from one person to another may be published in the shortest possible way; though, wherever burdens on property are meant to be created, these burdens must fully and distinctly appear on the record, otherwise they will not affect third parties transacting in ignorance. The statutes regulating these matters in Scotland are the acts of the Scotch Parliaments, 1698, c. 4; 1693, c. 15 & 35; 1696, c. 5 & 39; also 8 & 9 Vict., c. 31 & 35; 10 & 11 Vict., c. 48 & 50; 17 & 18 Vict., c. 62.

REGNAULT. See DISSERTATION SIXTH, § 632.

REGULUS, MARCUS ATILIUS, a Roman consul, who is celebrated by ancient poets and historians for his self-sacrificing heroism during the first Punic war, about 260 B.C.

REHER, a town and district of Hindustan, in the province of Delhi. The town has much declined, in consequence of the seat of government having been removed to Nijibabad. It is 80 miles N.N.W. from Bareily; Long. 104. 35. E., Lat. 57. N. The district is situated between the twenty-eighth and twenty-ninth degrees of north latitude. It formerly constituted the northern limit of Kuttaher or Rohilcund, and was ceded to the British by the Nabob of Oude in the year 1801. Both town and district are now included in the collectorship of Bareily.

REICHENAU, a town of Bohemia, in the circle and 9 miles E.S.E. of Königgrätz. It has an old and a new princely palace, the latter one of the finest buildings of Bohemia, with a valuable library and picture gallery; a Piarist college, gymnasium, and another school; manufactures of linen and woollen cloth, and an important market for corn. Pop. 4500.

REICHA, ANTON, an excellent composer and didactic writer on musical composition, was born at Prague on 27th February 1770. Having learned singing and the elements of music, he left Prague in his seventeenth year to join his uncle, Joseph Reicha, an eminent violoncellist and good composer, who was settled at Bonn, in the service of the Elector of Cologne, and who completed the musical education of Anton. Some of Anton Reicha's biographers assert that he studied music under Mozart and Michael Haydn. In 1794 Anton Reicha went to Hamburg, and remained there for five years as a teacher of the piano and of accompaniment. There he composed the music of a French opera, which he was advised to bring out at Paris. Arriving at Paris in 1799, he produced a successful symphony at the Rue de Cléry concerts; but owing to the closing of the Feydeau and Favart theatres, was disappointed in bringing out an opera. He then went to Vienna, where he held friendly intercourse with Haydn, Albrechtsberger, Salieri, and Beethoven. He now devoted himself to composition, and produced a great number of various works. Among these were *Trente-six Fugues pour le Piano, d'après un Nouveau Système*, dedicated to Haydn. There was nothing new in this system, it having been suggested to Reicha by a bad treatise on fugue published by the French writer H. F. M. Langlé, and founded on a false system of responses to fugue subjects on every degree of the scale, and the destruction of all distinct tonalities. Reicha's work was published in 1803, but met with no success, although some writers were so ignorant of the truth as to call Reicha "the restorer of the fugue." About the close of 1808 Reicha sought refuge in Paris from the evils of a new war in Germany. In Paris he began to teach musical composition according to an expeditious method, which consisted in directing the attention of his pupils solely to the forms of modern music, to the exclusion of all those forms which it is necessary to study in order to obtain a real knowledge of the art of composition. In 1814 he published his *Traité de Mélodie*, in which he claims the merit of being the first to write upon that subject,—thereby proving his complete ignorance of the various excellent works on melody published by Italians and Germans, and even of the work on composition published by the Frenchman Momigny in 1806. There are good things in Reicha's work, although he takes too narrow a view of his subject under the aspect of rhythm and melodic phrases only, neglecting altogether the laws of melody as these relate to tonality, modulation, harmony, and beauty. In 1817 he succeeded Méhul as professor of counterpoint in the Paris conservatory; and in 1818 published his *Cours de Composition Musicale*,—a work founded upon wrong views of the theory of chords, but containing much useful practical information. In 1824 and 1826 he published his *Traité de Haute Composition Musicale*, in which his ignorance of historical facts, and of the forms of ancient music, were so great as to bring him under the severe criticisms of the Abate Baini, in the latter's work on Palestrina. Reicha treats of double counterpoint as applicable to modern composition, but takes no notice of simple counterpoint, which is really the foundation of all other kinds.

While settled in Paris Reicha enjoyed the friendship and counsel of Cherubini. Very desirous to obtain success as a dramatic composer, he produced three operas,—*Cagliostro*, which fell flat on the first representation; *Natalie* in 1816, and *Sapho* in 1822, both unsuccessful. Several times he sought to be admitted as a member of the French Academy of Fine Arts, but was denied that honour until after the death of Boieldieu in October 1835, whose place he then obtained. He died at Paris, of inflammation of the chest, on 23d May 1836, and was buried on the 30th in the cemetery of Père Lachaise. His funeral obsequies were performed in the church of St Roch, and were attended by Cherubini, Paër, Auber, and all the members of the Institute, as well as the professors and pupils of the Conservatory, and the artists of the Royal Academy of Music and of the Comic Opera. He bore the rank of Knight of the Legion of Honour, and was highly esteemed in private life by his numerous friends. Besides the works already mentioned, Reicha published many others. His best compositions are his twenty-four Quintets for flute, oboe, clarinet, horn, and bassoon, which are much esteemed by connoisseurs. Three of his didactic works are *Etudes ou Théories pour le Pianoforté*, 1800; *Art du Compositeur Drama-*

Reichenbach.

tique, 1833; *Petit Traité d'Harmonie Pratique à Deux Parties.* His other works are numerous, consisting of two Symphonies, an Overture, an Octuor, Quintets for various instruments, twenty stringed Quartets, Trios, Duets, Sonatas for piano and violin, Sonatas for piano, Studies and Fugues for the piano, Variations, &c. (G. F. G.)

REICHENBACH, a town of Saxony, in the circle and 7 miles S.E. of Zwickau. It is, next to Plauen, the largest manufacturing and commercial town in this part of the country; upwards of 500 of the inhabitants being employed in the manufacture of cloth, especially merino and cashmere. Weaving, spinning, and dyeing are also carried on here. A great part of the town was destroyed by a fire in 1833. Böttiger the antiquary was born here in 1760. Pop. 9127.

REICHENBACH, a town of Prussia, in the province of Silesia, circle and 31 miles S.W. of Breslau, on the Pielbach, and near the Eulengebirge. It is surrounded by a double moat and walls; and has a castle, several churches and schools, a town-hall, &c. Manufactures of woollen cloth are carried on here; and there is some trade. Pop. 5760.

Reichenberg.

REICHENBERG, a town of Bohemia, second in size and importance to Prague, in the circle of Bunzlau, on the Neisse, an affluent of the Oder, 58 miles N.E. of Prague. It has many good buildings, but the streets are narrow, uneven, and irregular. There are here two palaces (one of which once belonged to Wallenstein), a Piarist college, several schools, and a theatre. The principal manufactures of the town are those of linen, cotton, and woollen stuffs, the dyeing of silk, tanning, the making of gloves and hosiery, jewellery, and musical instruments. Pop. 13,184.

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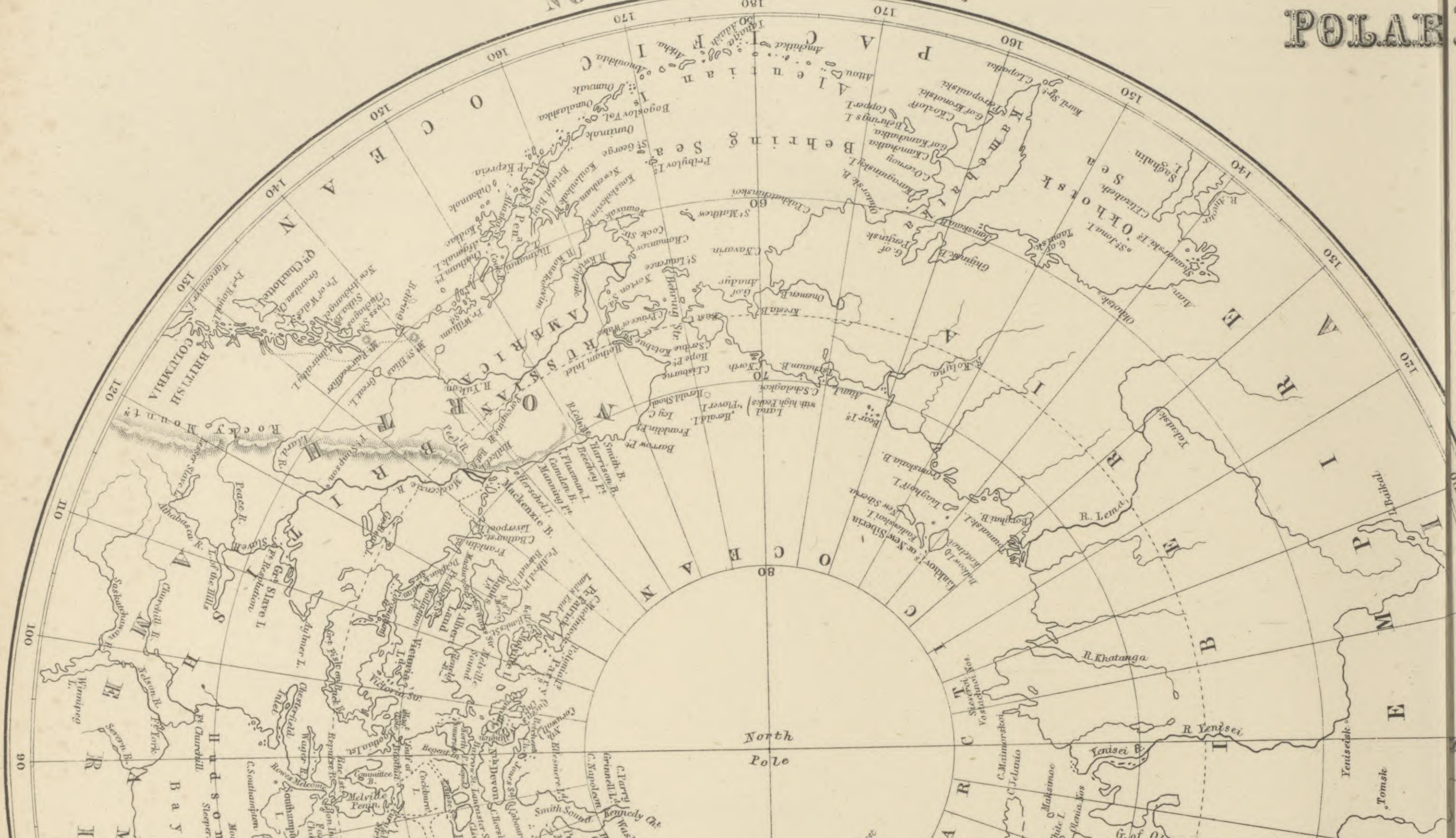

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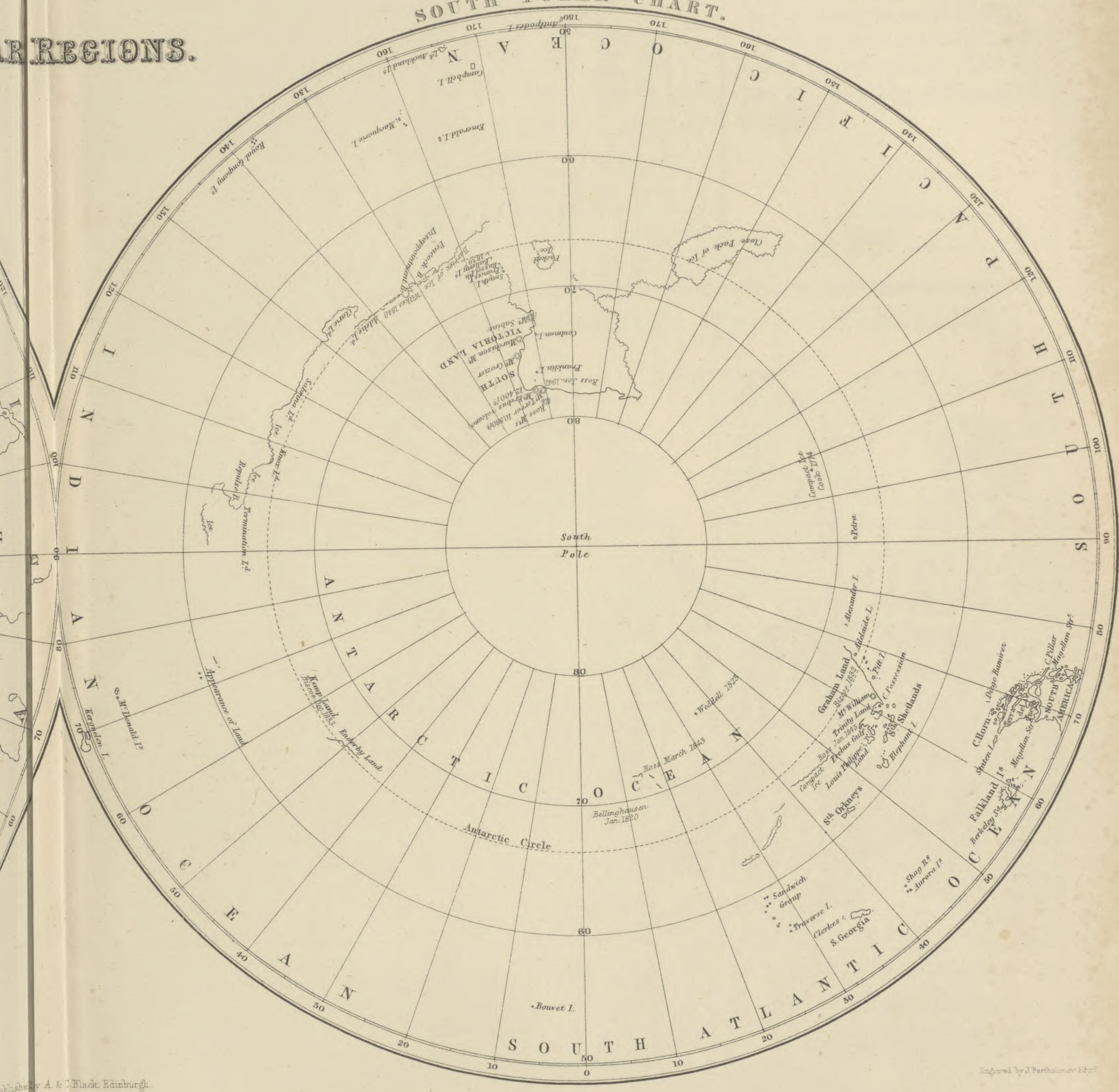

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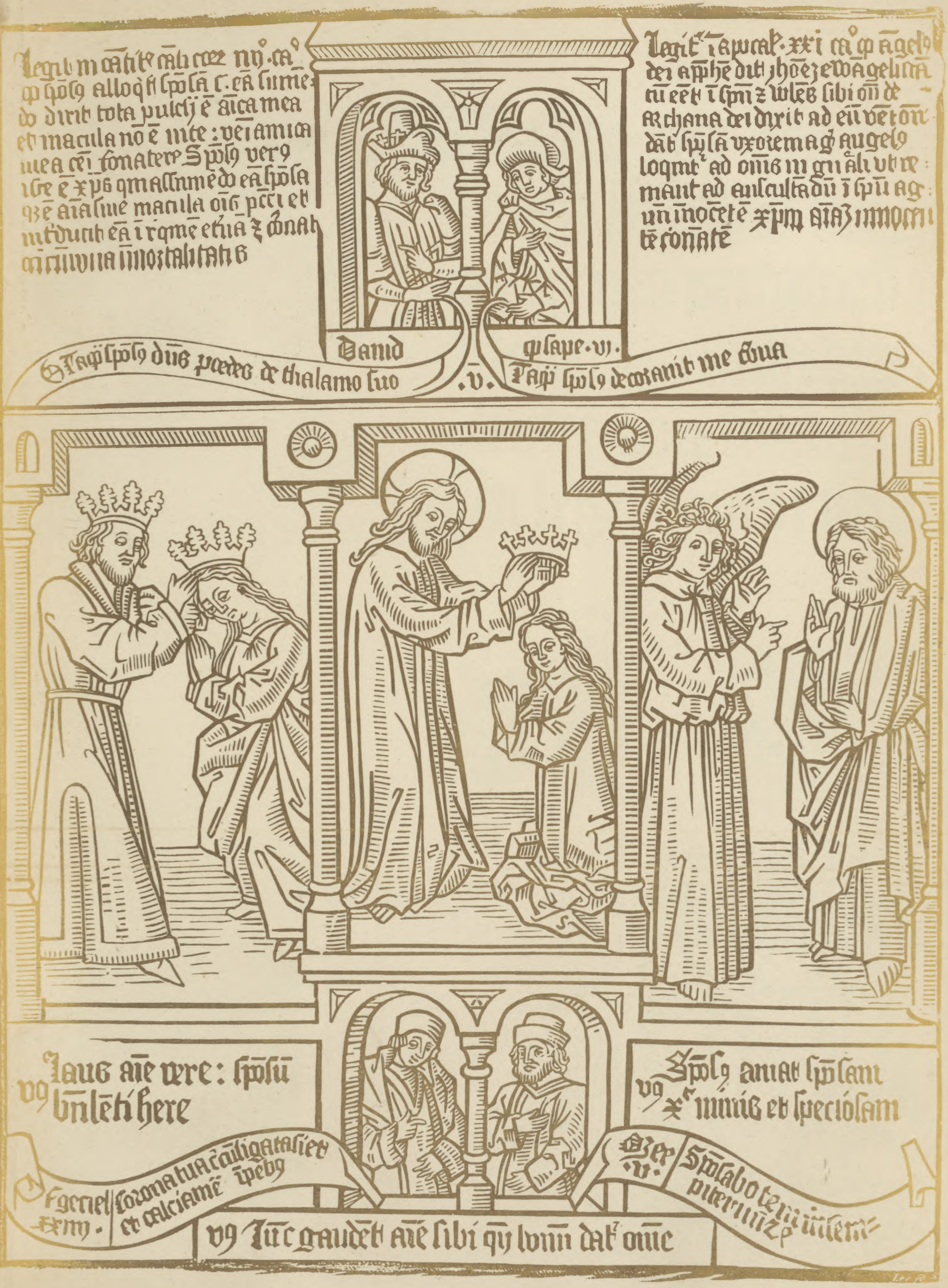

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et macula nō ē in te: veni amica
mea veni coronaberis Spōſ9 ver9
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q̄ ē aīa ſine macula oīs pcc̄i et
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eā corona īmortalitatis

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cū eēt i ſpū ꝛ volēs ſibi oſtēde-
re archana dei dixit ad eū veni oſtē-
dā tibi ſpōſā vxorem agni Angel9
loquit' ad oīs in gnāli vt re-
maneāt ad auſcultādū i ſpū ag-
nū inocētē xp̄m aīā īmacula-
tā coronātē

David — Tanq̄ ſpōſ9 dñs pcedēs de thalamo ſuo

Yſaye . vi. — Tanq̄ ſpōſā decorauit me corona

.v.

v9 Laus aīe vere: ſpōſū
vult tenere

v9 Spōſ9 amat ſpōſam
xp̄s nimis et ſpecioſam

Ezechiel xvi. — Corona tua circūligata ſit et calciamē ī pedib9

Oſee .ii. — Sponſabo te mihi in miſericordijs

v9 Tūc gaudet aīe ſibi q̄a bonū dat omne

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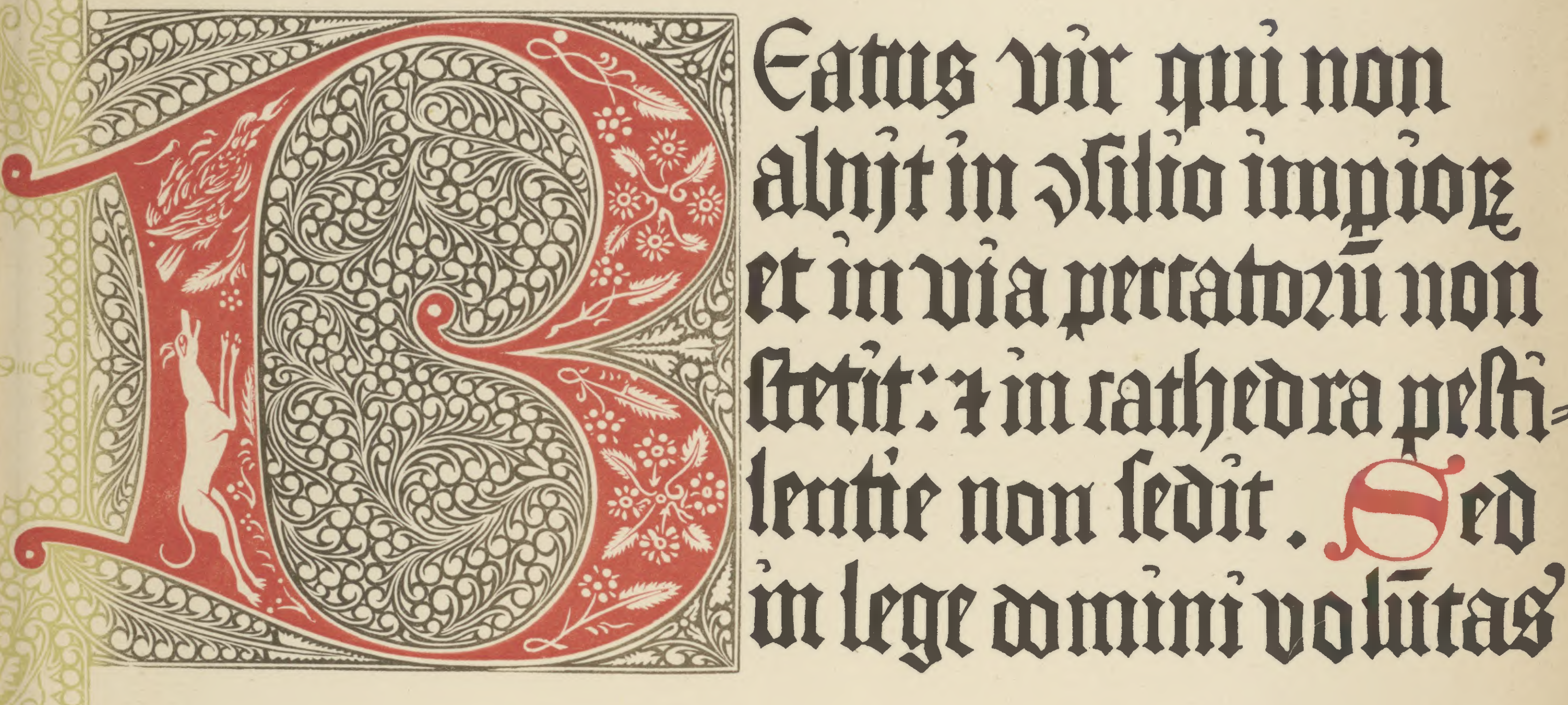
Fac-Simile of the Mentz Psalter, A.D. 1457.



Eatus vir qui non
abijt in ꝯsilio impioꝝ
et in via peccatorū non
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lentie non sedit. Sed
in lege domini volūtas

COLOPHONS.

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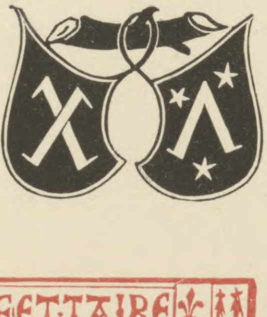

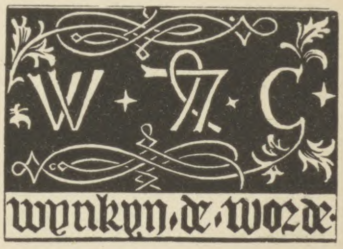

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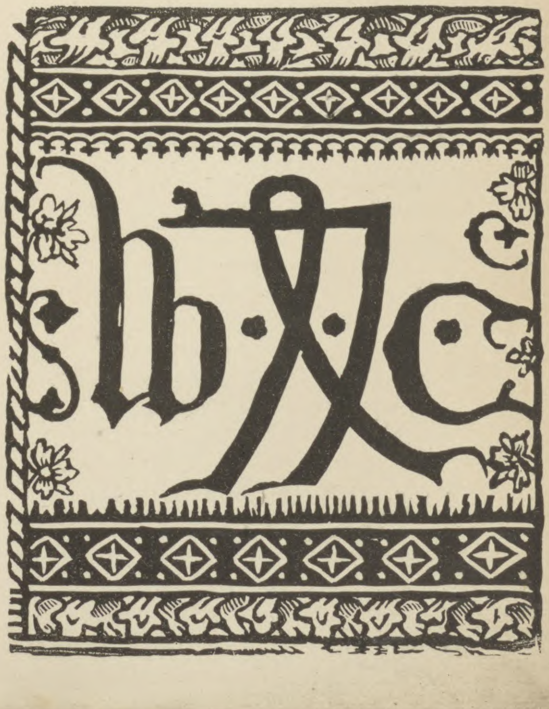

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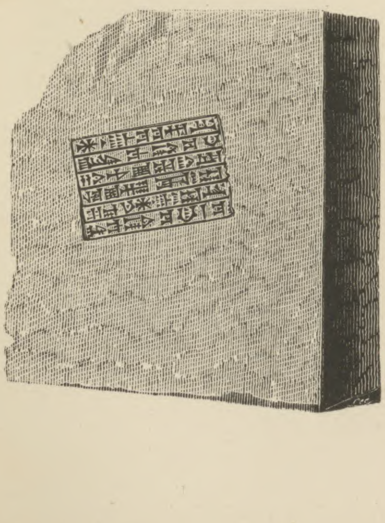

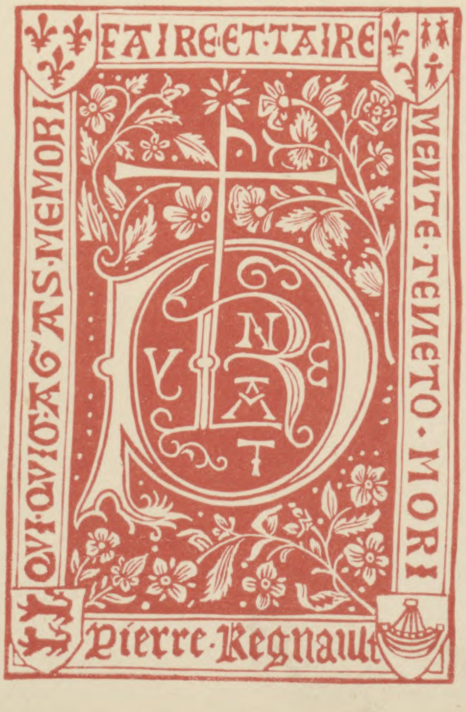

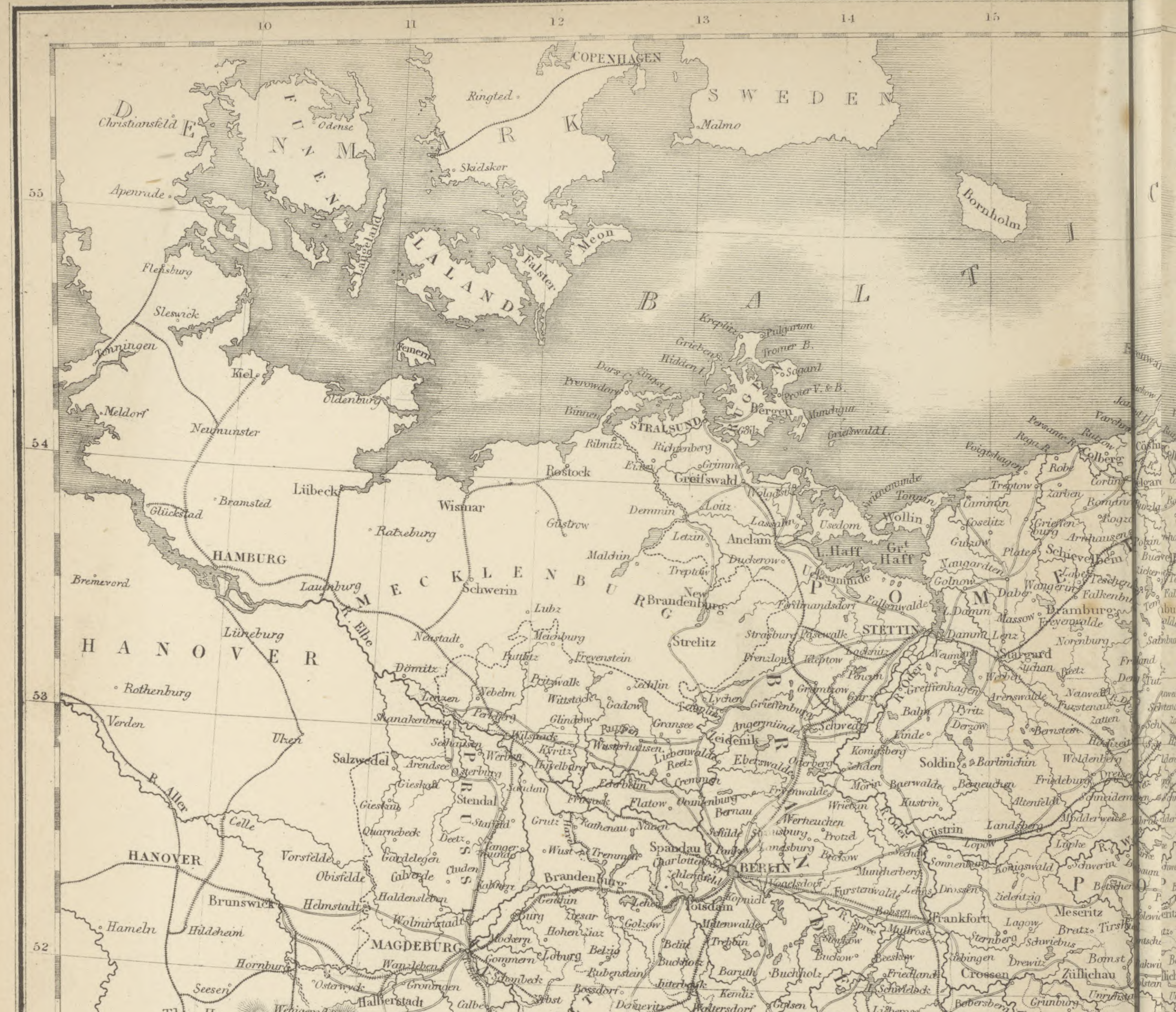

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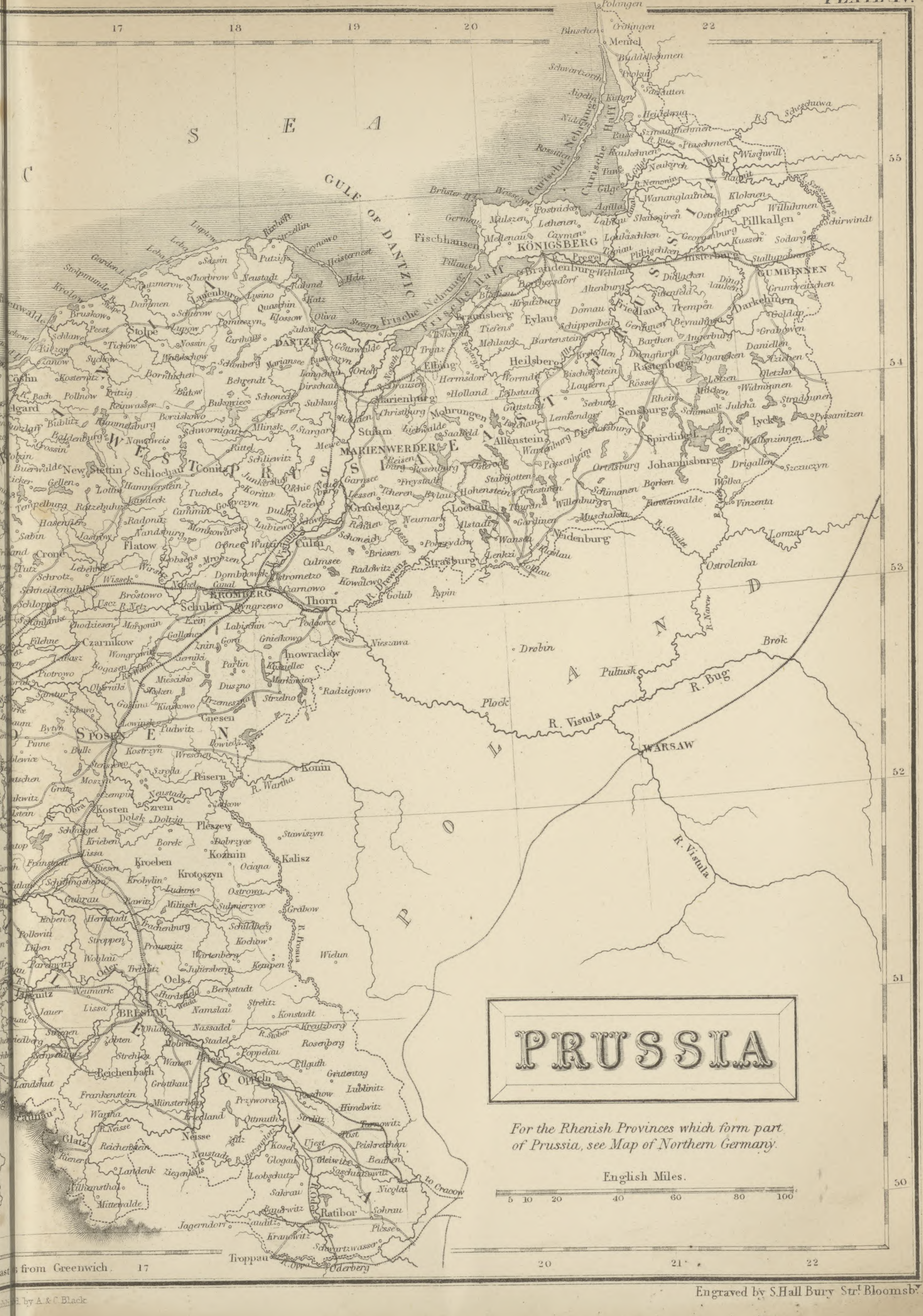

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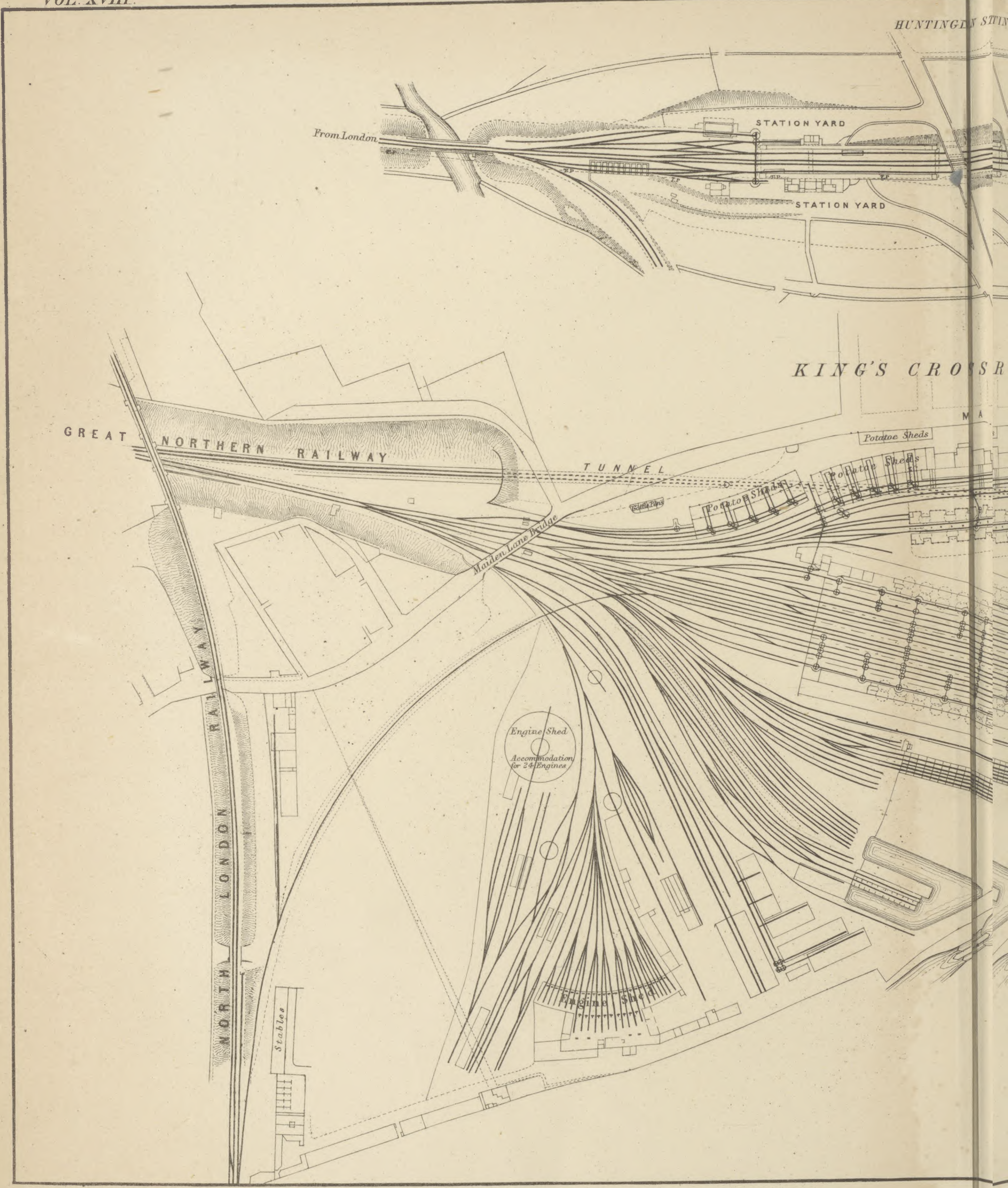

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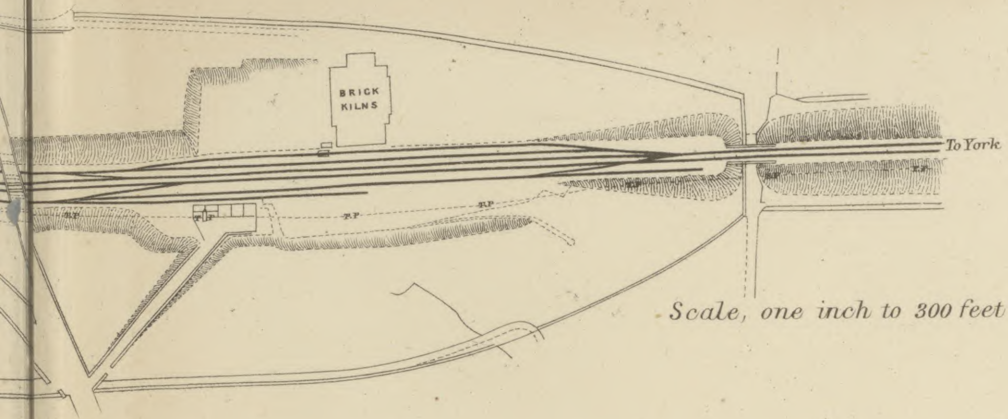

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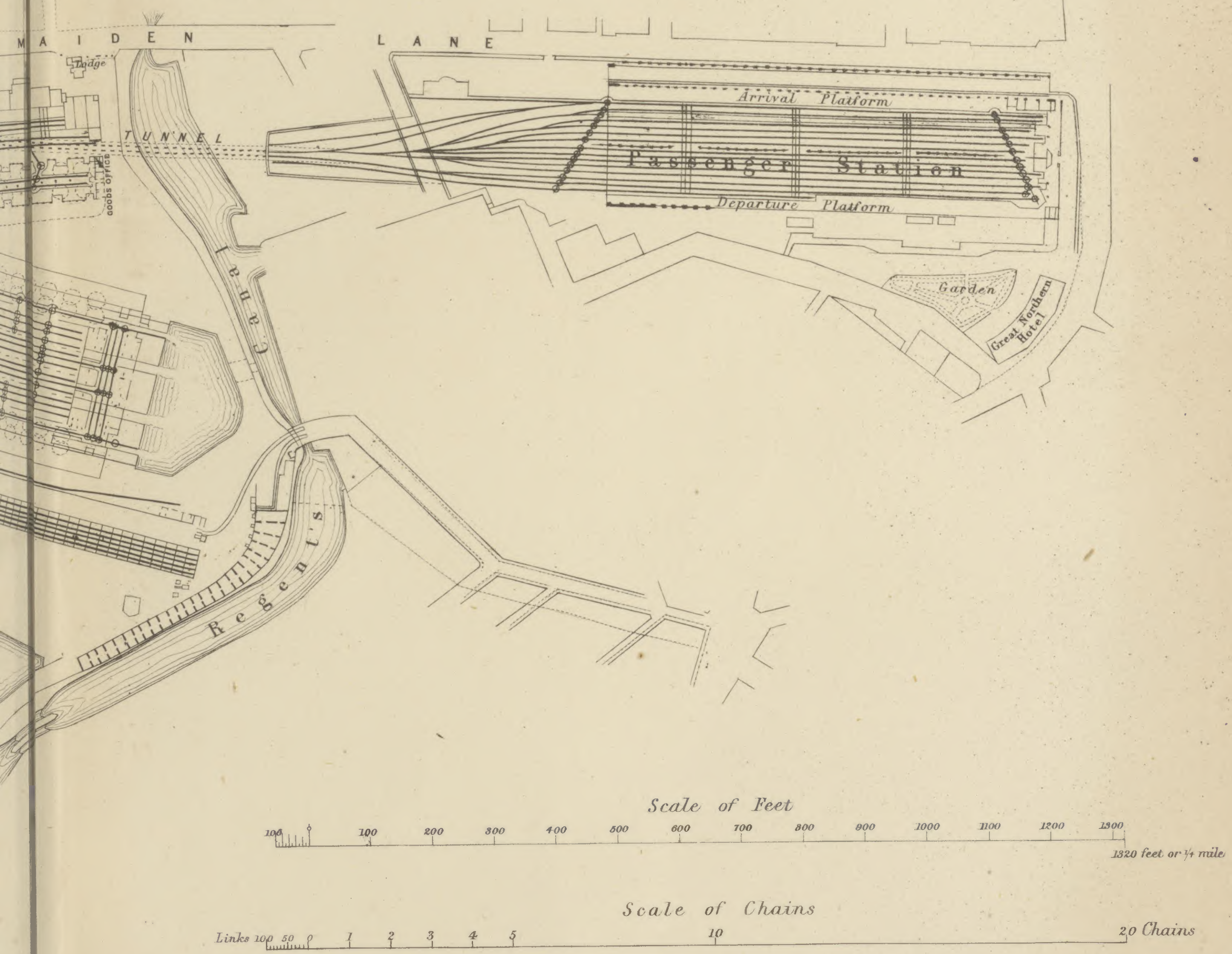

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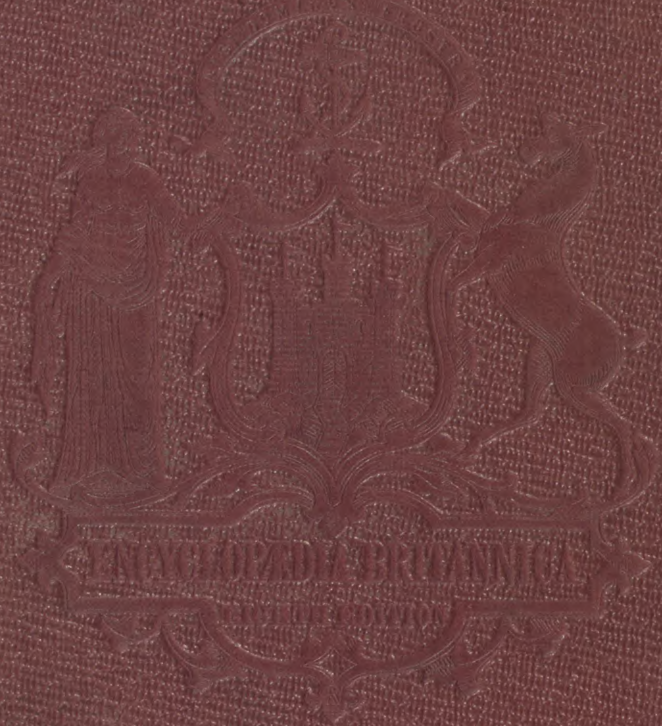
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